DIRECT TECHNICAL TESTIMONY OF MICHAEL BACA

I. INTRODUCTION

My name is Michael Baca, and I am the Water Quality Standards Coordinator for the Surface Water Quality Bureau ("SWQB"). I am presenting this written testimony on behalf of the Petitioner, the New Mexico Environment Department ("NMED" or "Department"), concerning the proposal to amend the State of New Mexico's Standards for Interstate and Intrastate Surface Waters ("Water Quality Standards" or "WQS"), codified at Title 20, Chapter 6, Part 4 of the New Mexico Administrative Code ("20.6.4 NMAC"). The Department has nominated certain river and stream reaches as Outstanding National Resource Waters ("ONRW") under Subsection D of 20.6.4.9 NMAC. These proposed WQS amendments follow the provisions of Subsections A and B of 20.6.4.9 NMAC, allowing the Water Quality Control Commission ("WQCC" or "Commission") to designate waters as ONRWs pursuant to Subsection C of 20.6.4.9 NMAC.

The Department narrowed the scope of these nominations to stream reaches covered under 20.6.4.9.B(1) NMAC. This criterion includes waters that have an existing special designation, such as a special trout water, wild river, or waters located in a wilderness area, or a national or state park, monument, or wildlife refuge. This criterion recognizes that these waters are significant attributes of and inherently embody the characteristics of ONRWs. Several of the proposed nominated stream reaches also fill gaps unintentionally created during previous ONRW designations to create continuity between previously designated ONRW stream reaches and related tributaries.

My testimony provides the following: (1) my qualifications and experience; (2) the background on the ONRW designation process (20.6.4.9 NMAC) and Antidegradation Policy;

(3) compliance with the ONRW nomination and petition requirements; and (4) compliance with the administrative procedures for WQCC rulemakings at 20.1.6 NMAC and NMED's stakeholder engagement activities related to this matter.

II. QUALIFICATIONS AND EXPERIENCE

I hold a Bachelor of Arts in Chemistry from Carleton College, and I am currently employed as the Surface Water Quality Bureau ("SWQB") Standards and Outreach Team Supervisor, and I also serve as the Water Quality Standards Coordinator. In this position, I lead the development, review, revision, and maintenance of surface water quality standards; supervise SWQB's Quality Assurance Officer to ensure data are collected and verified under approved standard operating procedures and data collection planning documents; and provide direction to staff working on SWQB special initiatives related to harmful algal blooms and volunteer data collection.

I began working for the Department in February of 2005 in the Environmental Health Bureau in the Gallup Field Office. In this position I provided training, issued permits, conducted compliance inspections and completed enforcement actions for the Food Safety, Onsite Wastewater, and Public Pool and Spa Safety Programs. I began as the Pool Specialist for northwestern New Mexico in July of 2006. I continued my duties in the food and onsite wastewater programs while taking on additional responsibilities as the subject matter expert and certified trainer for the pool program. In this role, I ensured consistent administration, implementation, and enforcement of the pool program across the district and provided internal and external training, technical guidance, and policy development at a state level.

I started working for the NMED Air Quality Bureau in July of 2008 in the Control Strategies Section in Las Cruces. In this position, I served as the air quality border liaison and

worked on technical and policy issues related to climate, particulate matter, and ozone pollution. I worked with stakeholders in formal and informal settings on cross jurisdictional air quality and climate concerns in the bi-national Paso del Norte Airshed, near Sunland Park, NM, El Paso, TX and Ciudad Juárez, Mexico. I developed ozone and particulate matter air quality management plans for New Mexico and participated in special studies regarding emissions inventories, monitoring, and photochemical modeling for the ozone nonattainment area near Sunland Park in southern Doña Ana County, as well as portions of that area's State Implementation Plan ("SIP") under the federal Clean Air Act.

From December of 2018 to September 2023, I served as the manager of the Control Strategies Section in Santa Fe, with a staff of six that develop air quality rules and the SIP; track and comment on federal air quality and climate rules, guidance, and regulatory actions; manage and participate in air quality studies; lead and participate in regional and local climate change and air quality improvement groups and committees; implement air quality management plans and grant programs; and facilitate stakeholder engagement, outreach and education events.

I have led and been a part of several rulemaking efforts for NMED including the Ozone Precursor Rule - 20.2.50 NMAC, Energy Transition Act Rule - 20.2.101 NMAC, Regional Haze Requirements - 20.2.68 NMAC (proposed), Fugitive Dust - 20.2.23 NMAC, and Permitting Rules for Nonattainment Areas - 20.2.79 NMAC. The rulemakings have covered emission sources in the Oil and Gas, Electric Power Generation, and Construction Sectors. An accurate and up-to-date copy of my resume is included as **NMED Exhibit 2**.

III. ONRW DESIGNATIONS AND ANTIDEGRADATION POLICY

An ONRW is where high quality waters constitute an outstanding National resource, such as waters of National and State parks and wildlife refuges and waters that possess exceptional

recreational or ecological significance with water quality that "shall be maintained and protected" (40 C.F.R. § 131.12(a)(3)). The Commission may designate waters as ONRWs where they determine the designation is beneficial to the state and the water meets one or more of the qualifying criteria outlined in 20.6.4.9 NMAC. The waters nominated for designation under 20.6.4.9.B(1) NMAC deserve ONRW status to protect these important stream reaches for present and future generations.

Under the federal Clean Water Act ("CWA"), 33 U.S.C. § 1251 et. seq. (1972), federal regulations require states to adopt a statewide antidegradation policy (40 C.F.R. §131.12(a)) and methods for implementing such policy (40 C.F.R. §131.6(d)). The requirement to develop an antidegradation policy and implementing methods or procedures is intended to help achieve the overall objective of the CWA "to restore and maintain the physical, chemical and biological integrity of the nation's waters." (33 U.S.C. § 1251(a)).

Federal regulations establish three levels of antidegradation protection for surface waters, referred to by the U.S. Environmental Protection Agency ("EPA") as Tier 1, 2, and 3 waters (40 C.F.R. § 13l.12(a)(1)-(3)). ONRWs receive Tier 3 protection, which is the highest level of protection. Except for certain temporary activities, water quality cannot be lowered in ONRWs, as detailed in New Mexico's Antidegradation Policy in 20.6.4.8(A) NMAC and Antidegradation Implementation Procedures found in Appendix A of the Water Quality Management Plan and Continuing Planning Process (**NMED Exhibit 3**).

The statewide antidegradation policy maintains and protects ONRWs, providing limited exceptions in 20.6.4.8.A(3)(a) through (e) NMAC and 20.6.4.8.A(4)(a) NMAC. These exceptions include temporary and short-term degradation if the Commission determines it to be necessary to accommodate public health or safety; temporary and short-term degradation in

response to an emergency action that is necessary to mitigate an immediate threat to public health or safety; pre-existing land use activities allowed by federal or state law prior to designation as an ONRW that are controlled by best management practices ("BMPs") and do not pose any new or increased discharges; acequia operation, maintenance and repair; and activities that result in the restoration or maintenance of the chemical, physical or biological integrity of the water. It is important to note that an ONRW designation does not prevent or preclude discharges or anthropogenic activities from occurring. Activities such as these require demonstration that they will not cause degradation of the ONRW or are one of the permitted short term and temporary activities identified above that are allowed under 20.6.4.8.A(3) and 20.6.4.8.A(4)(a) NMAC.

Regarding the federal National Pollutant Discharge Elimination System ("NPDES") and Section 404 Dredge or Fill permitting programs, the designation of an ONRW would not prohibit a permittee from applying to discharge to an ONRW so long as it can be demonstrated the discharge would not cause degradation of the water quality as established in baseline conditions or established existing uses, whichever is more stringent, or the discharge is consistent with an exception listed in 20.6.4.8.A NMAC noted above. Should an application to discharge to an ONRW be submitted, the Department will use all available and defensible data to implement protections in accordance with the state's antidegradation policy.

IV. ONRW NOMINATION AND PETITION REQUIREMENTS

Under the WQA and the Commission's rulemaking rule (20.1.6.200.A NMAC), any person may, at any time, petition the Commission to adopt, amend or repeal a water quality standard (NMSA 1978, § 74-6-6(B)). Additionally, 20.6.4.9.A NMAC states that "[a]ny person may nominate a surface water of the state for designation as an ONRW" by filing a rulemaking

petition with the WQCC. The Commission must hold a public hearing and consider technical testimony to adopt new or amended standards (NMSA 1978, §§ 74-6-3(E) and -6(A)) including the designation of a new ONRW. New or revised standards must be submitted by the State to the EPA for approval under Section 303(c) of the CWA.

The criteria for ONRW designation in New Mexico are set forth in Subsection B of 20.6.4.9 NMAC, which provides that a surface water of the state, or a portion of a surface water of the state, may be designated as an ONRW where the Commission determines that the designation is beneficial to the State of New Mexico, and:

> (1) the water is a significant attribute of a state special trout water, national or state park, national or state monument, national or state wildlife refuge or designated wilderness area, or is part of a designated wild river under the federal Wild and Scenic Rivers Act; or
> (2) the water has exceptional recreational or ecological significance; or
> (3) the existing water quality is equal to or better than the numeric criteria for protection of aquatic life and contact uses and the human health-organism only criteria, and the water has not been significantly modified by human activities in a manner that substantially detracts from its value as a natural resource

NMED focused this petition on waters that meet the special designations criteria specified in 20.6.4.9.B(1) NMAC.

Subsection A of 20.6.4.9 NMAC lists the required elements, documentation, and evidence that must be included in any petition to nominate an ONRW. NMED has met the requirements of this subsection as demonstrated in its nomination (**NMED Exhibit 4**).

A. Maps of the Surface Waters of the State

20.6.4.9.A(1) NMAC requires that a petition include maps of the surface waters nominated, "…with the location and proposed upstream and downstream boundaries." Appendix A of the nomination provides the Geographic Information System (GIS) based maps that NMED

developed for the nominated waters (**NMED Exhibit 4**). GIS mapping layers for the nominated waters and previously designated ONRWs are available on the SWQB's online mapper at https://gis.web.env.nm.gov/oem/?map=swqb.

B. Written Statement and Evidence Based on Scientific Principles

20.6.4.9.A(2) NMAC requires "a written statement and evidence based on scientific principles in support of the nomination, including specific reference to one or more applicable ONRW criteria listed in Subsection B." This information is provided in **NMED Exhibit 4**. Specifically, Table 1 of the nomination lists the specific water bodies, their upstream and downstream boundaries, and their special designation pursuant to the 20.6.4.9.B(1) NMAC qualifying criteria for ONRW designation.

In total, NMED is nominating 46 stream reaches totaling 256.5 miles for ONRW designation in this matter (**NMED Exhibit 5**). Of those, 36 meet a single special designation criterion, with three as part of a designated Wild and Scenic River (Rio Chama, Red River), five within a national monument (Bandelier and Rio Grande del Norte), three within a national preserve (Valles Caldera), one within a national historical park (Pecos), nine are in a Wilderness area (Columbine-Hondo), and 15 reaches are designated as Special Trout Waters (STW). Additionally, 10 reaches are STWs and meet one additional special designation eligibility requirement. Of these, one is in Bandelier National Monument, two are in Valles Caldera National Preserve, one is in Cimmaron Canyon State Park, and six are in the Columbine Hondo Wilderness Area.

Under special designations criterion at 20.6.4.9.B(1) NMAC, a water body may be designated an ONRW if it is a significant attribute of a Special Trout Water. STWs make up the largest category of stream reaches nominated for ONRW designation in this petition. The New

Mexico Department of Game and Fish (“NMDGF”) identifies and manages STWs to achieve various goals including to produce trophy-sized trout, improve conservation of native trout, or enhance the overall trout population structure and density. NMDGF tailors fishing regulations for STWs to the water body and may include modified bag limits, catch-and-release for native species like Rio Grande cutthroat trout, or restricted tackle. In STWs, it is also illegal to disturb rocks, plants, or sediment to attract fish increasing the protection of the physical habitat in these waters.

A surface water may be nominated for ONRW special designations if it is "part of a designated wild river under the federal Wild and Scenic Rivers Act (WSRA)” (20.6.4.9.B(1) NMAC). The wild designation is specifically intended to protect the free-flowing character of the nation's finest rivers. According to the WSRA, these rivers "possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations" (16 U.S.C. § 1271). The aforementioned values of waters make them eligible for recognition under the federal WSRA and portions of two of the nominated waters, the Red River (4 miles) and the Rio Chama (23.63 miles), have been designated as wild.

WRSA and ONRW designations are complimentary; each secures the protection of different qualities of land and water. ONRW designation protects water quality, while the WSRA protects natural flows and scenic integrity of both the water body and surrounding land. Thus, while each designation protects a river's natural qualities, the designations protect different interests and are mutually reinforcing and not redundant.

A water is eligible for ONRW special designations if it is a significant attribute of a

Wilderness area. The Wilderness Act was enacted by Congress in 1964. (16 U.S.C. §§ 1131(a)). The Act describes wilderness as:

> [U]ndeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value (16 U.S.C. § 1131 (c)).

Wilderness areas in New Mexico have been designated primarily through congressional acts and the protection of "watersheds" has been cited as one of the purposes for which these areas were designated (Pub. L. 95-237, § 1 (b); Pub. L. 96-550, § 101). Through these Wilderness designations, Congress recognized that these areas' watersheds are of "national interest" and significance (Pub. L. 95-237, § 1 (b)).

A key goal of Congress in designating Wilderness areas is to protect and preserve the land's natural conditions in accordance with the statute. A significant natural condition of any Wilderness area is its surface waters. Wilderness waters embody recreational, ecological, geological, scientific, scenic and historic values that should be preserved and protected for future generations. Wilderness waters are a significant attribute to the Wilderness because of the critical role they play in overall watershed health. This is especially true for New Mexico, an arid state, where surface waters are highly valued, and often include the headwaters that feed downstream water supplies. In addition to fresh water, the nominated streams provide New Mexicans fishing opportunities; places of solitude and relaxation; unique habitats for plants and animals; and reference sites to compare against impacted ecosystems.

Special designations also include national or state parks, monuments, or wildlife refuges. Twelve (12) of the nominated waters are within a national historic park (Pecos), national monument (Bandelier and Rio Grande del Norte), or national preserve (Valles Caldera). Congress creates a wide range of titles including national park, national monument, national preserve, national recreation area, and many others when creating legislation for new units in the National Park System. However, the statutory authorities and management policies of the National Park Service ("NPS") generally apply to all National Park System units, regardless of title (54 U.S.C. § 1000101). However, the units of the National Park System vary widely in their physical features and the purposes for which they were designated.

National parks contain some of the country's best-known natural attractions. They typically are large, diverse areas with outstanding natural features and ecological resources. National preserves are similar to national parks in their size and natural features but typically allow uses like hunting or mining that Congress considered incompatible with national park designation. Five nominated waters are within Valles Caldera National Preserve, two of which are also STWs.

National historical parks are notable for their connection with events or people of historical interest. The Pecos National Historic Park and the Pecos River have played a critical role in supporting civilizations for thousands of years. The river has provided water to support these communities, including the ecosystems that sustain and support the flora and fauna in the area. Additionally, the recreational opportunities, geology, and the history of the area draw thousands of visitors annually.

National monuments may be established by Congress or proclaimed by the President under the Antiquities Act of 1906 (54 U.S.C. § 320101 et seq). Many of the park system's

national monuments contain historical or archaeological artifacts, but others are notable for their natural features or recreational opportunities. Five nominated waters are within Bandelier National Monument and one within the Rio Grande del Norte National Monument (Bureau of Land Management).

The nominated surface waters are a significant attribute of the special designations areas where they are located. In addition to providing habitat for numerous animals, these waters provide riparian and wetland plant communities that serve critical ecological functions by slowing flows when elevated during spring snowmelt or summer monsoons, trapping organic debris, reducing erosion, and filtering suspended sediments. Designation of the nominated streams as ONRWs will enhance protection of those ecological attributes that support the varied recreational activities enjoyed by many. These uses are sustainable and likely to increase in value with time and under ONRW designation. Protection and conservation of fish and wildlife resources is essential to ensuring the long-term benefit of these waters to the state.

C. Water Quality Data

20.6.4.9.A(3) NMAC requires "water quality data, including chemical, physical, or biological parameters, if available, to establish a baseline condition for the proposed ONRW." The Department has met this requirement by collating and providing available water quality data for the nominated waters in Appendices B1-B4 of the nomination (**NMED Exhibit 4b**). The Department also provided a summary of water quality condition for each nominated water based on the associated CWA § 303(d) / §305(b) assessment unit status as detailed in Table 2 of the nomination (**NMED Exhibit 4**).

D. Discussion of Activities that Might Contribute to Water Quality Reduction

20.6.4.9.A(4) NMAC requires a discussion of activities that might contribute to reduction

of water quality in the proposed ONRW. Existing and potential activities that could reduce water quality in the nominated waters include but are not limited to climate change, wildfires, dams, hard rock mining, illegal waste disposal, and point source discharges. These activities, as well as others, are discussed in detail in the demonstration. In New Mexico, the NPDES program is administered by EPA Region 6 with the assistance of SWQB staff that review and certify that permits comply with New Mexico law. Additionally, SWQB staff conduct compliance evaluation inspections of NPDES permit holders on behalf of EPA. Four (4) of the nominated waters have existing point sources with individual NPDES permits. Three permits are for fish hatcheries, two are for wastewater treatment plants, and one for a closed mining facility undergoing cleanup and remediation activities. NMED identified existing individual NPDES permits, major dams, or recent wildfire burn scar (since 2017) within the 12-digit USGS HUC upstream (or contributing tributaries) of the nominated stream reach in the demonstration.

E. Additional Evidence to Substantiate the Designation

20.6.4.9.A(5) NMAC requires "any additional evidence to substantiate the designation, including a discussion of the economic impact of the designation on the local and regional economy within the state of New Mexico and the benefit to the state." The proposed ONRW designation of waters is not expected to have detrimental economic impact on existing uses within these areas because there are no new requirements that will apply to existing activities. As previously discussed, "pre-existing land-use activities" that are controlled by BMPs are exempt from any additional requirements as a result of ONRW designation so long as no new or increase in discharge occurs. Petitioners do not propose to alter the protection given to existing uses under the current regulations but propose to maintain this protection. For example, grazing conducted in an ONRW watershed in accordance with a permit issued by the United States Forest Service

("USFS") is considered a pre-existing land use activity. The USFS already requires grazing permittees to implement BMPs to protect water quality. (**NMED Exhibit 6**).

While designation is not expected to result in detrimental economic impacts to pre-existing land uses, designation may provide economic benefits to the state. By designating waters as ONRWs, the State of New Mexico takes an important step to ensure protection of headwater streams that support wilderness uses such as livestock grazing and recreation, and ultimately feed downstream public drinking water supplies, agriculture, and other important uses. According to the USFS, national forest lands provide 14% of the runoff of the contiguous United States land area and the value of this water has been estimated at $3.7 billion per year nearly 25 years ago. (**NMED Exhibit 7**). More recently, researchers for the USFS found that although forests accounted for only 36% of land cover in the U.S., they accounted for nearly 50% of the surface water yield. Annually, as many as 150 million people are served by drinking water utilities supplied from surface waters from forested lands (**NMED Exhibit 8**). As demand and pressure on water supplies continue to increase from population growth, climate change, and drought, it becomes increasingly important to protect the water and watersheds that supply and support our communities.

As discussed, ONRW designation can help to protect wildlife habitat provided by designated waters. Furthermore, the designation can help to preserve rivers and streams enjoyed by thousands of people annually. Although numbers are not available for recreational and wildlife uses of individual areas alone, New Mexico does derive a significant amount of revenues from outdoor recreation and associated activities. Annually, thousands of visitors are drawn to New Mexico's forests, rivers, and lakes for hunting, fishing, and several non-consumptive outdoor activities, such as wildlife viewing, rafting, hiking, and camping. Key

elements of New Mexico's attraction are high quality waters and scenic landscapes with minimal human influence. Regardless of recreational activity pursued, each has a positive economic contribution due to visitor spending. The U.S. Department of Commerce's Bureau of Economic Analysis reported that the value added for New Mexico's outdoor recreation was 1.9% of the State's Gross Domestic Product, or $2.4 billion in 2022. Employment in the outdoor recreation sector in New Mexico provided 27,977 jobs accounting for an approximately 20% increase from 2020 (**NMED Exhibit 9**).

Recently, the National Park Service ("NPS") published the Visitors Spending Effects Report ("VSE") to quantify the annual economic contribution of NPS visitors on national, state, and local economies (**NMED Exhibit 10**). The report captures the effects of direct spending purchases and the secondary effects (indirect and induced spending) of additional jobs and economic activity on the local economy. Secondary effects include indirect spending at local businesses that supply goods and services to directly affected businesses. Secondary effects also include induced effects of employees using their income to purchase goods and services in the local economy. The direct and secondary effects together give the total economic effect of visitor spending in a local economy.

In 2023, 2.3 million park visitors spent an estimated $142 million in local gateway regions while visiting NPS lands in New Mexico. Statewide these expenditures supported a total of 1,860 jobs, $55.9 million in labor income, $95.7 million in value added, and $177 million in economic output in the New Mexico economy. Three units managed by the NPS are included in the nomination and contribute to the economic benefits of tourism at New Mexico's NPS lands.

The economic impact of national forests on the surrounding local and regional economies has been thoroughly evaluated by the University of New Mexico's Bureau of Business and

Economic Research ("BBER"). BBER has evaluated the Carson and Santa Fe National Forests and described the socioeconomic impact on forest users, and the impact of each forest on the surrounding local and regional economy. The BBER reports cover the full range of activities that occur within national forests. **NMED Exhibit 11** provides excerpts of key information and tables from the BBER reports that quantify the direct, indirect and induced financial benefits of ranching, timber harvesting, recreation and forest service operations on regional and local economies for each national forest.

Nominated waters are located within the Rio Grande, Pecos, and Canadian basins in the Carson and Santa Fe National Forests where visitor spending and tourism from outdoor recreation play a vital role to the local and regional economies. Wilderness areas in the Carson National Forest include the Cruces Basin, Latir Peak, Wheeler Peak, and the northern parts of Pecos and Chama River Canyon Wildernesses. The land in the Carson National Forest is used mostly for recreation and livestock grazing. Snowfall within the Carson National Forest contributes substantially to the runoff water needed throughout the Rio Grande Valley for agricultural purposes. The forest comprises some of the most productive and important watersheds in the region (**NMED Exhibit 11**). In total, the Carson National Forest contributes directly and indirectly an estimated $414 million in output, 4,003 jobs and $89.3 million in income to the local economy. Additionally, the Carson National Forest plays a key role in terms of water generation and retention, which is vital to the economic development of the arid southwest region. According to BBER, water is ultimately the most significant economic contribution and risk associated with forest management in the Carson (**NMED Exhibit 11**).

The Santa Fe National Forest contains the Dome, San Pedro Parks, and most of the Pecos and Chama Wildernesses. In total, the Santa Fe National Forest contributes directly or indirectly

an estimated 2,379 jobs and $159 million in income to the local economy. As with the Carson National Forest, water retention and generation benefits and the presence of rivers are ecologically and economically significant to the region. (**NMED Exhibit 11**).

Under 20.6.4.9.B NMAC, the Commission may designate an ONRW where it determines that the designation is beneficial to the state and meets one or more of the criteria listed in that regulatory provision. NMED developed the ONRW proposal to nominate streams with existing special designations, consistent with 20.6.4.9.B(1) NMAC, that are part of larger recreational or ecological management systems as category of waters that should receive the highest level of water quality protection in the state.

Areas with special designations provide many important benefits and values to New Mexico. These areas and the nominated waters are a source of abundant clean water, essential to human life, aquatic life, livestock, agriculture, and wildlife. These areas when maintained and healthy also provide important ecological services, including watershed resilience toward wildfire and drought, carbon storage, nutrient cycling, flood mitigation, fish and wildlife habitat, and biodiversity. Cleaner water is less expensive to treat because water filtration equipment is less expensive to maintain. These areas and the nominated waters also provide important and diverse recreational activities to New Mexicans.

Additionally, the nominated waters contribute to scenic, spiritual, and cultural values of these areas. These are valuable, but not easily valued, and irreplaceable services that are generally taken for granted. Additionally, the water retention and generation properties of these areas contribute to the economic viability of surrounding communities. Adequate flow and water quality are essential to maintaining fish species and fisheries, which in turn are sources of many economic, recreational, cultural and spiritual values. (**NMED Exhibit 7**). Water is a critically

important resource to our semi-arid State. As private lands continue to be developed, public and other protected lands will grow in importance as sources of high-quality water runoff. (**NMED Exhibit 12**).

F. Affidavit of Publication of Notice of the Petition

20.6.4.9.A(6) NMAC requires an "affidavit of public of notice of the petition in a newspaper of general circulation in the affected counties and in a newspaper of general statewide circulation." The notice of petition was published on July 19, 2024, in the *Santa Fe New Mexican*, and on July 20, 2024, in the *Albuquerque Journal*. Additionally, a listserv email was sent to approximately 1,900 subscribers and direct emails were sent to federal, state, and tribal representatives and interested parties. A copy of the notice of the petition and affidavits of publication are provided as Appendix D of the nomination (**NMED Exhibit 4**). NMED was unable to publish notice of the petition in the *Los Alamos Monitor*, *The Taos News*, and the *Las Vegas Optic* as these newspapers are not vendors to provide services to the state. Note that the notice of petition is a separate and distinct requirement from the notice of rulemaking hearing.

G. Public Comments

In conjunction with the notice of petition, NMED held a 30-day public comment period from July 20 through August 19, 2024. Instructions for providing comment were included in the public notice. In addition, NMED held a virtual public meeting on August 8, 2024, providing a presentation on the current nomination and the anticipated procedural steps for rulemaking. Appendix E1 contains the slides presented at this meeting. Public participation opportunities were highlighted, and staff provided a live demonstration of how to: find rulemaking material and supporting documents, use our GIS Mapper, navigate various NMED websites and information repositories, and submit comment through NMED's Smart Comment Portal. A

summary of the public meeting including participants and questions received can be found in Appendix E2 of the nomination (**NMED Exhibit 4**).

NMED received significant interest and support for the nomination with 656 submissions via email and an additional 76 submissions through the Department's Public Comment Portal as shown in Appendix E3 of the nomination (**NMED Exhibit 4**). All 656 email submissions (form letters) support the ONRW designation without modification to the list of waters provided in the public review draft of the nomination.

Public comment through the Department's Public Comment Portal was categorized into six bins based on the nature of the comment or affiliation of the commentor. NMED received: generally supportive comments (32), comments supportive of specific waters (5), comments suggesting other waters (26), comments and letters from Non-Governmental Organizations (10), comments about private land (2) and comments on mining (1). Of note, the Big Tesuque River was suggested by 22 commentors to be included on the list but it does not meet the criteria listed in 20.6.4.9.B(1) NMAC. NMED met twice with citizens of the Village of Tesuque to discuss their concerns and suggestions, the criteria used to nominate waters as ONRWs, and the process to nominate waters.

NMDGF provided a comment letter via email on the public review draft list of waters as provided in Appendix E4 of the nomination (**NMED Exhibit 4**). NMED and NMDGF met before and after their submittal, to discuss concerns and specific requests to remove waters. As a result, NMED reevaluated STW nominations and retained those that are headwater streams, those that meet additional 20.6.4.9.B(1) NMAC criteria, and those that had public comment in specific support of the water. This resulted in the removal of three reaches in the final demonstration -- two on the Rio Chama immediately downstream of El Vado and Abiquiu Dams,

and one on the Red River.

V. RULEMAKING PROCEDURES, PUBLIC NOTICE, AND STAKEHOLDER ENGAGEMENT

Rulemaking before the Commission begins when a person files a written petition and statement of reasons to adopt, amend, or repeal a regulation, in accordance with 20.1.6.200 NMAC. The petitions must specify the statutory authority for the commission to adopt proposed rules, estimate the amount of time to conduct the hearing, and include a copy of the entire rule with line numbers and proposed changes in redline fashion (20.1.6.200.B NMAC). The Commission may grant a rulemaking hearing, in accordance with 20.1.6.200.C NMAC and specify the procedures for conducting the hearing as outlined in 20.1.6.200.D NMAC, including provisions for public notice and public participation.

A. Public Notice

Notice of rulemaking hearings must be provided to the public in accordance with the State Rules Act (NMSA 1978, § 14-4-1) and 20.1.6.201.A NMAC. The public notice must include publication in a newspaper of general circulation, the New Mexico Register, and other means necessary as determined by the Commission (20.1.6.201.B NMAC). The public notice of rulemaking must include: the subject, a summary, and the purpose of the proposed rule, the legal authority for the rule and its adoption, the technical basis for the proposed rule and how to find technical information, governing laws of procedure, and information on how to present information and participate in the hearing, examine documents, and download information (20.1.6.201.C(1) – (7) NMAC). The public notice may also state the Commission's intent to make a decision at the conclusion of the hearing, as applicable (20.1.6.201.C(8) NMAC). In addition to publication of notice, the Commission must "provide [notice] to the public," ,as

defined at 20.1.6.7.P NMAC, by distributing rulemaking information by:

- posting it on the commission's website,
- posting it on the New Mexico sunshine portal,
- making it available at the applicable constituent agency's district, field, and regional offices,
- sending it by email to persons who have made a written request for notice of announcements addressing the subject of the rulemaking proceeding and who have provided an email address to the commission administrator,
- sending it by email to persons who have participated in the rulemaking and who have provided an email address to the commission administrator,
- sending written notice that includes, at a minimum, an internet and street address where the information may be found to persons who provide a postal address; and
- providing it to the New Mexico legislative council for distribution to appropriate interim and standing legislative committees.

The public notice for the hearing was drafted and published by the Department in the Albuquerque Journal, Santa Fe New Mexican, and the New Mexico Register on October 8, 2024 (**NMED Exhibit 13**). The Department assisted the Commission administrator with completing notification requirements and provided rulemaking information to the public, as described in 20.1.6.7.P NMAC. The Department completed "provide to the public" notice requirements on or before October 9, 2024 (**NMED Exhibit 14**).

B. Notice to Tribes

The State recognizes the importance of communication and collaboration with tribes to ensure water quality across boundaries. The State has memorialized this sentiment through the State-Tribal Collaboration Act, NMSA 1978, § 11-18-3, Executive Order 2005-004, and the Department's Tribal Communication and Collaboration Policy. In an effort to ensure opportunity for adequate communication and collaboration with tribes, the Department provided notice of the hearing to tribal representatives, through the Department's Tribal Liaison, on October 7, 2024 (**NMED Exhibit 15**).

C. Notice to Federal and State Agencies

Additionally, the Department notified potentially affected federal and state agencies regarding the nomination and rulemaking hearing for ONRW designations. NMED attached the public notices and nomination to each email, provided links to additional information, and invited questions, concerns, and requests for further engagement (**NMED Exhibit 15**). NMDGF is the only agency that provided feedback and comments as previously discussed.

D. Notice to the Small Business Regulatory Advisory Commission

Finally, in accordance with the Small Business Regulatory Relief Act (NMSA 1978, § 14-4A-4), the Department provided notification of the proposed amendments to the Small Business Regulatory Advisory Commission on October 8, 2024 (**NMED Exhibit 16**).

E. East Jemez Resource Council Presentation

At the request of the East Jemez Resource Council ("EJRC"), the Department provided a presentation at their Fall meeting in Los Alamos on October 29, 2024 (**NMED Exhibit 17**). The EJRC is an interagency collaborative effort that "promotes understanding and coordination of natural and cultural resources in the east Jemez mountains region" and is not a decision-making organization. It is a collaboration of knowledge sharing non-profit groups, institutions, pueblos, and government agencies. EJRC meets bi-annually and participants present information from their respective groups/agencies to foster interagency relationships and collaborations within the local region on natural resources management issues. The meeting was conducted in-person and online and the presentation was well received with no negative feedback or concerns raised.

The SWQB has not received any additional contact or comments regarding this matter. However, written public comment for the hearing is being accepted by the Commission administrator via the Department's Public Comment Portal through December 9, 2024. Additional public comment opportunities will be provided at the hearing, both in-person and

virtually.

VI. CONCLUSION

Continuing increases in population, greater development, and continuing drought have put the state's water and natural resources under enormous strain. Like other arid western states, one of the most significant challenges facing New Mexico is developing a long-term strategy to protect and maintain our water resources in a way that is sustainable and economically supportable. Water managers must utilize all available tools to protect and improve the quality of the state's waters. ONRW designation can benefit the public through increased scrutiny and higher level of protection for these waters. Once water quality is degraded, it is generally very expensive and extremely difficult to restore. ONRW designation provides further incentive to maintain the quality of these special waters into the future for the benefit of humans and wildlife.

Designating the nominated waters as ONRWs will establish a foundation for long-term preservation and restoration of New Mexico's headwaters and most sought-after fishing destinations. Designation of the nominated waters would be beneficial to the state of New Mexico because protection of the quality of these waters will help maintain:

(1) a clean water supply for human uses, agricultural uses, and wildlife habitat within these areas and downstream uses by municipal water supply for domestic and industrial uses, domestic wells, agriculture, livestock watering, and recreational interests;
(2) healthy, functioning ecosystems, preserve habitat, support biodiversity, and protect endangered and threatened species;
(3) the recreational benefits in these areas; and
(4) the designated uses of the waters under the Commission's WQS at 20.6.4 NMAC.

Natural resources, including water and watersheds, minerals, rangelands and forests, play an important role in the state's economic and fiscal health. The state has a fundamental responsibility to current and future generations to ensure that water supplies and water quality

are protected and managed in a manner that ensures that the state's priorities and interests are a primary consideration. ONRW designation provides the state with an additional tool to utilize in management decisions that affect water quality to ensure adequate and appropriate protection of our waters.

MICHAEL G. BACA

EDUCATION - September 1999-June 2004, Carleton College, Northfield, MN, B.A. in Chemistry

PROFESSIONAL EXPERIENCE – February 2005-Present, New Mexico Environment Department

October 2023 – Present, Surface Water Quality Bureau, Water Resources Manager I

Serve as the Water Quality Standards Coordinator and the supervisor for the Standards and Outreach Team. Oversee, lead, and assist in the development, revision, and implementation of New Mexico's surface water quality standards, including rulemakings and special projects. Provide technical testimony and exhibits for proposed water quality management plans and standards amendments presented before the Water Quality Control Commission, including third-party rulemakings, the Triennial Review and the Water Quality Management Plan and Continuing Planning Process. Organize public stakeholder engagement opportunities regarding proposed changes to standards to provide feedback and discussion with the public, regulated community, interests groups, nonprofit organizations, academia and state, local and federal government representatives and elected officials. Oversee the day-to-day activities of the team: managing, assigning and prioritizing tasks and projects, developing employees, providing technical and policy guidance, and administering personnel related actions such as evaluations, discipline, and hiring.

December 2018-September 2023, Air Quality Bureau, Staff Manager

Manage the daily operations of the Control Strategies Section including a staff six to implement and enforce the federal Clean Air Act in New Mexico through the development and revision of the State Implementation Plan and other air quality management plans and rules for the state. Assign and prioritize completion of tasks and projects to achieve the vision and mission of the Department and the Bureau's performance measures. Provide technical and policy guidance through the development of work products and administration of existing programs, policies, rules, regulations, and resources. Oversee, lead and assist with rulemaking and special projects including the adoption of rules and management plans by presenting testimony and exhibits before the Environmental Improvement Board. Manage air quality programs and projects to award contracts and grants, ensure timely submission of deliverables and technical reports, and review financial expenditures to meet contractual obligations and compliance with state procurement rules. Organize and develop public stakeholder engagement strategies to provide meaningful engagement opportunities and collaborations with the public, regulated community, interests groups, nonprofit organizations, academia and state, local and federal government representatives and elected officials. Complete timely HR actions to include training, employee evaluations, discipline, hiring and other personnel actions.

July 2008-December 2018, Air Quality Bureau, Environmental Analyst

Represent the Department as the air quality liaison with binational border air quality agencies and stakeholders, participating in the Joint Advisory Committee and the USEPA border programs. Develop and prepare technical testimony and exhibits for public hearings in front of the Environmental Improvement Board to present and defend air quality plans and rules for adoption in New Mexico, including state implementation plans required by the USEPA. Analyze ambient air quality monitoring data and prepare technical documents for submission to the USEPA for high wind blowing dust events that cause air pollution episodes. Conduct public education and outreach meetings and develop educational material regarding air quality, rule requirements, and rule development. Review and comment on permits, Environmental Impact Statements, and Environmental Assessments for compliance with

federal and state rules and standards. Manage air quality research projects and contracts in the border area to ensure timely submission of deliverables.

February 2005 -July 2008, Field Operations Division, Environmental Scientist and Specialist

Oversee public swimming pool program at a district level to ensure consistent permitting, inspection, and enforcement actions across six counties in northwest New Mexico. Review engineering plans and approve permits for construction of swimming pool and bath facilities. Conduct training for swimming pool department staff and operators. Permit and inspect restaurants and food processors, swimming pool facilities, and liquid waste disposal system installations and initiate enforcement actions for compliance with applicable regulations. Conduct public education and outreach to help the regulated community comply with environmental management principles, administrative requirements, and state regulations.

State of New Mexico
Continuing Planning Process
Appendix A

Antidegradation Policy Implementation Procedure for Regulated Activities

Originally Approved 2004
Approved Revision October 23, 2020

Contents

List of Figures

List of Tables

Glossary

Alternatives Analysis: An evaluation of possible cost-effective, reasonable alternatives to regulated discharges that might degrade water quality, including less-degrading alternatives, non-degrading alternatives, and no-discharge alternatives, such as treatment process changes, relocated discharge facilities, land application, reuse, and subsurface discharges. The evaluation must provide substantive information pertaining to the cost and environmental impacts associated with the proposed discharge and the alternatives being evaluated, so that alternatives that are cost-effective and reasonable and least degrading are identified.

Antidegradation: A regulatory policy and implementation procedure approved by EPA and the WQCC to protect existing uses of surface waters and to specify how the WQCC will determine, on a case-by-case basis, whether and to what extent, existing water quality may be lowered in a surface water.

Assimilative Capacity: The difference between the baseline water quality concentration for a pollutant and the most stringent applicable water quality criterion for that pollutant.

Baseline Water Quality (BWQ): A characterization of selected pollutants in a perennial surface water as measured and expressed during a specified time period. Once established, baseline water quality is a fixed quantity/quality unless it is updated by NMED to reflect changes in water quality.

Bio-accumulative Pollutant: a pollutant, such as pesticides or other chemicals, that accumulates in aquatic organisms when ingestion and absorption rates are faster than metabolic and excretion rates (*see* human health-organism only criteria in 20.6.4.900 NMAC).

Degradation: A decline in the chemical, physical, or biological conditions of a surface water or other decline in water quality as measured on a pollutant-by-pollutant basis.

Detection Limit: The minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results.

Designated Use: A use of a surface water specified in the *Standards for Interstate and Intrastate Surface Waters* (20.6.4 NMAC). Designated uses include domestic water supply, irrigation and irrigation storage, primary contact, secondary contact, livestock watering, wildlife habitat, aquatic life, and fish culture and water supply.

Effluent-Dependent Water: An effluent-dependent water is a surface water that without the point source discharge of wastewater would be an ephemeral water.

Ephemeral Surface Water: A surface water that contains water briefly only in direct response to precipitation; its bed is always above the water table of the adjacent region.

Existing Use: A use and the water quality necessary to support the use that has been attained in a surface water on or after November 28, 1975, whether or not it is a designated use in the surface water quality standards (20.6.4 NMAC) or if it is currently attaining the quality required for that use.

Existing Water Quality: Baseline water quality.

High Quality Water: A surface water with water quality that is better than the applicable water quality standard as determined on a pollutant by pollutant basis.

Intermittent Surface Water: A surface water that contains water for extended periods only at certain times of the year, such as when it receives seasonal flow from springs or melting snow.

Less-Degrading Alternative: A cost-effective, reasonable alternative to a proposed discharge that would result in fewer detrimental changes to water quality as characterized by the baseline water quality evaluation.

Loading Capacity: total assimilative capacity of a waterbody for the pollutant of concern at critical flow. The loading capacity is the maximum amount of pollutant loading that a waterbody can receive and still meet water quality standards.

Minimal Degradation: A deterioration or decline in water quality that results in the consumption of less than 10 percent of the available assimilative capacity for a pollutant.

National Pollutant Discharge Elimination System [NPDES]: The point source discharge permit program established by Section 402 of the Clean Water Act (33 U.S.C. § 1342).

Non-Degrading Alternative: A cost-effective, reasonable alternative to a proposed discharge that would result in no significant degradation of water quality as characterized by the baseline water quality evaluation.

Outstanding National Resource Water (ONRW): A surface water that is classified as an outstanding national resource water under 20.6.4.9 NMAC.

Perennial Surface Water: A surface water that typically contains water throughout the year and rarely experiences dry periods.

Regulated Discharge: A point source discharge regulated under Section 402 of the CWA, a discharge for Dredge and Fill material regulated under Section 404 of the CWA, and any discharged authorized by a federal permit or license that is subject to state water quality certification under Section 401 of the CWA.

Relative Percent Difference (RPD): RPD is an expression of the degree of variation between two water quality samples taken under similar conditions. RPD is calculated using the following equation, where S represents the concentration of the pollutant in the original sample and D represents the concentration of the pollutant in the new sample.

$$\boldsymbol{RPD = \frac{|S - D|}{(S + D)/2}\ x\ 100}$$

Short-Term Degradation: Degradation that is six months or less in duration, i.e., water quality returns to baseline water quality within six months after the discharge commences.

Significant Degradation: The consumption of 10 percent or more of the available assimilative capacity for any pollutant of concern at critical flow conditions or any consumption of assimilative capacity that exceeds a cumulative cap of 50% of assimilative capacity.

Significantly Improved Water Quality: For purposes of a BWQ re-evaluation, significantly improved water quality compares the original baseline water quality data to new water quality data acquired or submitted to the Department and calculates the relative percent difference (RPD) between the two data points. If the RPD is greater than or equal to 20% and sampling technique, sample processing and transport, and laboratory analyses are comparable, a new baseline characterization may be warranted.

Surface Waters of New Mexico: All surface waters situated wholly or partly within or bordering upon the state, including lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, reservoirs or natural ponds. Surface waters of the state also means all tributaries of such waters, including adjacent wetlands, any manmade bodies of water that were originally created in surface waters of the state or resulted in the impoundment of surface

waters of the state, and any "waters of the United States" as defined under the Clean Water Act that are not included in the preceding description.

Temporary Degradation: Degradation that is six months or less in duration, i.e., water quality returns to baseline water quality within six months after the discharge commences; short-term degradation.

Tier 1 Protection: Policies and procedures that prohibit degradation which results in the loss of an existing use, or violation of water quality criteria; and prohibit degradation of existing water quality where pollutants of concern do not meet applicable water quality standards. Tier 1 defines the minimum level of protection for all waters and requires that water quality be maintained such that the existing and designated uses of the water are supported. This applies to waters that do not meet or meet but are not better than the water quality standards for existing or designated uses. Surface waters with this protection may already be of lower quality.

Tier 2 Protection: Policies and procedures that prohibit significant degradation of a surface water unless a review of reasonable alternatives and social and economic considerations shows that the lowering of water quality is necessary for important social and economic considerations in the area where the water is located. Tier 2 protection level applies to perennial and intermittent waters where data confirm high quality water (i.e., where existing water quality is better than applicable water quality standards as determined on a pollutant-by-pollutant basis).

Tier 3 Protection: Policies and procedures that prohibit any lowering of water quality in Outstanding New Mexico Waters as identified under 20.6.4.9 NMAC unless impacts are minimized and temporary.

Toxic Pollutant: A pollutant or combination of pollutants, including disease-causing agents, that after discharge and upon exposure, ingestion, inhalation or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will cause death, shortened life spans, disease, adverse behavioral changes, reproductive or physiological impairment or physical deformations in such organisms or their offspring.

Translator: Methodologies to guide the calculation of site-specific numeric targets (not criteria) based on a given narrative standard.

Water Contaminant: Any substance that, if discharged or spilled, could alter the physical, chemical, biological or radiological qualities of water.

Water Pollutant: A water contaminant in such quantity and of such duration as may with reasonable probability injure human health, animal or plant life or property, or to unreasonably interfere with the public welfare or the use of property. Pollutants may include liquid, solid, gaseous, or hazardous substances such as contaminants, toxic pollutants, solid waste, chemicals, pesticides, herbicides, fertilizers, incinerator residue, sewage, garbage, sewage sludge, munitions, petroleum products, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, dirt, and mining, industrial, municipal and agricultural wastes.

Water Quality Criteria: Elements of water quality standards that are expressed as pollutant concentrations, levels, or narrative statements representing a water quality that supports a designated use.

1 Overview of New Mexico's Antidegradation Approach

Water quality standards (WQS) are the foundation for a wide range of programs under the Clean Water Act (CWA). WQS consist of designated uses such as aquatic life and recreation, water quality criteria necessary to protect those uses, and antidegradation requirements. Each State must develop, adopt, and retain a statewide antidegradation policy regarding water quality standards and establish procedures for its implementation through the water quality management process. Antidegradation implementation is based on a set of procedures to be followed when evaluating activities that may impact the quality of New Mexico's surface waters. Antidegradation implementation is an integral component of a comprehensive approach to protecting and enhancing surface water quality.

Antidegradation protections consist of three levels, or tiers, of protection defined by New Mexico's water quality standards in 20.6.4.8 NMAC. Tier 1 protections provide a floor of protection, ensuring that existing instream water uses and the level of water quality necessary to protect those existing uses are maintained and protected. Tier 2 protections maintain and protect water quality that exceeds water quality numeric and narrative criteria, prohibiting any lowering of water quality unless necessary to accommodate social or economic need. Tier 3 protections are afforded to waters designated by the Water Quality Control Commission (WQCC) as Outstanding National Resource Waters (ONRWs). In ONRWs, no degradation is permitted except in limited, specifically defined instances, such as to accommodate public health or safety activities or to enable activities to restore or maintain water quality.
Antidegradation applies to all activities with the potential to adversely affect water quality or existing or designated uses, including:

- Any proposed new or increased point source or nonpoint source discharge of pollutants that would lower water quality or affect the existing or designated uses.
- Any proposed increase in pollutant loadings to a waterbody when the proposal is associated with existing activities.
- Any increase in flow alteration over an existing alteration.
- Any hydrologic modifications, such as dam construction and water withdrawals.

This document has been drafted to provide guidance to persons responsible for regulated discharges that may degrade water quality in New Mexico. Regulated discharges include those that require a permit and/or a water quality certification under Section 401 of the Clean Water Act (CWA) pursuant to state or federal law. The Nonpoint Source Management Plan, a separate document incorporated by reference into the WQMP/CPP, describes antidegradation implementation procedures applicable to nonpoint source discharges. The information contained in this document is intended to provide guidance only and is not a substitute for the provisions of any other laws, rules, or regulations.

The guidance that follows addresses implementation procedures for New Mexico's antidegradation rule at 20.6.4.8 NMAC, and the federal antidegradation policy at 40 CFR 131.12. NMED is required by 40 CFR 131.12(a) to develop and adopt a statewide antidegradation policy and to identify methods for implementing that policy. The guidance generally includes:

- Processes for identifying the antidegradation protection level (i.e., the "*tier*") that applies to a surface water;
- Procedures for determining baseline water quality (BWQ);

- Approaches for evaluating water quality degradation;
- Procedures for identifying and evaluating less degrading or non-degrading alternatives;
- Procedures for determining the importance of economic or social development to support significant degradation of high quality surface waters; and,
- Information on intergovernmental coordination and public participation processes.

1.1 DESIGNATED USES AND WATER QUALITY CRITERIA

Water quality standards, including designated uses and associated water quality criteria can be found at 20.6.4 NMAC. Under the Clean Water Act (CWA) and New Mexico's surface water quality standards, various uses are assigned to surface waters. Designated uses include domestic water supply, irrigation and irrigation storage, primary contact, secondary contact, livestock watering, wildlife habitat, aquatic life, and fish culture and water supply. Designated uses are accompanied by an established set of *water quality criteria* designed to ensure that the designated uses are achieved. In accordance with state regulations, designated uses can be established or changed only through administrative rulemaking. Most surface waters have several designated uses. Where more than one use exists, or has been designated for a surface water, the use with the most stringent water quality criteria must be maintained and protected.

1.2 COVERAGE AND GENERAL APPLICABILITY

In general, the antidegradation implementation procedures described in this guidance apply to every proposal for a new or increased permitted discharge of a pollutant to a "surface water of the State." Permitted discharges are those discharges regulated under the authority of the CWA and discharges regulated pursuant to 20.6.2 NMAC that have the potential to impact surface water quality. These include National Pollutant Discharge Elimination System (NPDES) point source discharges regulated under Section 402 of the CWA; discharges which result in the placement of dredged or fill material into surface waters regulated under Section 404 of the CWA; and any discharge authorized by federal permits and licenses that are subject to state water quality certification under Section 401 of the CWA.

These procedures do not apply to non-point sources (NPS). In instances when significant degradation is determined to be a concern and NPS sources are impacting water quality, NMED will work with stakeholders to identify and implement best management practices, as described in the Nonpoint Source Management Plan.

These procedures also do not apply to other water quality-related actions, including revision of Commission documents (e.g., New Mexico Water Quality Standards, Continuing Planning Process, Statewide Water Quality Management Plan, and New Mexico Nonpoint Source Management Plan); the Commission's establishment of Total Maximum Daily Loads (TMDLs); or the conduct of studies, including use attainability analyses, by any party, including NMED. These types of water quality-related actions already are subject to extensive requirements for review and public participation, as well as various limitations on degradation imposed by state and federal law.

Section 3 summarizes the antidegradation review approach used in New Mexico, which is based on the type of regulated discharge under consideration (e.g., by permit type), the receiving water, and the BWQ for relevant pollutants of concern in the receiving surface water.

1.3 COORDINATION WITH ASSESSMENT AND IMPAIRMENT LISTING

Section 305(b) of the CWA requires each state to prepare and submit to the U.S. Environmental Protection Agency (EPA) a biennial report describing water quality of all surface waters in the state. Each state must monitor water quality and review available data to determine if water quality standards are being met. From the assessment, the CWA Section 303(d) List ("303(d) list") is created which identifies surface waters that do not meet water quality standards. These waters are known as water quality limited waters or impaired waters. Identification of a surface water as impaired may be based on a violation of a numeric or narrative water quality criterion. NMED's antidegradation policy implementation procedure (i.e., this appendix) assigns a protection category for the receiving water based on whether water quality standards are being met.

To coordinate antidegradation reviews with the 305(b) reporting and 303(d) listing activities, NMED will implement the following protections:

- *Tier 1 Protection (applicable to all waters):* No further degradation is permitted in a surface water where the most current water quality for that criterion does not meet, or meets but is not better than, the applicable water quality standards. Impaired waters are identified on New Mexico's 303(d) list and targeted for future water quality management planning (e.g., TMDLs, Watershed Based Plans (WBPs), etc.) to improve water quality and attain WQS.
- *Tier 2 Protection (applicable to perennial and intermittent waters where data confirm high-quality water is present):* Where possible, NMED may award priority points for grant or other funding programs that target water quality protection and restoration and support actions needed to protect and restore water quality. NMED may also revise the BWQ based upon more recent water quality data included in the biennial assessment of surface waters.
- *Tier 3 Protection (applicable to all waters designated as an ONRW):* No degradation is allowed in an ONRW, except in limited, specifically defined instances, such as to accommodate public health or safety activities or to enable activities to restore or maintain water quality, as outlined in 20.6.4.8(A)(3) and 20.6.4.8(A)(4) NMAC. For activities that may cause short-term degradation, NMED may award priority points for grant or other funding programs that target water quality protection and support actions needed to protect and restore water quality.

In addition, NMED participates in reviews for Clean Water State Revolving Funding. Applications are reviewed for compliance with water quality standards for both surface and groundwater, and projects that directly implement a fix to a water quality problem are awarded priority points to allow more rapid implementation of those projects. This results in a more proactive approach from the Department to restore or maintain water quality in surface waters across the state.

1.4 INTERGOVERNMENTAL COORDINATION AND REVIEW PROCESS

Federal and state regulations require intergovernmental coordination and public participation for Tier 2 reviews and public participation in decisions that may result in water quality degradation. Coordinating antidegradation reviews among various agencies and other interested parties will involve significant cooperation in gathering data, conducting evaluations, analyzing alternatives and evaluating potential social and economic impacts. A list of agencies that may be involved in the intergovernmental coordination and review process is included as Appendix A.5 of this document.

For comprehensive Tier 2 reviews on perennial waters, determining BWQ, evaluating projected impacts, analyzing possible alternatives, and evaluating economic or social benefits, if applicable, must occur prior to issuing an individual NPDES permit. Therefore, it is recommended that an applicant discharging into a perennial water meet with NMED in a pre-application conference at least one year prior to permit issuance. Timely notification and early consultation with NMED will help ensure that the issuance of permits can proceed without disruption to facility design, construction, or other activities planned by the applicant.

1.5 PUBLIC NOTIFICATION AND PARTICIPATION

Information on BWQ, designated uses, water quality standards, applicability of protection tiers, impact analyses, alternatives analyses, agency decisions, and other matters related to antidegradation reviews will be documented by NMED and made part of the public record. Public notification of proposed actions and requests for public comment will be made in accordance with Chapter 8 of this appendix.

2 Tiered Protection Levels

2.1 TIER DEFINITIONS

Federal law requires that surface waters be protected from discharges that might degrade water quality. To implement this requirement, it is necessary to identify antidegradation protection levels, or tiers, appropriate to each surface water. The state antidegradation rule at 20.6.4.8 NMAC delineates three tiers of protection for New Mexico surface waters. These tiers are applied on a pollutant-by-pollutant basis. Although Tiers are defined on a pollutant-by-pollutant basis, ONRWs are identified on a waterbody basis as described further below in this section and in NMAC 20.6.4.9(D) NMAC. Under this approach, surface water quality might degrade for one or more pollutants of concern but be unaffected for other pollutants. Degradation may be further described as *de minimis* (consumption of less than 10% of the assimilative capacity for a pollutant of concern) or significant (consumption of 10% or more of the assimilative capacity for a pollutant). Minimal (*de minimis*) degradation is permitted under the antidegradation rule and does not trigger comprehensive Tier 2 antidegradation review requirements. Significant degradation triggers the comprehensive Tier 2 antidegradation implementation procedures described below. The tiered protection levels are applied as follows:

Tier 1 – Applies as the default protection level for all surface waters, including intermittent waters, ephemeral waters, effluent dependent waters, and other surface waters and requires that water quality be maintained such that the existing and designated uses of the water are supported. Tier 1 prohibits further degradation of existing water quality where a pollutant of concern does not meet or meets but water quality is <u>not</u> better than applicable water quality criteria. Tier 1 protection for impaired waters apply only to those pollutants that resulted in the 303(d) listing**.**

Tier 2 – Applies to perennial surface waters with high quality water (i.e., where existing water quality is better than applicable water quality standards as determined on a pollutant-by-pollutant basis). Tier 2 requires that existing high-quality water be maintained but allows for limited (*de-minimis*) degradation. The Tier 2 protection level prohibits significant degradation unless a review of reasonable alternatives and social and economic considerations supports a lowering of water quality. Tier 2 may also apply to intermittent waters if data are available and indicate a high-quality water (i.e., water quality better than applicable WQS). Tier 2 is the default protection level for all high-quality perennial and intermittent waters (i.e., water quality is better than the applicable WQS).

Tier 3 – Applies only to New Mexico Outstanding National Resource Waters (ONRWs) identified in 20.6.4.9(D) NMAC. Tier 3 prohibits any degradation and lowering of water quality in an ONRW unless impacts are minimal and temporary. Approval for any degradation must be obtained according to the process outlined in 20.6.4.8(A)(3) and 20.6.4.8(A)(4) NMAC.

Antidegradation is more about levels of protection than it is about levels of quality. In fact, for Tier 3 it could be said that antidegradation is all about protection, as the outstanding character may have little to do with actual water quality in the traditional sense of pollutant concentrations (e.g., waters may have particularly high ecological value). Numeric water quality criteria are considered in an antidegradation analysis, however NMED takes other considerations into account as warranted. For example, Tier 3 (ONRWs) analyses require consideration of the essential character or special use that makes the water an ONRW, such as high ecological or recreational value.

Most of the involvement in the antidegradation policy is regarding Tier 2 waters. This tier is where antidegradation procedures can work to maintain high quality water and is also where dischargers may have to expend extra effort to reduce their proposed degradation of water quality or demonstrate that allowing lower water quality is necessary to accommodate important economic and social development in the area in which the water is located.

2.2 DESIGNATION OF TIER CATEGORY

At a minimum, all surface waters in New Mexico are protected in accordance with Tier 1 antidegradation requirements. Tier 1 applies categorically to all intermittent and ephemeral streams, effluent dependent waters, and all surface waters on the 303(d) list on a pollutant-by-pollutant basis. Where a surface water is listed on the state's 303(d) list for one or more pollutants, and where existing water quality for other pollutants is better than water quality standards, the surface water will be afforded Tier 1 and Tier 2 protection on a pollutant-by-pollutant basis. That is, Tier 1 protection for the pollutants not meeting water quality standards and Tier 2 protection for pollutants that are better than water quality standards.

Perennial waters, and possibly some intermittent waters, that are found to have existing water quality better than applicable water quality standards are protected at the Tier 2 level. For Tier 2 protection, determinations regarding the significance of degradation are based on BWQ and the relative change in water quality projected to result from the discharge under review. In general, BWQ, as discussed in Chapter 4 of this appendix, defines existing water quality for purposes of antidegradation reviews. BWQ can be established for surface waters through monitoring and water quality assessments conducted by NMED, regulated entities, or by others (e.g., contractors). Tier 3 protection applies to ONRWs listed in 20.6.4.9(D) NMAC. Tier 3 protection will be afforded for all pollutants of concern in an ONRW.

Where a perennial water has been assessed but has not been listed as an impaired water or as an ONRW, the presumed antidegradation protection level is Tier 2 for all pollutants of concern. If a protection tier has not already been determined for a perennial surface water, NMED will establish the tier by identifying the use(s) of the segment, determining BWQ, and comparing the attributes of the surface water under study to the criteria for the tiers as cited above.

Upon establishing the appropriate tier(s) for a surface water, NMED will document its findings along with BWQ characterization and make this information available as part of the public record. Tier levels established by NMED may be revised, or alternate tier assignments may be assigned when waters are added or removed from the 303(d) list or are added to the list of ONRWs (see 20.6.4.9(D) NMAC).

Table 2-1 summarizes decision criteria for assigning protection tiers and the antidegradation requirements for each. More information on conducting the antidegradation reviews for waters requiring Tier 2 and Tier 3 protection can be found in Chapter 3 of this document.

Table 2-1. Tier Descriptions and Summary of Antidegradation Protection Requirements

Tier	Waters Included	Protection Requirements
1	All surface waters that meet but are not better than applicable water quality criteria, i.e., not considered "high quality," as determined on a pollutant by pollutant basis. All surface waters on the state's 303(d) list of impaired waters for the pollutant that resulted in the listing. Intermittent waters.[1] All ephemeral waters. All effluent dependent waters.	The minimum level of protection necessary to maintain the existing and designated uses of a surface water. Where a surface water is impaired or meets, but water quality is not better than, applicable water quality criteria, there shall be no lowering of the water quality with respect to the pollutant causing the impairment. Tier 1 protection applies regardless of any economic or social benefits associated with a proposed discharge.
2	For intermittent[1] and perennial waters reflecting high-quality waters, i.e., where the level of water quality is better than applicable water quality criteria as determined on a pollutant-by-pollutant basis. Tier 2 is the default protection level for high-quality perennial and intermittent waters that are not ONRWs or on the 303(d) list.	High-quality water in perennial and intermittent (if known) streams and lakes must be protected at a level that minimizes degradation of that water quality. No significant degradation of the Tier 2 pollutants in the surface water is allowed unless a comprehensive antidegradation review of reasonable alternatives demonstrates that the lowering of water quality is necessary for important social and economic considerations in the area in which the waters are located.
3	ONRWs.	No new or expanded direct discharges. No lowering of water quality allowed unless it is minimized and temporary, *and* degradation is approved according to 20.6.4.8 NMAC.

[1] For intermittent waters, if water quality data are available and assessable, and indicate a high-quality water (i.e., water quality better than applicable WQS), then Tier 2 protection applies on a pollutant-by-pollutant basis.

3 Antidegradation Review Requirements

The antidegradation review procedure is based on the protection tier assigned to the receiving water, the type of receiving water, existing (i.e., baseline) water quality in the receiving water, the projected impacts, and nature of the proposed discharge.

In general, the antidegradation review requirements described in this guidance apply to regulated discharges that have the potential to degrade water quality. These include NPDES point source discharges regulated under Section 402 of the CWA; discharges which result in the placement of dredged or fill material into surface waters regulated under Section 404 of the CWA; and any discharge authorized by federal permits and licenses that are subject to state water quality certification under Section 401 of the CWA.

3.1 Antidegradation Review Requirements by Tier

Tier 1: Reviews to Protect Existing Uses

Tier 1 reviews must ensure that the level of water quality necessary to protect existing uses is maintained and protected. In general, the "level of water quality necessary to protect existing uses" is defined by state-adopted surface water quality standards.

General Applicability

Tier 1 protection applies to all surface waters. In determining whether a surface water is afforded only Tier 1 protection, NMED will focus on whether the surface water meets or fails to meet applicable WQS.

Impaired Waters

For surface waters listed as impaired on the 303(d) list and for those waters that meet but are not better than the water quality criteria for a particular designated use, Tier 1 protection will be provided for the listed pollutants. Non-listed pollutants in 303(d) listed waters and those surface waters that are of high-quality may be afforded Tier 2 protection. Under Tier 1, no discharges will be permitted to cause further degradation for pollutants that do not meet applicable water quality standards. Where existing uses of a surface water are impaired, there will be no lowering of the water quality with respect to the pollutant(s) of concern causing the impairment.

Non-Perennial and Effluent Dependent Waters

Lack of flow in ephemeral and intermittent waters makes it difficult to characterize BWQ and conduct Tier 2 antidegradation reviews. Similarly, lack of flow and/or the nature of flow in effluent dependent waters also makes these waters difficult to characterize, other than simply characterizing the effluent being discharged. These non-perennial waters will receive Tier 1 protection for all pollutants of concern unless there is sufficient BWQ data to demonstrate a high-quality water for intermittent waters to which a Tier 2 evaluation would be appropriate. Applicable WQS must be maintained and protected for these surface waters.

For example, certain individual and general permit applicants will likely discharge to a non-perennial stream segment where there is no other existing discharge to the segment, little or no flow in the channel beyond the immediate area of the discharge, and no available ambient water quality data. No BWQ

evaluation will be required for these discharges. Antidegradation reviews for most discharges to non-perennial waters will focus on requirements that applicable WQS be met end-of-pipe (unless ambient water quality data are available for a BWQ evaluation), and technology-based requirements, e.g., best available technology (BAT), are applied as required by permit conditions. Antidegradation review for NPDES individual municipal separate storm sewer system (MS4) and general permits as well as dredge or fill permits under Section 404 of the CWA for will focus on meeting WQS in receiving waters by ensuring compliance with the permit or state certification of the permit pursuant to Section 401 of the CWA.

General (Narrative) Criteria under 20.6.4.13 NMAC

Total Dissolved Solids (TDS) – NMED will follow the guidance laid out in the Colorado River Salinity Control Forum. Compliance with the Forum requirements will be considered to meet the intent of the narrative standard.

Plant Nutrients – NMED will evaluate nutrient discharges in accordance with available thresholds (i.e., translators) and will use applicable thresholds for the Tier 1 antidegradation review. A similar approach has been taken with Raton and Santa Fe WWTPs, capping the facilities at their current level of discharge/degradation. Depending on the data available, limits will be derived using a percentile of the data set (85th, 95th, etc.) that is reasonably achievable and still maintains and protects existing water quality. There are no technologically based effluent limits (TBELs) available for nutrients for publicly-owned treatment works (POTWs) at this time, but based on the type of treatment system available, NMED will work with the facility to incorporate limitations that maintain or reduce current levels of nutrient loading.

Other General Criteria – If a narrative standard does not have associated numeric thresholds or translators, NMED will not evaluate the narrative standard for antidegradation purposes due to the impracticality of such an evaluation.

Tier 2: Reviews to Protect High Quality Waters

Tier 2 protection applies to high quality perennial and intermittent (if data are available and assessable) waters with water quality better than applicable WQS, as determined on a pollutant-by-pollutant basis. Existing water quality in high quality surface waters must be maintained and protected. Tier 2 prohibits significant degradation unless a review of reasonable alternatives and social and economic considerations support a lowering of water quality, and after opportunity for intergovernmental review and public comment and hearing. If degradation is allowed, it must not result in a violation of applicable WQS.

General Applicability

Any regulated discharge to a high quality water is subject to Tier 2 antidegradation review to determine if the discharge will significantly degrade water quality. Determinations issued under these provisions will be made in accordance with the public notification process described in Chapter 8 of this appendix. If NMED determines after an initial evaluation that comprehensive Tier 2 review requirements do not apply to a proposed discharge, the discharge must still achieve the requirements of the permit or conditions of the water quality certification.

Basic vs. Comprehensive Tier 2 Review

A basic Tier 2 antidegradation review is used to determine whether or not significant degradation will occur from a regulated discharge, i.e., whether or not 10% or more of the available assimilative capacity

for any pollutant of concern will be consumed as a result of the proposed discharge during critical flow conditions or any consumption of assimilative capacity that exceeds a cumulative cap of 50% of assimilative capacity. The BWQ and applicable WQS must be reviewed as part of a basic Tier 2 antidegradation review.

A comprehensive Tier 2 antidegradation review, which includes an alternatives analysis and social and economic demonstration for the degradation, is required for any new or expanded discharge that may significantly degrade a Tier 2 protected water.

No comprehensive Tier 2 antidegradation review is required for discharges regulated under a general NPDES permit or a Section 404 dredge or fill permit. These discharges will be required to meet the conditions of the general permit or Section 401 water quality certification.

Tier 3: Reviews to Protect Outstanding New Mexico Waters

Existing water quality in ONRWs must be maintained and protected. Any discharge that would degrade existing water quality in an ONRW is prohibited, unless the applicant demonstrates that the water quality impacts are temporary and necessary for public health and safety or restoration, and the applicant receives approval for the activity according to the process in 20.6.4.8 NMAC.

General Applicability

Tier 3 protection applies only to surface waters that are classified as ONRWs and identified under 20.6.4.9(D) NMAC.

Tier 3 Review

Discharges that impact ONRWs are subject to Tier 3 antidegradation review. New or expanded discharges that may cause degradation directly to an ONRW identified under 20.6.4.9(D) NMAC are prohibited, except in limited, specifically defined and temporary events, such as to accommodate public health or safety activities or to enable activities to restore or maintain water quality, as outlined in 20.6.4.8.A(3) and (4) NMAC. In general, temporary is defined as occurring for a period of six months or less and is not recurring. In addition, NMED will impose necessary controls on indirect discharges that occur upstream or to tributaries of an ONRW to maintain and protect existing water quality in the downstream ONRW.

Determinations regarding antidegradation reviews for activities that affect ONRWs, such as public health or safety activities or activities to restore or maintain water quality, will be made on a case-by-case basis after consideration of the following factors outlined in 20.6.4.8(A)(3) and 20.6.4.8(A)(4) NMAC:

- The degradation shall be limited to the shortest possible time and shall not exceed six months;
- The degradation shall be minimized and controlled by best management practices or in accordance with permit requirements as appropriate; all practical means of minimizing the duration, magnitude, frequency and cumulative effects of such degradation shall be utilized;
- The degradation shall not result in water quality lower than necessary to protect any existing use in the ONRW; and
- The degradation shall not alter the essential character (e.g., exceptional recreational or ecological significance) or special use (e.g., state special trout water; national or state park, monument, wildlife refuge; designated wilderness or wild river) of the ONRW, as supported by the proceedings and final decision establishing the water as an ONRW.

Prior to the WQCC's decision, NMED will provide a written recommendation to the commission. This recommendation will take into account the following factors:

- Change in ambient concentrations predicted at the appropriate critical flow condition(s)
- Change in loadings (i.e., the new or expanded loadings compared to total existing loadings to the segment)
- Reduction in available assimilative capacity
- Nature, persistence and potential effects of the pollutant
- Potential for cumulative effects
- Degree of confidence in the various components of any modeling technique utilized (e.g., degree of confidence associated with the predicted effluent variability)

The antidegradation review findings must be documented and public participation activities initiated, as per the procedures in 20.6.4.8(3)(a) NMAC. If the review finds that the proposed discharge will not be temporary, the proposed discharge will be denied. In all cases, Tier 1 protection must be maintained.

Emergency Response Action

If an emergency response action is occurring in proximity to an ONRW and is necessary to mitigate an immediate threat to public health or safety, it may proceed prior to notification to the WQCC and NMED, in accordance with the following as outlined in 20.6.4.8(A)(3)(c) NMAC:

- only actions that mitigate an immediate threat to public health or safety may be undertaken pursuant to this provision; non-emergency portions of the action shall comply with the requirements of 20.6.4.8 NMAC;
- the discharger shall make best efforts to comply with requirements noted above;
- the discharger shall notify the department of the emergency response action within seven days of initiation of the action; and,
- within 30 days of initiation of the emergency response action, the discharger shall provide a summary of the action taken, including all actions taken to comply with the requirements above.

Upstream Discharges & Tier 3 Review

A discharge upstream of an ONRW is prohibited where the proposed discharge would degrade existing water quality of the downstream ONRW on a longer than temporary basis. To determine whether the proposed discharge will result in the lowering of water quality in the downstream ONRW, the following factors may be considered:

- Change in ambient concentrations predicted at the appropriate critical flow condition(s)
- Change in loadings (i.e., the new or expanded loadings compared to total existing loadings to the segment)
- Reduction in available assimilative capacity
- Nature, persistence and potential effects of the pollutant
- Potential for cumulative effects
- Degree of confidence in the various components of any modeling technique utilized (e.g., degree of confidence associated with the predicted effluent variability)

If a preliminary determination is made that the requirements above will be met, the antidegradation review findings must be documented and the applicable public participation activities must be initiated. If the review finds that the proposed discharge will result in the lowering of water quality in a downstream ONRW, the proposed discharge will be denied.

3.2 ANTIDEGRADATION REVIEW REQUIREMENT BY TYPE OF PERMIT

Antidegradation review requirements for regulated discharges that may degrade water quality vary according to 1) classification, existing uses, and condition of the receiving water; 2) the type of discharge and permit under which the discharge is conducted; and 3) the range and severity of projected impacts on the surface water. For example, antidegradation review requirements for discharges authorized under general permits differ from antidegradation review requirements for discharges regulated by individual permits. This section outlines the antidegradation review requirements for regulated discharges that may degrade water quality, including those with individual and general NPDES permits and those covered under Section 404 of the CWA (Dredge or Fill permits).

Compliance with the requirements of general permits and prompt attention to conditions that might result in water quality degradation will help ensure that discharges authorized by general permits do not cause violations of WQS. Moreover, some new or expanded discharges formerly authorized by a general permit may not be eligible for such coverage in the future if NMED believes they could significantly degrade a surface water. In those cases, applicants will be required to seek coverage under an individual permit.

In order to implement New Mexico's antidegradation policy in an efficient manner, it is recommended that persons proposing individually-permitted discharges which might degrade water quality in a perennial water notify NMED before determining BWQ (see Chapter 4 of this appendix) or applying for a permit. Such an approach will help ensure that the antidegradation review proceeds smoothly, without delay, and that planned facilities will comply with applicable statutes and rules. Figure 3-1 summarizes the Tier 2 review process for individual NPDES permit reissuance and new or expanded NPDES permits. Figure 3-2 summarizes the review requirements for individual NPDES; NPDES Stormwater Permits; general NPDES permits; individual and nationwide Section 404 permits, and federal permits and licenses subject to Section 401 water quality certification.

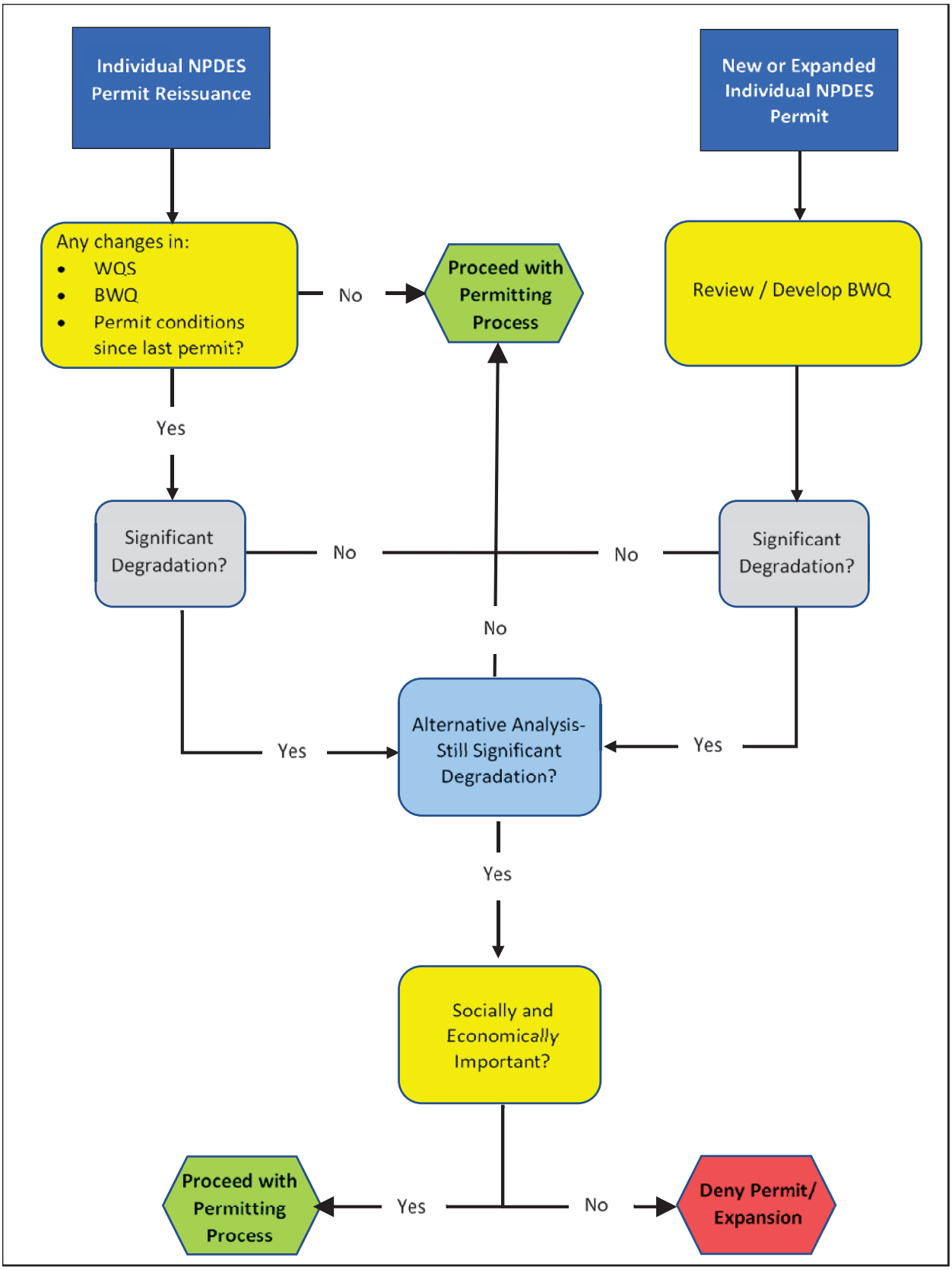


Figure 3-1. Tier 2 Antidegradation Review Process for Individual NPDES Permits

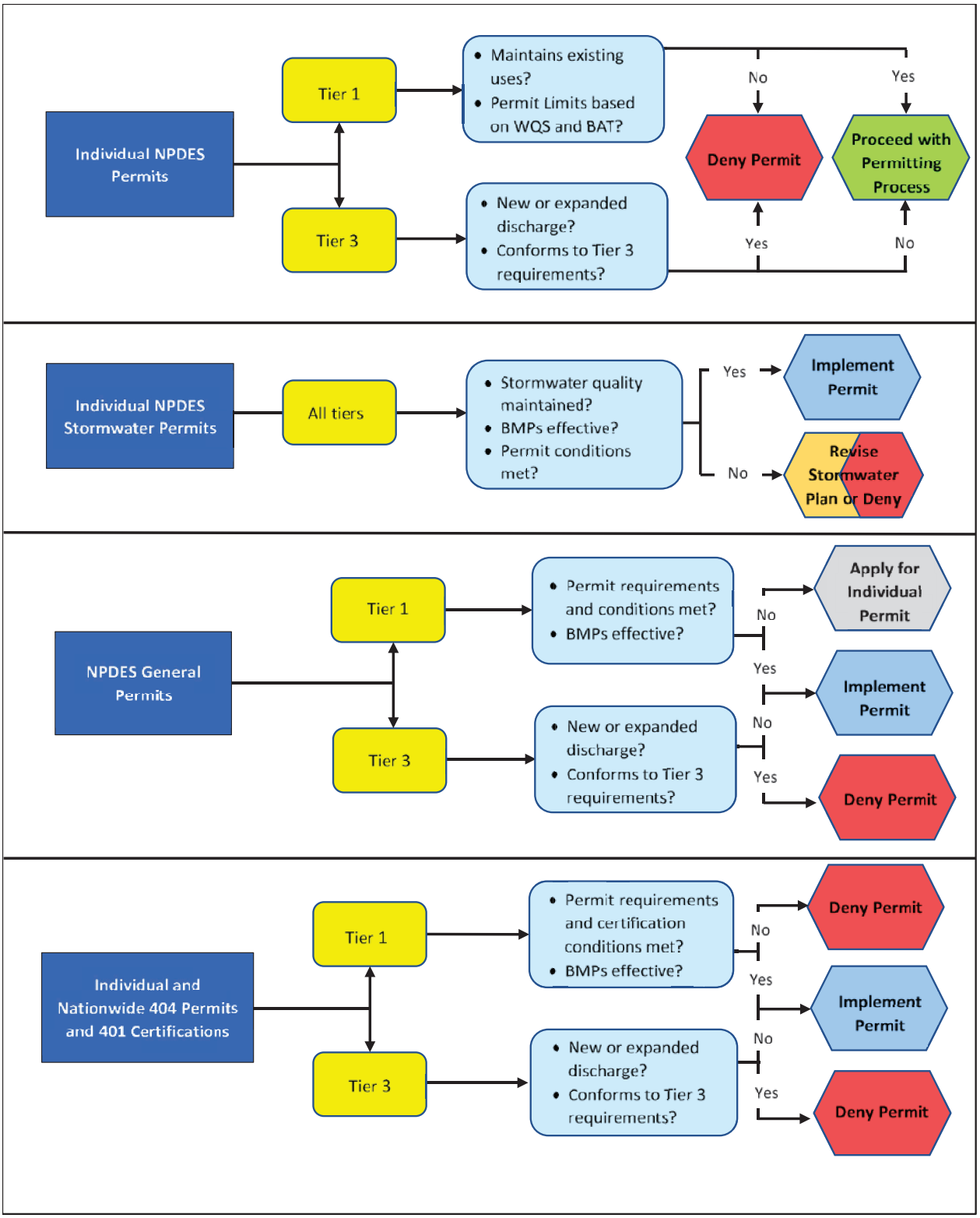


Figure 3-2. Antidegradation Review Requirements by Permit Type

3.3 INDIVIDUAL NPDES PERMITS

General Applicability

All point source discharges regulated by individual NPDES permits are subject to an antidegradation review at the time of issuance, modification, or renewal of a permit. All NPDES permits must ensure that water quality is protected at the appropriate tier based on available water quality information; however, at a minimum, the level of water quality necessary to maintain existing uses must be maintained and protected.

Reasonable Potential for Minor POTWs

Facilities less than 0.1 million gallons per day (MGD) are not required to sample or report any toxic substances on their NPDES permit applications, since studies indicated they have "no reasonable potential" to discharge toxic substances in amounts that would violate state WQS. Facilities greater than 0.1 MGD, but less than 1 MGD report some toxic substances that are present in facility discharges of that size.

Supporting information for this decision was published by EPA as "Evaluation of the Presence of Priority Pollutants in the Discharges of Minor POTW's," June 1996, and was sent to all state NPDES coordinators by EPA Headquarters. In this study, EPA collected and evaluated data on the types and quantities of toxic pollutants discharged by minor POTWs of varying sizes from less than 0.1 MGD to just under 1 MGD. The Study consisted of a query of the EPA Permit Compliance System (PCS) database from 1990 to 1996, an evaluation of minor POTW data provided by the State agencies, and on-site monitoring for selected toxics at 86 minor facilities across the nation.

Therefore, in the cases of facilities under 0.1 MGD, these facilities have already been assessed as having no reasonable potential to discharge toxic substances in toxic amounts. Additional historical records may provide information to assess reasonable potential.

Overview of the Antidegradation Review Procedure

The antidegradation review for individual NPDES permits will be based upon the assigned protection tier, the existing uses of the segment, applicable WQS, flow regime of the receiving water, pollutants of concern associated with the discharge, projected impacts on the receiving water, cumulative impacts from other pollutant sources, and the significance of any degradation that might occur as a result of the discharge.

All applicants will be required to identify pollutants reasonably expected to be in the discharge, estimate flow rates, and characterize pollutant concentrations and/or mass pollutant loads, as specified by NMED. In addition, applicants for new and expanded discharges to perennial waters under an individual permit are required to collect and submit existing or new information on BWQ needed to analyze the impact(s) of the discharge to a perennial water if ambient water quality data are not available. For the purpose of this analysis, expanded means an increase in design flow of the facility. In many cases, NMED's current water quality monitoring (conducted on a rotating basis in watersheds across the state) will provide applicable baseline data for use in these evaluations; however, for certain cases, the applicant may need to generate additional data for consideration in the antidegradation analysis if there are atypical pollutants of concern that are not normally monitored by NMED. For intermittent streams, the applicant

may choose to collect and submit water quality data for BWQ, which will help to evaluate appropriate and protective limits that may not be end-of-pipe requirements.

If feasible, it is recommended that an applicant discharging to a perennial water meet with NMED in a pre-application conference at least one year prior to individual NPDES permit issuance because of the substantial information requirements associated with development of effluent limits and, if necessary, a comprehensive Tier 2 antidegradation review.

Permit Limits and Antidegradation Requirements for Individual Permits

During the permit development process, EPA Region 6 will coordinate with NMED, who will evaluate existing water quality using both internal and applicant-supplied data, identify designated uses of the receiving water and analyze the impacts of the discharge as well as cumulative discharges that might affect the assimilative capacity of the receiving surface water for relevant pollutants of concern. Individual permit limits for discharges to perennial waters will be based upon applicable effluent guidelines, the characteristics of the discharge, and analyses designed to ensure that no significant degradation of the receiving water occurs. Permit limits for discharges to ephemeral, intermittent, and effluent dependent waters will be based on the WQS and EPA effluent guidelines and other technology-based requirements (e.g., secondary treatment requirements, BAT, MEP). Regardless of hydrology, all permit limits must ensure that existing uses are maintained and protected. NMED will use its authority under Section 401 of the Clean Water Act to conditionally certify federal permits that authorize discharges to Waters of the United States where the antidegradation analysis shows that stricter water quality controls are needed.

Proposed new or expanded discharges that may significantly degrade waters protected at the Tier 2 level must undergo a comprehensive antidegradation review to determine whether less degrading or non-degrading alternatives exist and whether significant degradation is necessary to accommodate important economic or social development in the area where the surface water is located. As it pertains to implementation of New Mexico's antidegradation policy, significant degradation is defined as the consumption of 10% or more of assimilative capacity of the receiving water for any pollutant of concern associated with the discharge during critical flow (e.g., 4Q3) conditions or any consumption of assimilative capacity that exceeds a cumulative cap of 50% of available assimilative capacity.

Early notification and consultation between the applicant, EPA, and NMED will help ensure that the NPDES permitting process proceeds efficiently. The following steps outline the general procedure for processing an NPDES permit:

- Applicant notifies NMED and EPA Region 6 of intent to apply for or renew permit coverage
- EPA determines eligibility for general permit or individual permit coverage
- Applicant consults with NMED on BWQ and available assimilative capacity in the receiving waterbody.
- NMED conducts antidegradation review and drafts a letter to document BWQ and available assimilative capacity; determination of minimal/significant degradation; and if a comprehensive Tier 2 antidegradation review is required. The letter is mailed to EPA and the permittee.
- If required, undergo comprehensive Tier 2 antidegradation review (alternatives analysis, economic/social documentation) – see Chapters 6 & 7 of this appendix.
- If significant degradation is deemed necessary based on the comprehensive Tier 2 review, conduct public participation and intergovernmental coordination consistent with Chapter 8 of this appendix.

- Applicant applies for permit after consultation with NMED.
- EPA (in consultation with NMED) develops draft permit limits based on effluent guidelines, applicable WQS, BWQ (if required), and antidegradation requirements.
- NPDES permitting process/comment period addresses both public notice requirements for antidegradation review and NPDES permitting.
- NMED prepares a Section 401 Water Quality Certification.
- Final permit drafted and issued.

Applicants seeking individual permit coverage for new or expanded discharges to a perennial surface water will be required to provide or collect BWQ information on pollutants of concern (e.g., pH, metals), if that information is not available (see Chapter 4). Data collection may be required depending on the availability of water quality data, nature of the proposed discharge, and the pollutants reasonably expected in the discharge.

Comprehensive Tier 2 Antidegradation Review Procedure for New or Expanded Discharges to Perennial Waters Requiring an Individual NPDES Permit

Degradation under Tier 2 will be deemed significant if the new or expanded discharge requiring an individual NPDES permit results in a reduction of available assimilative capacity (the difference between the BWQ and the applicable water quality criterion) of 10% or more at the defined critical flow condition(s) for the pollutant(s) of concern or any consumption of assimilative capacity that exceeds a cumulative cap of 50% of available assimilative capacity for the pollutant(s) of concern. Significant degradation will be determined on a pollutant-by-pollutant basis.

It should be noted that pollutants of concern for Tier 2 antidegradation reviews include those pollutants reasonably expected to be present in the discharge for which a numeric water quality criterion exists. If multiple water quality criteria apply, assimilative capacity will be calculated using the most stringent applicable WQS.

If a determination is made that significant degradation will occur, NMED will determine whether significant degradation is ***necessary*** by evaluating whether reasonable and cost-effective, less degrading or non-degrading alternatives to the proposed new or expanding discharge exist. The applicant will be responsible for conducting an alternatives analysis as described in this guidance. NMED will evaluate the alternatives analysis submitted by an applicant for consistency with the requirements outlined in Chapter 6. The alternatives analysis must provide substantive information on all reasonable, cost effective, less degrading or non-degrading alternative. Alternatives may include:

- Pollution prevention measures
- Reduction in scale of project
- Water reuse
- Treatment process changes
- Innovative treatment technology or technologies
- Advanced treatment technology or technologies
- Seasonal or controlled discharge options to avoid critical flow periods
- Improved operation and maintenance of existing treatment systems
- Alternative discharge locations, including subsurface discharges
- Zero discharge alternatives

As a rule of thumb, NMED will consider non-degrading or less degrading pollution control alternatives with costs that are less than 110 percent of the base costs of the pollution control measures associated with the proposed discharge to be cost-effective and reasonable (see Chapter 6.4 of this appendix).

If it is determined that reasonable, cost-effective, less degrading or non-degrading alternatives to the proposed discharge exist, the project design must be revised accordingly. In general, if such alternative(s) exist, the alternative or combination of alternatives that result in the least degradation must be implemented. If the regulated entity does not agree to adopt such reasonable and cost-effective alternatives, the alternatives analysis findings will be documented and the discharge will not be allowed. If significant degradation would occur even after application of reasonable less degrading or non-degrading alternatives, a determination must be made as to whether the proposed discharge is necessary to accommodate important economic or social development in the area in which the waters are located. NMED will evaluate the social and economic documentation for consistency with the requirements outlined in Chapter 7.

If the proposed discharge is determined to have social or economic importance in the area where the surface water is located, the basis for that preliminary determination will be documented and the Tier 2 review will continue. If significant degradation is proposed, the applicant also must show that the highest requirements for new and existing point source discharges are achieved, that all cost-effective and reasonable best management practices for non-point source pollution control are identified and effectively implemented and that Tier 1 protection is provided.

Tier 2 reviews include the public participation provisions outlined in Chapter 8. Once the intergovernmental coordination and public participation requirements are satisfied, NMED will make a final determination concerning the social or economic importance of the proposed discharge. All key determinations, including determinations to prohibit the discharge, must be documented and made a part of the public record (40 CFR 131.12 (b)).

3.4 INDIVIDUAL NPDES STORMWATER PERMITS

Urban areas with populations greater than 100,000 based on the 1990 census were considered Phase I Municipal Separate Storm Sewer Systems (MS4) communities and were required to apply for an individual NPDES stormwater permit. Urban areas as defined in the 2000 and subsequent census surveys every 10 years are considered Phase II MS4 communities. Stormwater discharges from Phase II MS4s are authorized by individual or general NPDES stormwater permits. However, neither Phase I nor Phase II MS4s authorized under individual stormwater permits are required to meet the same antidegradation requirements that apply to other individual NPDES permits outlined above.

In addition to MS4s, other entities can be required to obtain an individual NPDES stormwater permit by EPA on a case by case basis.

Overview of the Antidegradation Review for Individual Stormwater Permits

Antidegradation reviews for individual NPDES stormwater permits will be based on an adaptive management approach. This approach may include routine monitoring of stormwater quality at representative outfalls to adequately characterize stormwater discharges. The permittee will then evaluate, through effectiveness monitoring, whether storm water quality is being maintained, improving, or degrading and whether Best Management Practices (BMPs) identified in the permittee's stormwater pollution prevention plan are effective at controlling the discharge of pollutants. Future antidegradation

review of individual NPDES stormwater permits will consist of an analysis of the effectiveness of the BMPs and compliance with the requirements of the stormwater permit.

3.5 General NPDES Permits

A number of discharges to surface waters are authorized under general NPDES permits. These include stormwater runoff from municipalities required to comply with the Phase II MS4 stormwater permit, industrial activities covered by the stormwater program (Multi Sector General Permits), stormwater from construction sites one acre or larger (Construction General Permits), pesticide applications in or adjacent to surface waters (Pesticide General Permit), and concentrated animal feeding operations (CAFOs).

All NPDES general permits require preparation of a stormwater pollution prevention plan (SWPPP) that includes identification and control of all pollutants associated with the activities to minimize impacts to water quality. The permits also include requirements to implement site-specific interim and permanent BMPs and/or other controls to reduce (or eliminate) pollutant loading to minimize impacts to water quality. BMPs are designed to prevent to the maximum extent practicable an increase in pollutant load to the water body. BMPs also include measures to reduce flow velocity to assure that applicable water quality standards, including the antidegradation policy, are met. Compliance with the terms and conditions of the general permits is required to maintain authorization to discharge under the general permit. Discharges covered by a general permit that do not comply with general permit conditions or antidegradation requirements will be required to seek coverage under an individual permit.

Overview of the Antidegradation Review for General Permits

Regulated discharges authorized by general permits are not required to undergo a Tier 2 antidegradation review as part of the permitting process. However, new and reissued general permits must be evaluated to consider the potential for significant degradation as a result of the permitted discharges.

Discharges covered by general permits are transient or essentially non-existent (e.g., “no discharge”) with temporary or short-term impacts. Further, dischargers seeking coverage under a general permit are required in their SWPPP to identify pollutants on a pollutant-by-pollutant basis and to design and implement controls to minimize impacts to water quality. As a result, discharges that comply with general permits are not likely to cause significant degradation of water quality. In addition, activities covered under general permits (e.g., construction, industries, municipalities, dairies, feedlots, etc.) are considered to have social and economic importance to New Mexico. Therefore, antidegradation review for general permits will be based on whether or not the permit conditions are met and if the BMPs are effective at limiting (or eliminating) pollutant loading to minimize water quality impacts.

3.6 Section 404 Permits

Section 404 of the CWA regulates the placement of dredged or fill material into the “waters of the United States.” The U.S. Army Corps of Engineers (Corps) administers the permit program dealing with these discharges (e.g., wetland fills, in-stream sand/gravel work, etc.), in cooperation with the EPA and in consultation with other public agencies. Individual permits are issued for discharges with significant impacts. Discharges covered under Section 404 permits include any activity that results in the placement of dredged or fill material within the ordinary high-water mark of the waters of the U.S. or within wetlands recognized as waters of the U.S.

Overview of the Antidegradation Review for Regional or Nationwide Permits under Section 404 of the CWA

Antidegradation reviews involving the placement of dredged or fill material will be performed via the water quality certification process under Section 401 of the CWA. New Mexico manages its Section 401 water quality certification program to ensure that discharges resulting in the placement of dredged or fill material into surface waters do not cause water quality impairments or significant degradation of surface waters. New Mexico certifies general Section 404 permits ("regional" permits issued by the Albuquerque district of the Corps, and "nationwide" permits issued at the national level) in advance of individual projects that will be covered by the permits. New Mexico denied certification of the 2017 nationwide permits for projects in ONRWs, except for projects covered by Nationwide Permit 27 (for "Aquatic Habitat Restoration, Enhancement, and Establishment Activities"). Pursuant to Section 404, the Corps requires dischargers to obtain specific authorization from the Corps before commencing a discharge under a nationwide or regional permit. A Corps notification requirement (Regional Condition 2b) coupled with a state Section 401 certification condition provides NMED the opportunity to review projects proposed for authorization under a nationwide permit and confirm their consistency with the existing Section 401 certification. This review process often results in improvements in project design and BMP selection and ensures compliance with the antidegradation policy.

For new nationwide Section 404 permits, new regional Section 404 permits, or projects covered by existing Section 404 permits that have not yet received Section 401 certification (as of 2020, projects located in ONRWs and not covered by Nationwide Permit 27), NMED considers developing new Section 401 certifications. Based on this review, NMED may make one of three decisions: 1) grant the certification, 2) grant the certification with conditions, or 3) deny the certification.

NMED's Surface Water Quality Bureau (SWQB) will use the Section 401 certification process to evaluate whether a discharge will cause significant degradation to water quality. Pollutant loads from dredge or fill projects regulated under Section 404 of the CWA are often difficult or impossible to quantify in the same manner as practiced in NPDES permits. Dredge or Fill permits are often used for temporary construction measures in or near a watercourse that may result in disturbance or deposition of sediments in the water. The primary tool for limiting the discharge of pollutants (e.g., sediment and contaminated sediment) from these activities is through certification conditions mandating the installation and operation of BMPs that prevent pollutant transport to a watercourse and thereby degradation. The SWQB reviews dredge or fill projects pursuant to the State's water quality certification procedures as described under 20.6.2.2002 NMAC and Section 401of the CWA. To protect and maintain water quality, the SWQB has long employed a strategy of requiring the implementation of BMPs that are designed to prevent to the maximum extent possible the discharge of pollutants to a surface water.

Under the BMP-based approach adopted by New Mexico, regulated discharges that qualify for coverage under the Corps regional or nationwide Section 404 permits that have been certified by the state pursuant to Section 401 of the CWA will not be required to undergo a formal antidegradation review at the time of submitting a Preconstruction Notification and receiving authorization to discharge under the nationwide permit. Antidegradation requirements will be deemed to be met if all appropriate and reasonable BMPs related to erosion and sediment control, project stabilization, and prevention of water quality degradation (e.g., preserving vegetation, stream bank stability, and basic drainage hydrology) are applied and maintained. Applicants desiring to fulfill antidegradation review requirements under this approach will be responsible for ensuring that nationwide permit requirements and relevant water quality certification conditions are met.

Regulated discharges that may degrade waters protected at the **Tier 3** level must comply with the antidegradation requirements applicable to that protection level (i.e., only temporary impacts are allowed as authorized under procedures laid out in 20.6.4.8(A)(3) and 20.6.4.8(A)(4) NMAC) before a certification will be granted under Section 401 of the CWA. Any discharge authorized under an individual or nationwide permit (with the exception of Nationwide Permit 27) under Section 404 of the CWA currently requires an individual certification if it will discharge to an ONRW to ensure that impacts will be temporary.

NMED reserves the right to make case-specific determinations regarding the implementation of this approach during the Section 404 permitting or Section 401 water quality certification processes, which must be completed prior to the commencement of any discharges that result in the placement of dredged or fill material into New Mexico surface waters.

Impacts to Downstream or Adjacent Waters

It is important to note that where a discharge covered by a regional or nationwide general permit under Section 404 of the CWA, the permit only applies to the site of the fill and does not apply to activities or conditions downstream of or adjacent to the site of the fill.

Certain nationwide and regional permits require individual certification by the State of New Mexico in accordance with Section 401 of the CWA. During that individual certification process, NMED will evaluate any potential impacts to downstream waters and incorporate certification requirements to ensure compliance with all aspects of the antidegradation rule.

Overview of the Antidegradation Review for Individual Permits Under Section 404 of the CWA

The decision-making process for individual Section 404 permits is contained in the Section 404(b)(1) guidelines and contains all of the required elements for a Tier 1 and Tier 2 antidegradation review. (40 CFR Part 230). Prior to issuing a permit under the Section 404(b)(1) guidelines, the Corps must: 1) make a determination that the proposed discharges are unavoidable (i.e., necessary); 2) examine alternatives to the proposed discharge and authorize only the least damaging practicable alternative; and 3) require mitigation for all impacts associated with the discharge. A Section 404(b)(1) findings document is produced as a result of this procedure and is the basis for the permit decision. Public participation is also provided for in this process. Because the Section 404(b)(1) guidelines meet the requirements of a Tier 1 and Tier 2 antidegradation review, NMED will not conduct a separate review for the proposed discharge. Tier 1 and Tier 2 antidegradation review will be met through Section 401 certification of individual Section 404 permits and will rely upon the information contained in the Section 404(b)(1) findings document. Any discharge to a Tier 3 water authorized under an individual or nationwide permit under Section 404 (with the exception of Nationwide Permit 27) currently requires an individual Section 401 certification.

4 Determining Baseline Water Quality

Existing – or Baseline Water Quality (BWQ) – provides the reference against which predicted degradation associated with a regulated discharge is measured. This section describes how BWQ is characterized through:

- Establishment of BWQ information for perennial surface waters using existing water quality data.
- Approaches which consider the size and potential impacts of the proposed discharge when determining data needs for BWQ characterization and antidegradation review.
- Cooperative action by both NMED and the applicant to generate BWQ information where few or no data exist.

4.1 SUMMARY OF APPROACH

BWQ is used to evaluate an activity or discharge and determine whether it will degrade or lower water quality. Only an activity or discharge that might cause degradation is subject to a Tier 2 antidegradation evaluation. This evaluation is performed for each parameter or pollutant of concern for which the surface water is afforded Tier 2 protection.

In general, BWQ for perennial waters will be based upon existing data collected under NMED monitoring and assessment programs. Evaluations of BWQ will seek to gather information on pollutants of concern reasonably expected to be in discharges regulated by an individual NPDES permit, including suspended and settleable solids, sediment, nutrients, bacteria, biological oxygen demand, and metals. Information about other pollutants of concern will be handled on a case by case basis.

Where no, or few, data exist, NMED will advise the applicant on what data are needed and provide guidance to the applicant on how to collect and report the needed information to NMED. For perennial waters, the priority approach for evaluating BWQ is to use existing water quality data where available. Where adequate data are not available, the second priority approach is to collect BWQ data. Note that due to the lack of flow on intermittent, ephemeral, and effluent dependent, these types of surface waters will be subject to Tier 1 protection levels and appropriate water quality-based effluent limits designed to achieve applicable water quality standards. If ambient water quality information is available for an intermittent water, BWQ will be determined and Tier 2 requirements applied to the waterbody. Therefore, applicants proposing discharges to these surface waters will not be required to determine BWQ.

The regulated entity for a new or expanded discharge to a perennial water that will be regulated by an individual permit generally will be required to provide BWQ data for pollutants of concern that are reasonably expected to be discharged to help NMED determine BWQ, existing uses, and the applicable tier. **The regulated entity is advised to contact NMED prior to initiating an evaluation of BWQ to seek guidance and concurrence regarding the pollutants to be evaluated and the proposed sampling protocols.** This initial consultation may also be used by regulated entities to evaluate the availability of existing data that may be used as a supplement to, or in lieu of, new BWQ data.

Once BWQ is established for a surface water, it is the yardstick against which degradation is measured during all future antidegradation reviews for that surface water unless BWQ is updated by NMED to reflect changes in water quality. Antidegradation policy generally does not allow a lowering of BWQ. However, certain circumstances may allow for re-evaluation of BWQ. For example, if it is shown that there was an

error in determining BWQ, then BWQ can be re-evaluated. Likewise, if water quality has improved, allowing for additional available assimilative capacity, then a request for re-evaluation of BWQ will be considered by NMED.

Table 4-1 shows the minimum BWQ information required, by size of discharge (design flow in million gallons per day), before permit development. Data collection for other pollutants may be required depending on the nature of the proposed discharge and the pollutants reasonably expected in the discharge. The BWQ requirements will be based on the surface water quality upstream of the facility.

Table 4-1. Minimum BWQ Information for Dischargers

Parameter/Pollutant	All Dischargers	Discharges >0.1 MGD	Discharges > 1.0 MGD
Flow	Y	Y	Y
Temperature	Y	Y	Y
BOD5/CBOD5/DO	Y	Y	Y
E. coli	Y	Y	Y
Total Suspended Solids	Y	Y	Y
pH	Y	Y	Y
Total Ammonia		Y	Y
Total Residual Chlorine		Y	Y
Total Nitrogen		Y	Y
Total Phosphorus		Y	Y
Total Dissolved Solids		Y	Y
Aluminum, either dissolved or TR			Y
Antimony, dissolved			Y
Arsenic, dissolved			Y
Beryllium, dissolved			Y
Barium, dissolved			Y
Boron, dissolved			Y
Cadmium, dissolved			Y
Chromium, dissolved[1]			Y
Cobalt, dissolved			
Copper, dissolved			Y
Cyanide, TR			
Lead, dissolved			Y
Manganese, dissolved			

[1] Upon consultation, NMED may require speciation of chromium into chromium III and chromium VI.

Parameter/Pollutant	All Dischargers	Discharges >0.1 MGD	Discharges > 1.0 MGD
Mercury [2]			Y
Molybdenum, either dissolved or TR			
Nickel, dissolved			Y
Selenium, either dissolved or TR			Y
Silver, dissolved			Y
Thallium, dissolved			Y
Uranium, dissolved			Y
Vanadium, dissolved			Y
Zinc, dissolved			Y
Hardness, dissolved – must be taken concurrently with metals sampling.			Y
Other constituents (i.e. organics, PCBs, or other applicable pollutants) based on consultation, type of facility	Y	Y	Y

4.2 BASELINE WATER QUALITY EVALUATION PROCEDURES

As needed, BWQ will be established if no BWQ characterization is available or if no information is available for a pollutant of concern reasonably expected to be discharged into the surface water. Data used for a BWQ characterization must meet the following criteria: 1) collected in accordance with an approved quality assurance project plan (QAPP); and 2) collected using specified sample collection and analysis protocols (SOP, SAP, etc.).

Given the complexity of the issue, BWQ characterizations may take some time to complete. It is recommended that regulated entities submit their BWQ monitoring plan and QAPP well in advance of any planned activities or permit application submittals, to facilitate and streamline the permitting process. In addition, environmental groups, trade organizations, the general public, and other governmental agencies may elect to generate BWQ data with the prior approval of NMED and under appropriate, documented quality assurance / quality control (QA/QC) procedures. The objective of this effort is to generate a reasonable, credible, and scientifically defensible characterization of existing water quality for antidegradation reviews.

During data generation projects by regulated entities or third parties, NMED may conduct field, laboratory, or QA/QC audits to verify that data generators are adhering to established sampling protocols, and may split samples for independent analysis. **Data generators that proceed without agency**

[2] Upon consultation, NMED may require speciation of total mercury or dissolved mercury. Methylmercury analysis may also be required.

notification and concurrence risk rejection of the data and significant delays in the permitting process. Potential generators of BWQ data are also encouraged to notify other regulated entities and stakeholders in the water quality segment or watershed of their intent to generate BWQ data. Stakeholder cooperation in the BWQ evaluation process may allow sharing of the cost of data generation and avoidance of conflict in subsequent permitting actions.

4.3 BWQ SAMPLING LOCATION

For new or expanded discharges into a perennial water where there are no existing water quality data on the surface water (i.e., where new data must be collected for evaluation of BWQ), the BWQ sampling location generally will be immediately upstream of the proposed discharge location. Determinations regarding BWQ characterization and accommodation of variations caused by seasonal impacts, water level fluctuations, or other factors will be made by NMED. Information submitted by permittees will be considered on a case-by-case basis.

Where there is adequate, existing water quality data from multiple sampling sites on a surface water, these stations can become the BWQ stations from which a composite BWQ characterization can be developed. Alternatively, NMED may choose one existing monitoring site as the BWQ station from which to characterize baseline water quality. NMED may request additional monitoring at the site if the existing data are insufficient, e.g., where no information has been collected on pollutants of concern reasonably expected in the proposed discharge. Applicants also may be required to collect BWQ data after the permit is issued to develop a BWQ profile during build-out of the activity's discharge capacity.

Sampling and Analysis Protocol

In general, BWQ will be established through existing monitoring and assessment programs sponsored or approved by NMED. NMED will consider the use of older data on a case-by-case basis, as deemed appropriate, if such data is representative of BWQ conditions. In cases where significant changes have occurred in the watershed, it may be appropriate to use a shorter period of record. The minimum elements of an acceptable BWQ monitoring plan include the collection of at least four samples (one sample per quarter) over a minimum one-year period. Data generators may sample more frequently than specified, but are expected to provide the results of all monitoring. Only NMED-approved monitoring results will be used in the establishment of BWQ. Applicants are advised to seek input from NMED prior to developing a BWQ sampling plan and/or collecting samples.

The sampling plan should address the following elements: experimental design of the sampling project; project goals and objectives; evaluation criteria for data results; background of the sampling project; identification of target conditions (including a discussion of whether any weather, seasonal variations, stream flow, lake level, or site access may affect the project); data quality objectives; types of samples scheduled for collection; sampling frequency; sampling period; sampling locations and rationale for site selection; and a list of field equipment (including tolerance range and any other specifications related to accuracy and precision).

Samples, containers, preservation techniques, holding times, and analysis should be conducted in accordance with *Guidelines Establishing Test Procedures and Analysis of Pollutants* at 40 CFR Part 136 and performed by a laboratory certified by the New Mexico Department of Health. The use of other validated analytical methodologies may be authorized where such use can be technically justified. Stream flow should be measured each time BWQ sampling is performed.

It is important to note that the BWQ pollutant concentrations derived from the data generated will be assumed to be the concentration present during the normal annual low-flow period. All stream samples should be taken when there is a measurable surface flow in the segment at the BWQ sampling location. If environmental conditions prevent achieving the minimum collection requirements, the sampling period should be extended until at least 4 samples are obtained. Acceptable methods for flow measurement include those described in the *Standard Operating Procedure for Stream Flow Measurement* (NMED/SWQB 2015) or at https://www.env.nm.gov/wp-content/uploads/2017/06/ SOP_7.0_Discharge _4-7-15.pdf, or in the U.S Geologic Survey manual *Techniques of Water Resources Investigations of the United States Geologic Survey* (Chapter A8, Book 3, "Discharge Measurements at Gauging Stations") or at https://pubs.water.usgs.gov/TWRI3A8/.

4.4 POLLUTANTS OF CONCERN

Pollutants of concern are those pollutants reasonably expected to be present in a discharge and may adversely affect the water quality of a receiving water body. Not every chemical found in the discharge nor every pollutant for which there are water quality criteria will be of concern. Pollutants that rise to the level of concern will vary by discharge—its quality as well as size—and location of that discharge (i.e., quality of the receiving water).

New or expanded dischargers regulated by an individual permit may be required to generate BWQ data for any pollutants of concern associated with the proposed discharge to a perennial water. In addition to the pollutants of concern, regulated entities may also be requested to provide water quality data for parameters necessary to determine the appropriate value range of water quality criteria (e.g., pH, temperature, hardness). The applicant may also be required to collect data pertaining to impairments in the receiving waterbody. Again, the importance of consultation between BWQ data generators and NMED staff prior to BWQ data generation cannot be overstated.

4.5 INTERPRETATION OF DATA AND ESTABLISHMENT OF BWQ

Generators of BWQ data are expected to provide documentation of their adherence to approved or established protocols and certification that the submitted information is accurate and complete. NMED will review available data and determine BWQ for surface waters on a pollutant-by-pollutant basis. Data generators should make every effort to use the most sensitive, practical analytical methods available. **The use of less sensitive analytical methods may cause rejection of the data set.**

In general, NMED will calculate the geometric mean of all credible data to determine BWQ for a particular pollutant, except *E. coli* bacteria for which the geometric mean will be calculated. For data sets that contain "not detected" or "less than" analytical results, BWQ will be considered to be the detection limit where the reported detection limit is less than or equal to the applicable water quality standard for the pollutant. If at least one data point is detected above the detection limit and the rest of the data points are reported as "less than", then all the data reported as "less than" will be counted as ½ the detection limit when calculating the geometric mean for the BWQ determination.

For data sets where the detection limit is greater than the applicable standard for a pollutant and the reported data are "not detected" or "less than", NMED may request additional data that is analyzed at an appropriate detection level. If additional data are not provided, NMED will use ½ the detection limit when calculating the geometric mean for the BWQ determination.

NMED will use the initial BWQ value established for a particular pollutant in a surface water to judge the impact of all subsequent proposals for discharges involving that pollutant. BWQ re-evaluations may be appropriate if the data used in the original determination is shown to be inaccurate or invalid or if the water quality of the segment is significantly improved when compared with the original BWQ determination. Affected stakeholders may submit a request to NMED for a BWQ re-evaluation under those circumstances. Sampling and analysis will follow the approach in Section 4.3 of this policy, including collection of a minimum of four data points for the re-evaluation.

For a waterbody to show significant improvement, NMED will evaluate old versus new data using the Relative Percent Difference (RPD) of the data. In perennial waterbodies, if the RPD indicates that the water has improved (with respect to specific analytes) according to the matrix listed below, a BWQ re-evaluation may be warranted. Other considerations for a re-evaluation of BWQ include sampling techniques, sample processing and transport, and laboratory analyses.

Table 4-1

Analyte Class (as noted in 20.6.4.900 NMAC)	**Relative Percent Difference (RPD) threshold for BWQ Re-evaluation**
Persistent/Bio-accumulative (HH-OO)	No re-evaluation – NMED will consider bio-accumulative pollutants on a case by case basis
All other analytes	≥20% improvement in water quality

5 Evaluating the Level of Degradation of Proposed Discharges

Antidegradation reviews are required for all regulated discharges that have the potential to degrade water quality in New Mexico. The review procedures described in this chapter do not apply to non-point sources of pollution (addressed in the Nonpoint Source Management Plan), discharges covered under Section 404 of the CWA (addressed through certification conditions and implementation of BMPs) or NPDES general permits (addressed through the implementation of benchmarks and BMPs). The antidegradation procedures vary by the tier level of protection and by the type of surface water. For pollutants with Tier 2 protection levels, the degradation evaluation determines whether or not significant degradation will occur – i.e., whether or not 10% or more of the available assimilative capacity for any pollutant of concern will be consumed as a result of the proposed discharge during critical flow (e.g., 4Q3) conditions or the cumulative cap of 50% of available assimilative capacity is exceeded. The level of degradation will be evaluated from BWQ conditions.

For Tier 3 protection levels, the degradation evaluation must determine that no degradation will occur as a result of the proposed discharge unless the impacts are temporary. As a general rule of thumb, temporary impacts are defined as impacts of less than six months duration.

5.1 Applicability of Degradation to the Various Protection Tiers

The concept of degradation is relatively simple: any discharge that results in a decline of water quality (as determined on a pollutant-by-pollutant basis). Degradation is not allowed to cause or contribute to impairments that result in the loss of existing uses (i.e., the Tier 1 threshold), and is not allowed at all in Outstanding New Mexico Waters (ONRWs) unless it is temporary (i.e., the Tier 3 threshold) as determined by NMED and approved according to 20.6.4.8 NMAC.

Significant degradation may be allowed in surface waters protected at the Tier 2 level if the applicant for a new or expanded discharge characterizes the effluent and BWQ, completes an alternative analysis, and provides social and economic supporting documentation. For Tier 2 reviews, determining BWQ, evaluating projected impacts, analyzing possible alternatives, and evaluating economic or social benefits, if applicable, must occur ***prior to*** issuing an individual NPDES permit. Therefore, it is recommended that an applicant discharging to a perennial water meet with NMED in a pre-application conference **at least one year prior** to the anticipated date of NPDES permit issuance.

Decisions regarding significant degradation of Tier 2 protection levels will only be made after the required alternatives analysis along with economic and social benefits justification have been completed, after technology-based and nonpoint source control requirements are met, and after the intergovernmental coordination and public participation provisions in Chapter 8 have been satisfied.

5.2 PROCEDURE FOR TIER 2 DEGRADATION EVALUATION

Tier 2 evaluation procedures vary by the type of surface water, as outlined below:

Discharges to Non-Perennial Waters

Many individual NPDES permit applicants will likely discharge to an ephemeral, intermittent, or effluent dependent water. Tier 2 degradation evaluation procedures do not apply to these discharges. Discharges to non-perennial waters will be required to meet applicable surface water quality standards and technology-based standards, e.g., best available technologies (BAT) at the "end-of-the-pipe" (i.e., Tier 1 degradation evaluation procedures).

In some limited cases, data may be available to determine BWQ in these non-perennial waters. If data are available and assessable and confirm a high-quality water, NMED would conduct a Tier 2 antidegradation review. Similar to perennial waters, no significant degradation of the Tier 2 pollutants would be allowed unless a comprehensive antidegradation review of reasonable alternatives and social and economic considerations supports a lowering of water quality.

Discharges to Perennial Waters

All other individually-permitted discharges to perennial waters must conduct an antidegradation review to determine whether or not significant degradation will occur, i.e., whether or not 10% or more of the available assimilative capacity for any pollutant of concern will be consumed as a result of the proposed discharge during critical flow (e.g., 4Q3) conditions or the cumulative cap of 50% of assimilative capacity is exceeded. The Tier 2 degradation review for new or expanded discharges is based on these characterizations:

- BWQ, as determined by data collected pursuant to Chapter 4
- The critical in-stream flow (e.g., 4Q3)
- The flow and pollutant loads resulting from the proposed discharge
- Projected changes in water quality that occur as a result of the proposed discharge

The results of the antidegradation review will be used to determine whether the proposed discharge will be subject to additional requirements as part of the permitting process, such as analyses of reasonable, cost-effective, less degrading or non-degrading alternatives and examination and justification of important economic and social costs and benefits (see Chapter 6 and Chapter 7, respectively).

Mixing Zones

If needed, a new or expanded facility who discharges to a perennial water may be evaluated for the applicability of a mixing zone analysis on a case by case basis.

5.3 CALCULATIONS TO DETERMINE SIGNIFICANCE OF DEGRADATION

At the Tier 2 protection levels, BWQ is better than the water quality standards for one or more pollutants. Therefore, no significant degradation from BWQ is allowed unless a comprehensive antidegradation review of reasonable alternatives and social and economic considerations supports a lowering of water quality. Degradation is generally assumed to be "significant" if a discharge consumes 10% or more of a surface water's assimilative capacity for any pollutant of

concern (other than bio-accumulative pollutants as defined by the human health-organism only (HH-OO) criteria at 20.6.4.900 NMAC) under critical flow conditions or the discharge consumes any percentage of the cumulative assimilative capacity beyond 50%.

To determine if a discharge will cause significant degradation, assimilative capacity must be calculated and then evaluated under critical flow conditions. The first step in this process is to calculate the assimilative capacity and significant degradation limit. The assimilative capacity of the waterbody for any pollutant of concern under review is the difference between *observed* BWQ and the most stringent applicable water quality criterion. Figure 5-1 provides a simplified visual representation of assimilative capacity for a given pollutant (Pollutant X). In this example, the most stringent applicable water quality criterion for Pollutant X is 10 mg/L and the *observed* BWQ measurement is 3 mg/L. In Figure 5-1, the assimilative capacity of Pollutant X is the difference between the water quality criterion and the BWQ, or 10 mg/L minus 3 mg/L, and equals 7 mg/L. The "significant degradation" limit is 10% of the assimilative capacity (7 mg/L) or 0.7 mg/L. Thus, a regulated discharge undergoing a Tier 2 review would be considered *de minimis* (i.e., no significant degradation) if it did not cause the water quality in the receiving surface water to exceed the BWQ (3 mg/L) plus the significant degradation limit (0.7 mg/L), or 3.7 mg/L for Pollutant X.

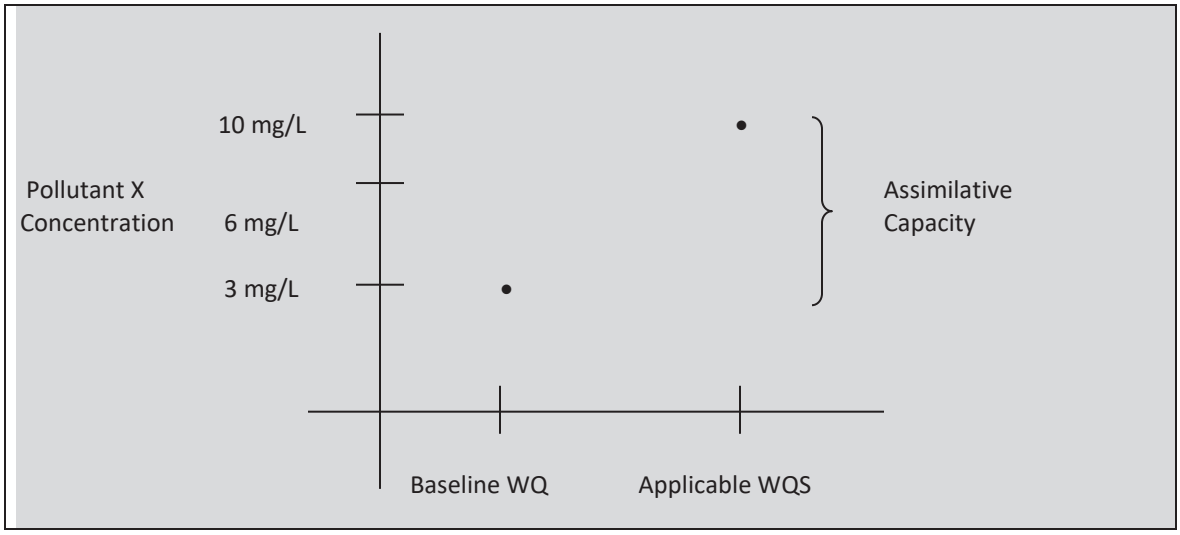


Figure 5-1. Simplified Representation of Assimilative Capacity

The second step to determine the significance of degradation is to evaluate the "significant" assimilative capacity concentration, identified in step one, under critical flow conditions. While NMED's antidegradation formula evaluates the assimilative capacity concentration similar to the example shown above in Figure 5-1, that resultant concentration is converted to a load using the receiving stream's critical flow and a conversion factor of 8.34. For example, the significant degradation concentration limit of 3.7 mg/L for Pollutant X in Figure 5-1 is converted to a loading capacity using the following formula:

$$Load\ Capacity\ \left(\frac{lbs}{day}\right) = concentration\left(\frac{mg}{L}\right) x\ flow\ (4Q3, million\ gallons\ per\ day)\ x\ 8.34$$

Consideration of Multiple Discharges – 50% Cumulative Cap

To address degradation associated with multiple regulated discharges to the same receiving water over time, NMED is establishing a separate significance threshold of a 50% cumulative cap on the consumption of assimilative capacity. This approach creates a "backstop" so that multiple regulated discharges to a water body over time which individually do not consume 10% of the assimilative capacity do not result in the consumption of the majority of the assimilative capacity without NMED ever conducting a comprehensive Tier 2 antidegradation review. NMED has established this significance threshold at 50% of the assimilative capacity when BWQ is characterized. This means that once 50% of the assimilative capacity is used in a surface water for a pollutant of concern, any further lowering of water quality is considered significant degradation. NMED will conduct a comprehensive Tier 2 antidegradation review for each lowering of water quality once the 50% cumulative cap is exceeded, regardless of the amount of assimilative capacity that would be used by the regulated discharge.

Critical Flow

The calculations noted above are to be executed under critical flow conditions for the pollutants of concern. For point source discharges, critical flow for all criteria/pollutants, except HH-OO, is the minimum four consecutive day flow that occurs with a frequency of once in three years (4Q3) in the receiving water. (20.6.4.11(B)(2) NMAC). Critical lake and reservoir water levels will be determined on a case-by-case basis.

Calculations for Tier 2 Pollutants

The calculation to determine if a discharge will result in significant degradation is a variation of the mass balance equation that is used to determine water quality-based effluent limits:

$$(Q_d)(C_d) + (Q_s)(C_s) = (Q_r)(C_r)$$

Where:

Q_d =discharge flow cfs
Q_s =stream flow (4Q3)
Q_r =resulting in-stream flow (downstream of discharge, or Q_s+Q_d)
C_d =discharge concentration,
C_s =concentration in stream

C_r = resultant in-stream concentration

Solve for C_d:

$$C_d = \frac{[C_r(Q_d + Q_s)] - [(C_s)(Q_s)]}{Q_d}$$

For purposes of Tier 2 antidegradation reviews, NMED solves for the discharge concentration that uses 10% of the assimilative capacity:

Where:

C_{bwq} = BWQ
C_r = resultant in-stream concentration = [(WQS - C_{bwq}) x 0.1 + C_{bwq}]

$$C_d = \frac{[((WQS - C_{bwq}) \times 0.1 + C_{bwq})(Q_d+Q_s)] - [(C_s)(Q_s)]}{Q_d}$$

The calculated discharge concentration (C_d) is compared with the proposed discharge concentration. If the calculated concentration is greater than the proposed concentration, then a determination of "no significant degradation" is found. If the level of degradation is estimated to be less than 10% of the assimilative capacity, and less than 50% of the cumulative cap (if applicable), *and* existing uses are maintained, the antidegradation review process is complete and the permitting process may proceed.

If the discharge is found to consume more than 10% of available assimilative capacity (calculated < proposed) or exceeds the 50% cumulative cap, a comprehensive Tier 2 review is required. The regulated discharge would be required to conduct an alternatives analysis (Chapter 6) and demonstrate "important economic or social development" (Chapter 7) if allowances are sought to further reduce assimilative capacity. If such demonstrations are made, the WQCC may allow consumption of additional assimilative capacity (degradation) as long as intergovernmental and public participation processes are followed and water quality standards are not violated.

6 Identifying and Evaluating Pollution Control Alternatives for Tier 2 Protection

A regulated entity proposing a new or expanded discharge requiring an individual NPDES permit that would significantly degrade water quality in a Tier 2 surface water (i.e., consume 10% or more of the assimilative capacity or exceed the cumulative cap of 50% for any pollutant of concern) is required to prepare an evaluation of alternatives to the proposed discharge. The evaluation must provide substantive information pertaining to the cost and environmental impacts associated with the proposed discharge and the alternatives evaluated. This chapter provides guidance on how to evaluate alternatives when an impacts analysis determines that significant degradation may occur.

The intent of the alternatives analysis is to identify cost-effective and reasonable *less degrading* or *non-degrading* approaches for reducing discharge-related impacts so they do not result in significant degradation of the receiving water.

6.1 Less Degrading and Non-degrading Pollution Control Measures

Under New Mexico's antidegradation implementation procedures, applicants are required to analyze these alternatives if their proposed discharge will cause significant degradation of higher quality (i.e., Tier 2) waters. Less degrading or non-degrading pollution control alternatives identified and evaluated during this process should be reliable, demonstrated processes or practices that can be reasonably expected to result in a defined range of treatment or pollutant removal.

Applications containing proposals for new or experimental methods will be required to append information regarding likely performance results and may be approved at the discretion of NMED with the understanding that if the proposed technology does not meet projected pollutant control targets the applicant must adopt conventional or other pollution control measures that meet state antidegradation requirements.

Pollution control alternatives that may be evaluated when a proposed discharge will result in significant degradation of the receiving water segments may include the following:

- Alternative methods of production or operation
- Pollution prevention and treatment process changes
- Recycling/reusing wastewater (i.e., closed loop systems)
- Holding/transport facilities for treatment/discharge elsewhere
- Groundwater recharge (i.e., soil-aquifer treatment, injection)
- 100% reuse
- Advanced or innovative biological/physical/chemical treatment
- Pollution prevention and process changes
- Improvements in the collection system
- Improved operation and maintenance of existing treatment system

- Seasonal or controlled discharges to avoid critical periods
- Alternative discharge locations, and associated water quality impacts at those locations
- Reduction in the scope of the proposed project

Applicants will be expected to address reasonable and cost-effective alternatives, or mix of alternatives, in their evaluations. NMED staff and the applicant will meet to discuss these and other issues early in the process. It is the responsibility of the applicant to screen for and propose a list of reasonable, cost-effective alternatives that will be evaluated in detail. NMED may require that additional alternatives be analyzed.

If the project results in significant degradation even after applying reasonable, cost-effective alternatives, the proposal must demonstrate 1) important social or economic development as outlined in Chapter 7; 2) the level of water quality necessary to protect existing uses is maintained (i.e., Tier 1 protection); 3) all cost-effective and reasonable BMPs for nonpoint source control are implemented; and 4) the highest statutory and regulatory requirements for all new and existing point sources are achieved (20.6.4.8(A)(2) NMAC).

6.2 IDENTIFYING COST COMPONENTS AND ASSESSING COSTS

An assessment of costs related to the alternatives summarized above is necessary to determine whether or not a prospective alternative pollution control measure is reasonable. General cost categories include:

- Capital costs
- Operating costs
- Other costs (one-time costs, savings, opportunity cost, salvage value)

In order to develop a standardized framework for projecting, evaluating, and comparing costs associated with various pollution control measures, applicants should use a "present worth" framework for generating and reporting cost information. Components of the present worth framework include:

$$P = C + O + [A * (P/A, d, n)] - S - L$$

Where:

P = Present worth,
C = Capital cost,
O = Other costs (expressed as dollars invested at the beginning of the project),
A = Annual operating cost,
d = Discount rate,
n = Useful life in years,
S = Present worth of salvage value of facilities,
L = Present worth of salvage value of land, and
$(P/A, d, n)$ = Equal series present worth factor, = $[(1 + d)^n -1] / [d (1+d)^n]$.

The present worth calculated for the alternative technologies depends on the right choice for the discount rate (d), and the useful life (n) of the equipment or facility. Recommended discount rates for New Mexico are provided by the New Mexico Water Infrastructure Finance Authority (WIFA). The useful life of the facility or equipment is based upon similar facilities or equipment handling similar wastes and flows and must be approved by NMED. Speculative costs for land, facilities,

etc., will not be allowed. For more information on the present worth calculation and other methods that may be used to assess costs, see Appendix A1, Direct Cost Comparison of Alternatives.

6.3 Evaluating Environmental Impacts Associated with Alternatives

Pollution control measures evaluated as alternatives to a proposed discharge may have environmental impacts that help define their overall value and/or desirability. Applicants are required to provide substantive information pertaining to both the cost and environmental impacts associated with pollution control alternatives evaluated for discharges that would significantly degrade Tier 2 level of protection. The information related to environmental impacts should include impacts on the natural environment (i.e., land, air, and water) resulting from implementation of the alternative. The types of impacts evaluated during this process may include:

- Sensitivity of stream uses
- Need for low-flow augmentation
- Sensitivity of groundwater uses in the area
- Potential to generate secondary water quality impacts (storm water, hydrology)
- System or technology reliability, potential for upsets/accidents
- Effect on endangered species
- Non-water quality environmental impacts
- Nature of pollutants discharged
- Dilution ratio for pollutants discharged
- Discharge timing and duration
- Siting of plant and collection facilities

Review of these impacts might be on a qualitative or quantitative basis, as appropriate. Non-water quality environmental impact analyses to be submitted by the applicant include estimations of the potential impact of the alternative(s) on odor, noise, energy consumption, air emissions, and solid waste generation. Odor and noise may be addressed qualitatively while other non-water quality impacts might need to be addressed quantitatively. The energy use, air emission, and solid waste generation impacts can be expressed as a percent increase/decrease as compared to the proposed discharge. Other factors that should be considered during the review include the technical, legal, and local considerations of the various alternatives examined. The schedule and the estimated time of completion of the project should also be provided for each alternative discussed.

6.4 Cost and Reasonableness Criteria for Alternatives Evaluation

In general, an alternative or suite of alternatives is considered to be cost-effective and reasonable if it is feasible and the cost is less than 110% of the *base costs* of pollution control measures for the proposed discharge in present worth costs. It should be noted that the 110% cost-effectiveness criterion is a general rule-of-thumb – if pollution control costs for alternatives that

would result in water quality benefits exceed the 110% cost threshold, those alternatives may be required if the water quality and environmental benefits outweigh the economic costs.

When calculating the cost of a proposed discharge and any less- or non-degrading alternatives, it is important to identify the base cost for required pollution control measures for any proposed discharge. The base cost for NPDES-permitted facilities is the cost of treatment to meet applicable water quality standards or the cost of meeting federal technology-based requirements, whichever is more stringent and legally applicable. The base cost for Section 404 dredge-and-fill permits (e.g., wetland fills, mining streambed fills) is the cost of pollution controls to meet minimum Section 404 permit and Section 401 water quality certification requirements.

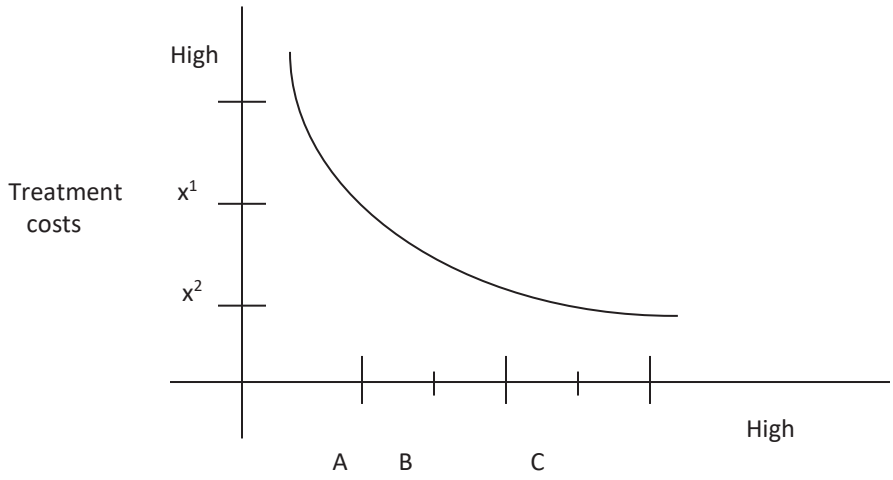
6.5 PROCEDURE FOR COMPARING COSTS OF VARIOUS ALTERNATIVES

In reviewing costs for a variety of discharge scenarios, three reference costs can be identified (see Figure 6-1):

- The cost of treatment that results in no discharges of any pollutants of concern (the "no-discharge" cost).
- The cost of treatment that produces an effluent that results in no significant degradation of the receiving water, i.e., that does not consume more than 10% of the available assimilative capacity for any pollutant of concern.
- The cost of treating an effluent to a quality that meets specific effluent/ BAT limits or water quality criteria for any/all pollutants of concern (i.e., the conceptual minimum Tier 1 requirement).

The base cost for comparing the reasonableness and cost-effectiveness of less degrading or non-degrading alternatives is the cost of producing an effluent that meets water quality standards or the cost of meeting federally-required effluent concentration limits or best available technology, whichever is more stringent (level C in Figure 6-1).

Applicants will be required to submit cost information to NMED for base pollution control measures as defined above and alternative pollution control measures that would result in no significant degradation (level B). NMED may request cost or other information regarding preventing degradation (level A). NMED will evaluate the limitations of the alternatives analysis and may request additional analyses or information, as needed, to make a determination.



A = The "no degradation" alternative
B = Activity modifications resulting in "no significant degradation," i.e., does not consume more than 10 percent of the available assimilative capacity for any other pollutant of concern (POC)
C = Activity modifications that achieve or maintain minimally required use-based water quality criteria or best available demonstrated control technology
x^1 = Costs for implementing the "no degradation" alternative
x^2 = Costs for less degrading alternative(s)

Figure 6-1. Comparison of Treatment Costs to Produce Effluents of Varying Quality

6.6 SUMMARY OF THE ALTERNATIVES ANALYSIS PROCESS

The preceding discussion describes the approach that will be followed by NMED for determining whether or not less- or non-degrading alternatives to the proposed new or expanded discharge will be required to prevent significant degradation of perennial surface water. The following steps summarize the alternatives analysis process and other relevant actions during comprehensive Tier 2 reviews:

- Based on characterizations of the new or expanded proposed discharge, BWQ, and projected impacts on the receiving water segment, NMED will determine whether or not the proposed discharge will significantly degrade water quality, i.e., consume more than 10% of the available assimilative capacity for any other pollutant of concern.
- If it is determined that significant degradation would likely occur due to the proposed discharge, an analysis of less degrading or non-degrading alternatives to the proposed discharge will be required.
- The applicant will be required to submit cost information for base pollution control measures associated with the proposed discharge, alternative pollution control measures that would result in no significant degradation, and for other less or non-degrading alternatives as appropriate.

- NMED will evaluate the proposed discharge, the less and non-degrading alternatives, and the costs and feasibility associated with each mix of options.
- NMED will approve the least degrading alternative – or mix of alternatives – that does not exceed the 110% base cost threshold (i.e., is cost-effective and reasonable).
- If the approved alternative (i.e., pollution control alternative or mix of alternatives) will not result in significant degradation of the receiving water segment, permitting of the discharge may proceed. If the approved alternative will still result in significant degradation of the receiving water, the applicant will be required to conduct an analysis of economic and social benefits so the WQCC can determine whether or not the discharge can be permitted.
- All water quality impacts in the alternatives analysis will be evaluated at the BWQ station and back-calculated to develop the upstream effluent limit (i.e., the degradation of proposed discharges including alternatives will be evaluated at the BWQ point, while permit limits and permit compliance will be developed and evaluated at the discharge point).

If the project results in significant degradation even after applying reasonable, cost-effective alternatives, in order to allow such degradation and lowering of water quality the proposal must demonstrate that the new or expanded discharge is important to economic and social development (as outlined in Chapter 7), protects existing uses (i.e., maintains Tier 1 protection), achieves the highest statutory and regulatory requirements for point sources, and implements cost-effective and reasonable BMPs for nonpoint source control (20.6.4.8(A)(2) NMAC). NMED encourages watershed planning to further protect surface water quality and CWA Section 319 grants are available for various groups to plan and implement on-the-ground improvement projects. In addition, Clean Water State Revolving Fund (CWSRF) loans are available for a wide range of wastewater or storm drainage projects that protect surface and ground water, including projects that control nonpoint source pollution.

7 Social and Economic Importance for Tier 2 Reviews

7.1 Regulatory Requirements for Social and Economic Analysis

As discussed in previous chapters, if an alternatives analysis has been conducted for a proposed new or expanded discharge to a Tier 2 protected water requiring an individual NPDES permit, and the least degrading, cost-effective alternative still results in significant degradation, an analysis of the social and economic importance of the discharge must be conducted. Under New Mexico's antidegradation policy, found at 20.6.4.8(A)(2) NMAC, the Commission may authorize a proposed discharge that would significantly lower the water quality of a Tier 2 water, if allowing lower water quality is necessary to accommodate important economic and social development in the area in which the surface water is located.

There are several steps in determining social and economic importance. First, the applicant conducts an analysis of the social and economic benefits/costs associated with the discharge. The applicant must document any social and economic benefits/costs associated with the proposed discharge and report them to NMED, including identifying and documenting general environmental justice issues in the area where the discharge will be located that may impact the benefits/costs analysis[3,4]. NMED then reviews the information and may require additional information and/or a more in-depth, substantial and widespread impact analysis if there is not enough information to make a decision or if the proposed discharge is complex. Additional information is included in Appendix A.3 and Appendix A.4. If enough information has been submitted, NMED will make a preliminary determination to deny or authorize the degradation. Finally, "after public comment and intergovernmental coordination, the WQCC analyzes all information and makes a final determination (20.6.4.8(A)(2) NMAC).

7.2 Role of the Applicant

The role of the applicant is to demonstrate the social and economic benefits of the proposed new or expanded discharge associated with allowing significant degradation of high-quality water. The report on social and economic benefits/costs (positive and negative) associated with the project is relatively simple and straightforward. NMED requires that up-to-date and accurate data are included in the report, and that estimates of job gains/losses, housing impacts, etc., be summarized completely and based on defensible estimates. Using the *Social and Economic Importance Worksheet*, Appendix A.2, the applicant must document how the proposed new or expanded discharge affects the social, economic, and environmental factors listed below.

Social, Economic, and Environmental Considerations

[3] For information on the EPA Region 6 EJ Action Plan, visit: https://www.epa.gov/environmentaljustice/region-6-new-mexico-ej-action-plan

[4] Environmental Justice Screening and Mapping Tool: https://www.epa.gov/ejscreen

Below are the **economic and social** benefits/costs most commonly associated with this socio-economic analysis:

- Creating, expanding or maintaining employment
- Reducing the unemployment rate
- Increasing median household income
- Reducing the number of households below the poverty line
- Increasing needed housing supply
- Increasing the community tax base
- Providing necessary public services (e.g., fire department, school, infrastructure)
- Correcting a public health, safety, or environmental problem
- Improving quality of life for residents in the area

Below are the **environmental** benefits or costs most commonly associated with this analysis:

- Promoting/impacting fishing, recreation, and tourism industries
- Enhancing/impacting threatened and endangered species
- Providing increased flood control and sediment trapping through maintaining or creating wetlands and riparian zones or impacting wetlands and riparian zones
- Reserving assimilative capacity for future industry and development or reserving no capacity for future discharges.

The applicant may choose or may be required to describe additional factors as needed to strengthen its Social and Economic Importance Analysis. Appendix A.4, *Other Economic and Environmental Considerations*, provides examples of other issues that might be helpful to address in developing an analysis. All information provided should be based upon the most current, available data.

7.3 ROLE OF NMED

Prior to issuance of any proposed new or expanded discharge permit that would significantly lower the water quality of a Tier 2 protected water, NMED will ensure that the proposed discharge is necessary to accommodate important economic or social development in the area in which the waters are located. NMED may also collect and analyze additional information to assess the market and non-market social and economic benefits and costs of the proposed discharge, including by soliciting public information and comment where appropriate or by accessing information available from the New Mexico Community Data Collaborative (http://www.nmcdcmaps.org/), the Distressed Communities Index (https://eig.org/dci), or EPA, including EJSCREEN (https://www.epa.gov/healthresearch/tools-support-environmental-justice). In making a preliminary decision, NMED will rely primarily on the demonstration made by the applicant. NMED will analyze all information and make a preliminary determination on the facts on a case-by-case basis.

If information available to NMED is not sufficient to make a preliminary determination regarding the socioeconomic importance of the proposed new or expanded discharge, NMED may require the project applicant to submit specific items of information needed to make a determination. NMED may also require use of quantitative models for large proposed discharge (e.g., major industrial wastewater treatment facility, large concentrated animal feeding operation, etc.).

Once the available information pertaining to the socioeconomic importance of the proposed new or expanded discharge has been reviewed by NMED, a preliminary determination to deny or authorize the degradation will be made. If the proposed discharge is determined to be necessary to accommodate important economic or social development in the area in which the affected waters are located, the substance and basis for that preliminary determination will be documented and the Tier 2 review will continue. NMED will make the preliminary determination available to the public and forward its preliminary determination to governmental agencies that may be impacted by the discharge.

Once the public participation and intergovernmental coordination requirements are satisfied, the WQCC will make a final determination concerning the social or economic importance of the proposed new or expanded discharge and whether to deny or authorize the discharge (20.6.4.8(A)(2) NMAC). All social and economic importance findings and other required findings, including determinations to deny issuance of a permit for a discharge, will be documented and made part of the public record.

8 Requirements for Intergovernmental Coordination and Public Participation

This chapter outlines public participation and intergovernmental coordination and review requirements. Antidegradation reviews for NPDES-permitted facilities will employ the public participation procedures that are available through the permitting process (e.g., draft permits, fact sheets, opportunities to comment, etc.). The NPDES permit fact sheet will include a discussion for the public of NMED's antidegradation review.

Once the intergovernmental coordination and public notice requirements outlined below are satisfied, NMED will make a final determination concerning the social or economic importance of the proposed new or expanded discharge in the area in which the affected receiving waters are located. All determinations, including determinations to prohibit the discharge, will be documented and made a part of the public record.

8.1 PUBLIC NOTIFICATION REQUIREMENTS

There are a number of opportunities for public participation in the review of new and increased discharges into Tier 1 waters. The WQCC adopts Total Maximum Daily Loads (TMDLs) with applicable wasteload allocations for point sources discharging to Tier 1 waters not meeting water quality objectives. This process includes public notice and comment. The EPA and Army Corps follow detailed procedures requiring public notice and comment when issuing NPDES and Section 404 dredge or fill permits. Finally, the NMED's Section 401 certifications can be appealed and a full hearing held before the WQCC.

Public notice and opportunity for public comment is also provided for all comprehensive Tier 2 reviews. NMED will publish notice and provide an opportunity to comment on the preliminary decision and statement of basis. The public comment period will be at least 30 days. Public notice and opportunity for comment may be combined with other public participation procedures, such as those related to NPDES permitting processes or intergovernmental coordination / review procedures. During the public comment period, any interested person may submit written comments and request a public hearing. A request for a public hearing must be in writing and must state the nature of the issues to be raised. If NMED determines that the request for public hearing raises issues of significant public interest within the scope of the antidegradation policy, the Department will hold a public hearing. The public hearing will be held in a location near the water affected by the discharge.

Discharges that may result in a significant degradation of water quality for Tier 2 pollutants may be approved by the WQCC, after full satisfaction of the intergovernmental coordination and public participation processes, provided that:

- The level of water quality necessary to protect existing uses is fully protected. Water quality shall be maintained and protected in all surface waters of the state (20.6.4.8(A)(1) NMAC).

- The highest statutory and regulatory requirements for new and existing point sources are achieved.
- All cost-effective and reasonable best management practices for non-point source pollution control are implemented.
- Allowing lower water quality is necessary to accommodate important economic or social development in the area where the surface water is located.
- Watershed-based planning as a further means to protect surface waters is encouraged.

All comprehensive Tier 2 findings will be documented by NMED and made part of the administrative record. Review documents – including evaluations of BWQ, existing uses, the level of review conducted, alternatives analyses, social/economic studies, impacts analyses, and any decisions or findings – will be made available to the public.

For activities that may impact Tier 3 waters, NMED will publish notice and provide a 30-day public comment period. After the comment period, NMED will provide a recommendation to the Commission. NMED will provide notice of activities approved by the WQCC pursuant to 20.6.4.8(A)(3)(a) NMAC and of activities conducted pursuant to 20.6.4.8(A)(4) NMAC by posting a brief description, location, and timeframe for such activities on a dedicated Department website.

8.2 Opportunities for Public Participation

Public participation in the implementation of New Mexico's water quality antidegradation policy can be broad or specific. Opportunities for broad participation include involvement in the triennial review of the water quality standards program (i.e., use designations, water quality criteria determinations, antidegradation implementation procedures) and participation in rule development relative to permitting processes. In addition, any interested party may nominate a water segment for protection at the Tier 3 level by following the procedure for consideration outlined under 20.6.4.9 NMAC (see Chapter 2). Finally, interested groups can conduct volunteer monitoring under an NMED-approved plan to support BWQ determinations.

Wherever possible, NMED will seek to integrate public participation regarding antidegradation reviews with existing NMED public participation procedures (e.g., NPDES permitting procedures).

8.3 Intergovernmental Coordination and Review

Intergovernmental coordination is required prior to approving a new or expanded discharge requiring an individual NPDES permit that would significantly degrade a surface water protected at the Tier 2 level. This requirement seeks to ensure that all relevant public entities at the local, state, and federal levels are aware of any proposal to significantly lower water quality and are provided with an opportunity to review, seek additional information, and comment on the proposal. The intergovernmental coordination and review process occurs prior to the issuance of any final determination on the social and/or economic importance of the proposed discharge, and may occur in tandem with public notice procedures outlined in the previous section. The time period afforded to commenting agencies will be consistent with the requirements for submission of public comments.

Intergovernmental coordination requirements will be satisfied by providing a written notice and request for comment to the appropriate agencies listed in Appendix A.5. Such notice will include summary information on the proposed new or expanded discharge, the receiving water segment, the BWQ of the receiving water segment, the tier designation, estimated impacts of the proposed discharge upon the receiving water, the alternatives reviewed, and the projected social or economic importance of the proposed discharge. In providing notice to these agencies, staff should note the importance of circulating the notice to local or regional constituents of the agencies involved so that NMED receives timely and complete responses from governmental entities that might have information regarding the proposal or might be affected by it.

8.4 APPEALS OF ANTIDEGRADATION REVIEW DECISIONS

Persons adversely affected by any final decision of the Department may appeal to the WQCC in accordance with the New Mexico Water Quality Act, NMSA 1978, Sections 74-6-1 to -17.

Appendix A.1
Direct Comparison of Alternatives

Direct cost comparisons of alternatives are typically performed on the basis of present worth calculations or calculations of uniform annual cost (if the useful life of each alternative is different), using an applicable interest (discount) rate. The present worth calculation is a well-established method for integrating the upfront capital costs (and associated indebtedness) of a project with its ongoing annual costs of operation, and transforming the integrated costs to one equivalent value. The calculation yields the total equivalent dollars which would have to be invested at the beginning of a project in order to finance it for the life of the facility. The monetary costs considered in the calculations include the total value of the resources, which are attributable to the wastewater treatment, control, and management systems and the component parts. To determine these values, all monies necessary for capital construction costs, operational costs, and maintenance costs should be identified.

Capital construction costs used in cost comparison analysis consist of estimates of the construction costs, including overhead and profit; costs of land (including land purchased for the treatment works site and land used as part of the treatment process or for ultimate disposal of residues), relocation expenses, and right-of-way and easement acquisitions; costs of design engineering, field services (including cost of bond sales); startup costs such as operator training; financing costs and interest during construction; and the costs of any other site-related environmental controls, such as erosion and sediment control practices.

Operational and maintenance costs are usually considered on an annual basis and include operational staff salaries, cost of energy and fuels, cost of treatment chemicals, cost of routine replacement of equipment and equipment parts, and other expenditures necessary to ensure effective and dependable operation over the life of the facility. Annual operation and maintenance costs should be averaged to account for variations, which might occur, year-to-year due to varying production or wastewater volume.

The salvage value of equipment, tankage, and materials from the treatment works is part of the present worth calculation. Salvage value is estimated using straight-line depreciation during the useful life of the project and can generally only be claimed for equipment where it can be clearly demonstrated that a specific market or re-use opportunity will exist. Salvage value estimation should also take into account the costs of any restoration or decommissioning of treatment units and final disposal costs. It is possible in some cases that these costs may be high enough that the net salvage value will be negative.

Land purchased for the treatment works site is also assumed to have a salvage value at the end of the project useful life equal to its market value at the end of the analysis period. The local inflation rate for land in the use area should be used to project the market value at the end of the analysis period.

It is also important to evaluate any opportunity cost associated with different alternatives. Opportunity costs should not be considered for speculative growth or production increases claimed by an applicant. Any costs claimed should be clearly associated with integral portions of projects, which are realistically available, and are otherwise locally approvable.

The discount rate used in the present worth or uniform annual cost calculation for public sewerage projects should be that rate published by the NMED Construction Program Bureau and associated funding agencies for the planning review and evaluation of water resource projects. The rate is available from NMED. For private sector projects, the interest rate utilized should be that rate at which the applicant can borrow funds. Since the present worth calculation is being performed more to compare alternatives rather than to obtain a very accurate estimation of

actual costs, the fact that the same interest rate assumption be utilized for each alternative is more important than the actual interest rate selected.

Cost estimates have an associated level of precision. The cost estimates prepared by the project sponsor should include an estimate of the error for each alternative. The applicant is responsible for documenting and defending all cost estimates used in the analysis.

Cost estimate equations:

The equations below are the basic expressions of the present worth and equivalent annualized cost concepts. Additional mathematical factors and apportionment of costs are incorporated into the equations where appropriate.

I. The basic present worth calculation should be performed in accordance with the following equation:

$$P = C + O + [A * (P/A,d,n)] – S – L$$

where,

P = present worth

C = capital cost

A = annual operating costs

(P/A,d,n) = equal series present worth factor $[(1 + d)^n – 1] / [d (1 + d)^n]$

d = discount rate

n = useful life in years

S = present worth of salvage value of facilities

L = present worth of salvage value of land

O = other costs (if any)

A gradient factor may be added into the equations to account for inflation of annual operating costs, as opposed to using an average value throughout the project life, by simply adding the additional following term onto the right-hand side of the above equation:

$$[G * (P/G,d,n)]$$

where,

G = uniform increase in annual costs

(P/G,d,n) = present worth factor for a gradient =

$(1 – nd) [(1 + d)^n – 1] / [d^2 * (1 + d)^n]$.

II. If the alternatives have different useful lives, the cost comparison may be performed using the Equivalent Uniform Annual Cost Method. The equation for this method is:

$$EUA = (C + O) * (A/P,d,n) + A – [(S + L) * (A/F,d,n)]$$

where,

EUA = equivalent uniform annual cost

(A/P,d,n) = capital recovery factor $[(1 + d)^n – 1] / [d (1 + d)^n]$

(A/F,d,n) = uniform series sinking fund factor $d / [(1 + d)^n – 1)]$

To add a gradient factor, the following additional term is simply added to the right hand side of the above equation:

[G * (A/G,d,n)]

where,

(A/G,d,n) = EUA factor for a gradient = $[(1 + d)^n – 1 – nd] / d * [(1 + d)^n – 1]$.

Additional cost factors:

Other costs, such as opportunity costs, while presented above as one-time present losses, may also have an annual lost revenue component, which could be accounted for by apportioning the costs as both upfront and annual costs.

In general, it is the responsibility of the applicant for a permit or approval to prepare detailed cost estimates for all appropriate and approvable discharge, non-discharge, and combination discharge/non-discharge alternatives. The cost estimates may be prepared by a licensed professional engineer, accountant, economist or other professional qualified in the field, but they must be submitted under a professional engineer seal as part of the permit application.

The sources and rationale for all data and assumptions must be clearly indicated. NMED will review the cost estimates for completeness, accuracy, and validity of assumptions. Where deficiencies are discovered, NMED will either request additional information or obtain the information on its own, or both. Following the review process, NMED will advise the applicant on which alternatives (or combination discharge/non-discharge alternatives) are cost-effective, and processing of a permit application will proceed on that basis. In general, an alternative or suite of alternatives is considered to be cost-effective and reasonable if it is feasible and the cost is less than 110% of the base costs of pollution control measures for the proposed discharge (present worth costs).

Other factors:

While the basic concept behind the direct comparison is the present worth method, which has traditionally been used, other approaches and factors may be proposed by applicants and will be considered by the Department (e.g., EPA's Water Quality Standards Handbook – *Interim Economic Guidance for Water Quality Standards*, EPA-823-B-95-002, 1995).

Combined approach:

Aspects of the other approaches can be integrated or combined with the direct comparison approach. For instance, in EPA's guidance document, the 1 percent of median household income user-fee criteria can be applied as a first test of cost-effectiveness, even before the direct cost comparisons are considered. Only if the user-fees exceed the screening criteria would the direct comparison of the alternative come into play.

Where appropriate, NMED may require that the submitted demonstration of cost-effectiveness include information to support both a primary screening/affordability evaluation as well as a secondary alternative-to-alternative cost comparison.

Appendix A.2
Social and Economic Importance Worksheet

Social & Economic Worksheet

Social and Economic Benefits/Costs

Does your proposed activity:

1. Create or expand employment?

   Yes _____ Describe _____

   No _____ Describe _____

   Don't Know ___

   Not Applicable Why not? _____

2. Reduce the unemployment rate?

   Yes _____ Describe _____

   No _____ Describe _____

   Don't Know ___

   Not Applicable Why not? _____

3. Increase median family income?

   Yes _____ Describe _____

   No _____ Describe _____

   Don't Know ___

   Not Applicable Why not? _____

4. Reduce the number of households below the poverty line?

   Yes _____ Describe _____

   No _____ Describe _____

   Don't Know ___

   Not Applicable Why not? _____

5. Increase needed housing supply?

   Yes _____ Describe _____

   No _____ Describe _____

   Don't Know ___

   Not Applicable Why not? _____

6. Increase the community tax base?

   Yes _____ Describe _____

   No _____ Describe _____

   Don't Know ___

   Not Applicable Why not? _____

7. Provide necessary public services (e.g., fire department, school, infrastructure)?

   Yes _____ Describe _____

   No _____ Describe _____

   Don't Know ___

   Not Applicable Why not? _____

8. Correct a public health or environmental problem?

   Yes _____ Describe _____

   No _____ Describe _____

   Don't Know ___

   Not Applicable Why not? _____

9. Improve quality of life for residents in the area?

   Yes _____ Describe _____

   No _____ Describe _____

   Don't Know ___

   Not Applicable Why not? _____

Environmental Protection Benefits/Costs

Explain how your proposed activity positively or negatively affects the following:

1. The societal and economic benefits/costs of better health protection.

   Describe _____

   _____

   Don't Know ___

   Not Applicable Why not? _____

2. Fishing, recreation, and tourism industries.

   Describe _____

   _____

   Don't Know ___

   Not Applicable Why not? _____

3. The general societal value of maintaining the quality of the environment.

   Describe _____

   _____

   Don't Know ___

   Not Applicable Why not? _____

4. Threatened and endangered species.

   Describe _____

   _____

   Don't Know ___

   Not Applicable Why not? _____

5. Increased flood control and sediment trapping through maintaining wetlands and riparian zones.

   Describe _____

   _____

   Don't Know ___

   Not Applicable Why not? _____

6. Reservation of assimilative capacity for future industry and development.

   Describe _____

   _____

   Don't Know ___

   Not Applicable Why not? _____

If you need more space to "describe" how this discharge will impact the social, economic and environmental benefits/costs above, please attach additional sheet(s) to this form.

Likewise, if additional considerations are desired or required in your social and economic justification analysis, please refer to Appendix A.3 and Appendix A.4.

Appendix A.3
Information for Substantial and Widespread Impact Analysis (OPTIONAL)

Attachment 1 – Tier 2 Review of a Public Facility

Attachment 1 includes additional information that may be required by the Department to evaluate socio-economic factors of a public facility during a Tier 2 review. This evaluation is based on two types of impacts, referred to as "substantial" and "widespread". The Substantial Impacts analysis is found in Tables 1-3 – 1-7. The Widespread Impacts[12] analysis is found in Table 1-8.

SUBSTANTIAL IMPACTS - SUMMARY

Purpose of Substantial Impacts analysis: Determine whether a public facility can afford pollution controls in order to avoid any degradation of water quality.

The first step in a Substantial Impacts analysis is to provide data on the socio-economic factors listed in the worksheets in Tables 1-1 and 1-2. This data is then used to determine two indicators called the "Municipal Affordability Screener" (Table 1-3) and the "Secondary Affordability Test" (Tables 1-4 – 1-6). The results of these indicators are then compared in the "Assessment of Substantial Impacts Matrix" (Table 1-7) as a way to determine overall affordability to the community.

Widespread Impacts[5] - Summary

Purpose of Widespread Impacts Analysis: evaluates the social costs of pollution control requirements by: 1) defining the affected community; 2) evaluating the community's current characteristics; and 3) evaluating how community characteristics would change if discharger must avoid degradation to water quality.

If the conclusion from the Substantial Impacts analysis is "Questionable Affordability" or "Community cannot afford the pollution control", then a Widespread Impacts analysis may be completed to further resolve the affordability issue. This analysis is primarily a qualitative evaluation based on community socioeconomic factors that are expanded to a larger scale than the Substantial Impacts analysis.

[5] Widespread Impact Analysis forms derived from EPA's Water Quality Standards Academy Participant Manual Update-4, 2000 [EPA 823-B-00-005].

Table 1-1. Antidegradation Data Worksheet

SOCIO-ECONOMIC INDICATORS	DATA
CITY'S DEMOGRAPHICS	
Population_____(year)	
Current Population_____(year)	
Type of household moving away from _____(city)	
Number of households	
Median Household Income (U.S. Census, Census Designated Place)	
Median Household Income (Local Planning Board Estimates, City)	
Median Household Income (U.S. Census, State)	
Median Household Income (U.S. Census, County)	
Major Type of Employment	
Regional Economic Conditions	
% of Total Wastewater Flow from Residential & Municipal Sources	
Unemployment Rate (City)	
Unemployment Rate (County)	
Unemployment Rate (State)	
CITY'S FINANCIAL HISTORY	
Property Tax Revenues (year)	
Sales Tax & Miscellaneous Revenues (year)	
Total Government Revenues_____(year)	
Property Tax Revenues (FY_____)	
Sales Tax & Miscellaneous Revenues (FY_____)	
Total Government Revenues (FY_____)	
Current Market Value of Taxable Property (FY_____)	
Property Tax Delinquency Rate	
Bond Rating - insured sewer	
Bond Rating - non insured sewer	
Overall Net Debt (FY_____)	

Table 1-2. Antidegradation Data Worksheet

SOCIO-ECONOMIC INDICATOR	DATA
Cost of Treatment Options (pollution controls) that will Avoid Degradation of Water Quality	
Capital Improvements	
OPTION 1. (year)_____dollars	
OPTION 2. (year)_____dollars	
Annual Operating Costs	
OPTION 1. (year)_____dollars	
OPTION 2. (year)_____dollars	
FINANCING FOR WASTEWATER TREATMENT OPTIONS	
OPTION 1. Source of Financing	
Repayment Term, Vehicle	
Bond Rate	
Total Annual Cost of Existing Plant	
OPTION 2. Source of Financing	
Repayment Term, Vehicle	
Bond Rate	
Total Annual Cost of Existing Plant	

Table 1-3. Substantial Impacts Analysis – Part I

PART I. CALCULATING THE MUNICIPAL AFFORDABILITY SCREENER	
This screener is used to evaluate expected impacts to households. It indicates whether community households can afford to pay the total annualized pollution control costs to avoid water quality degradation.	
A. Calculate Average Annualized Cost Per Household	
1. Calculate the Total Annual Cost of the Project	
Interest Rate for Financing (*i) =*	_____(expressed as a fraction)
Time Period for Financing (*n) =*	_____(years)
Annualization Factor: $\frac{i}{(i+1)^n - 1}(+ i) =$	_____ (1)
Total Capital Cost of Project to be Financed =	_____ (2)
Annual Operating Costs of Project =	_____ (3)
Annualized Capital Cost [(1) *x* (2)] =	_____ (4)
Total Annual Cost of Project [(3) + (4)] =	_____ (5)
2. Calculate the Total Annual Cost to Households	
Total Annual Cost of Project (5) x Percentage of Total Wastewater Flow Attributable to Residential and Municipal Wastewater Flows =	_____ (6)
Total Annual Cost of Existing Plant ($) *x* Percentage of Total Wastewater Flow Attributable to Residential and Municipal Wastewater Flows =	_____ (7)
Total Annual Cost to Households [(6) + (7)] =	_____ (8)
3. Calculate the Average Annualized Cost Per Household Total Annual Cost to Households (8) = Number of Households	_____ (9)
B. Calculate Screener Value:	
Average Annualized Cost Per Household (9) (*x 100) =* Median Household Income	_____% municipal affordability screen (10)
What type of impact does the Municipal Affordability Screener Indicate in table below?	_____ impact

Little Impact	Mid-Range Impact	Large Impact
< 1.0 %	1.0% - 2.0%	> 2.0%

Explanation of Impacts:
Little Impact – high affordability; households can afford to pay pollution control costs
Mid-Range Impact – uncertain affordability
Large Impact – low affordability; pollution control costs may cause economic hardship on households

Is there a need to proceed to the Secondary Affordability Test? (yes, if large impact or mid- range impact)	_____(yes/no)

Table 1-4. Substantial Impacts Analysis – Part II

PART II. APPLYING THE SECONDARY AFFORDABILITY TEST

A. EVALUATING THE DEBT INDICATORS

Bond Rating:
This is a Measure of the Credit Worthiness of a Community

What is Bond Rating of (name of municipality)_____?

What is the resulting score? (assign score from table below)

Source of Bond Rating	Weak	Mid-Range	Strong
S&P	below BBB	BBB	above BBB
Moody's	below Baa	Baa	above Baa
Score	1	2	3

_____score points (11)

Overall Net Debt to Market Value of Taxable Property:
This measures Debt Burden on Residents within the Community

(municipality)_____Overall Net Debt = _____ (12)

(municipality)_____Market Value of Taxable Property = _____ (13)

Overall Net Debt (12) (x 100) = _____ % (13a)
Market Value of Taxable Property (13)

What is the resulting score? (assign score from table below)

	Weak	Mid-Range	Strong
Compare % from 13a	>5%	2% - 5%	<2%
Score	1	2	3

_____score points (14)

Explanation of Ratings:
Weak = negative effect on indicator from increased costs for pollution controls
Mid-Range = uncertain effect on indicator
Strong = indicator can withstand increased costs for pollution controls

Table 1-5. Substantial Impacts Analysis – Part II

PART II. APPLYING THE SECONDARY AFFORDABILITY TEST (continued)

B. EVALUATING THE SOCIOECONOMIC INDICATORS

Unemployment Rate:
This measures the General Economic Health of the Community

What is (municipality)_____Unemployment Rate? _____

Is this above, below, or equal to the State's rate?

What is the resulting Score? (assign score from table below)

	Weak	Mid-Range	Strong
Compare unemployment rate	Above State Average	State Average	Below State Average
Score	1	2	3

_____score points (15)

Median Household Income:
This Measure Provides an Overall Indication of Community Earning Capacity

What is (municipality) Median Household Income?

Is this above, below, or equal to the State's rate?

What is the resulting Score? (assign score from table below)

	Weak	Mid-Range	Strong
Compare median income	Below State Average	State Average	Above State Average
Score	1	2	3

score points (16)

Table 1-6. Substantial Impacts Analysis – Part II

<table>
<tr><td colspan="2">PART II. APPLYING THE SECONDARY AFFORDABILITY TEST (continued)</td></tr>
<tr><td>C. EVALUATING THE FINANCIAL MANAGEMENT INDICATORS</td><td></td></tr>
<tr><td>Property Tax Revenue to Full Market Value of Taxable Property:
This Measures Funding Capacity Available to Support Debt Based on Community's Wealth</td><td></td></tr>
<tr><td>What is (municipality)_____Property Tax Revenue?</td><td>_____ (17)</td></tr>
<tr><td>What is the Full Market Value of Taxable Property?</td><td>_____ (18)</td></tr>
<tr><td>Property Tax Revenue (17) / Full Market Value of Taxable Property (18) (x 100) =</td><td>_____% (18a)</td></tr>
<tr><td>What is the resulting Score? (assign score from table below)
<table>
<tr><td></td><td>Weak</td><td>Mid-Range</td><td>Strong</td></tr>
<tr><td>Compare % from 18a</td><td><2%</td><td>2% - 4%</td><td>>4%</td></tr>
<tr><td>Score</td><td>1</td><td>2</td><td>3</td></tr>
</table></td><td>_____score points (19)</td></tr>
<tr><td>Property Tax Collection Rate:
This Measures How Well the Local Government is Administrated</td><td></td></tr>
<tr><td>What is the Property Tax Collection Rate of (municipality)</td><td>_____%</td></tr>
<tr><td>What is the resulting Score? (assign score from table below)
<table>
<tr><td></td><td>Weak</td><td>Mid-Range</td><td>Strong</td></tr>
<tr><td>Compare tax collection rate</td><td><94%</td><td>94% - 98%</td><td>>98%</td></tr>
<tr><td>Score</td><td>1</td><td>2</td><td>3</td></tr>
</table></td><td>_____score points (20)</td></tr>
<tr><td>D. CALCULATE THE CUMULATIVE SECONDARY AFFORDABILITY TEST SCORE: This is the average score of all the indicators calculated above.</td><td></td></tr>
<tr><td>(11) + (14) + (15) + (16) + (19) + (20) / 6 =</td><td>_____cumulative score (21)</td></tr>
<tr><td>In what impact range does the cumulative secondary score fall?
<table>
<tr><td></td><td>Weak</td><td>Mid-Range</td><td>Strong</td></tr>
<tr><td>Compare cumulative score from 21</td><td>< 1.5</td><td>1.5 – 2.5</td><td>> 2.5</td></tr>
</table></td><td>_____ impact range</td></tr>
</table>

Table 1-7. Substantial Impacts Analysis – Part III

<table>
<tr><td colspan="2">Part III. Assessment of Substantial Impacts Matrix</td></tr>
<tr><td>THE MUNICIPAL AFFORDABILITY SCREENER (10) =</td><td>_____%</td></tr>
<tr><td>THE CUMULATIVE SECONDARY AFFORDABILITY TEST SCORE (21) =</td><td>_____score points</td></tr>
<tr><td>Where does (municipality)_____appear in the Substantial Impacts Matrix below?

Substantial Impacts Matrix
<table>
<tr><th rowspan="2">Secondary Assessment Score</th><th colspan="3">Municipal Affordability Screener</th></tr>
<tr><th><1.0%</th><th>1.0% - 2.0%</th><th>>2.0%</th></tr>
<tr><td>< 1.5</td><td>?</td><td>X</td><td>X</td></tr>
<tr><td>1.5 – 2.5</td><td>√</td><td>?</td><td>X</td></tr>
<tr><td>> 2.5</td><td>√</td><td>√</td><td>?</td></tr>
</table>
? = Questionable affordability
√ = Community can afford the pollution control
X = Community cannot afford the pollution control</td><td></td></tr>
<tr><td>Based on the Substantial Impacts Matrix above, what is the affordability status (afford, not afford, or questionable) of the (municipality)_____?

In other words, can the project proponent afford to upgrade the facility in order to avoid water quality degradation?</td><td>_____
Matrix Result</td></tr>
<tr><td>If the conclusion from the Substantial Impacts analysis is either “Cannot Afford” or “Questionable Affordability”, then proceed to the Widespread Impacts analysis for further evaluation.</td><td>Complete Widespread Impacts Analysis?

_____(yes/no)</td></tr>
</table>

Table 1-8. Widespread Impacts Analysis – Public Facility

1. Define the Affected Community

Evaluate the Discharger's Contribution to the Community:

- Contribution to economic base (e.g., property taxes and employment)
- Provides product or service upon which other businesses or thecommunity depend

2. Evaluate Community's Current Characteristics

Evaluate how community's current socioeconomic health may change if proposed project must avoid degradation to water quality by considering the following factors:

- Median household income
- Unemployment rate
- Rate of industrial development
- Developing and declining industries
- Percent of households below poverty line
- Ability of community to carry more debt
- Local and regional factors

Other applicable information on the local and regional economy that should also be reviewed includes:

- Annual rate of population change
- Current financial surplus as a percentage of total expenditures
- Percentage of property taxes actually collected
- Property tax revenues as a percentage of the market value of real property
- Overall debt outstanding as a percentage of market value of real property
- Overall debt per capita
- Percentage of outstanding debt due within 5 years

3. Evaluate How Community Characteristics Would Change if Discharger Must Avoid Degradation to Water Quality

Evaluate the projected adverse socioeconomic impacts of adding pollution controls to the project to meet antidegradation requirements by considering the following:

- Property Values
- Employment Rate
- Commercial Development Opportunities
- Tax Revenues
- Expenditure on Social Services
- State level impacts such as loss of revenues and increased expenditures

Attachment 2 – Tier 2 Review of a Private Facility

Attachment 2 includes additional information that may be required by the Department to evaluate socio-economic factors of a private facility during a Tier 2 review. This evaluation is based on two types of impacts, referred to as "substantial" and "widespread". The Substantial Impacts analysis is found in Table 2-2. The Widespread Impacts analysis is found in Table 2-3.

SUBSTANTIAL IMPACTS - SUMMARY

Purpose of Substantial Impacts analysis: Determine whether a private facility can afford pollution controls in order to avoid any degradation of water quality.

The first step in a Substantial Impacts analysis is to provide data on the socio-economic factors listed in the worksheet in Table 1. This data is then used to calculate four financial tests that in turn indicate the financial health of a private entity (Table 2).

WIDESPREAD IMPACTS - SUMMARY

Purpose of Widespread Impacts analysis: Evaluates the social costs of pollution control requirements by: 1) defining the affected community; 2) evaluating the community's current characteristics; and 3) evaluating how community characteristics would change if discharger must avoid degradation to water quality.

If the Substantial Impacts analysis (i.e., the four financial tests) indicates that the private entity's financial health is questionable, then a Widespread Impacts analysis may be completed to further resolve the affordability issue. This analysis is primarily a qualitative evaluation based on community socioeconomic factors that are expanded to a larger scale than the Substantial Impacts analysis.

Table 2-1. Data Worksheet for Financial Factors

Financial Factor	Data
Current Assets	
Current Liabilities	
Cash flow per given year	
Total debt of the entity	
Amount firm has borrowed (debt)	
Amount of stockholders' capital (equity)	
Pre-tax earnings	
Annualized pollution control cost	

Table 2-2. Substantial Impacts Analysis - Financial Tests Used to Measure the Financial Health of a Private Entity

1. Liquidity Test - Indicates how easily an entity can pay its short-term bills. Current Ratio = Current Assets / Current Liabilities NOTE: A ratio greater that 2 indicates affordability
2. Solvency Test - Indicates how easily an entity can pay its fixed and long-term bills. Beaver's Ratio = Cash flow per given year / Total debt of the entity NOTE: > 0.20 Indicates private entity is solvent < 0.15 Indicates private entity may go bankrupt
3. Leverage Test - Indicates how much money the entity can borrow. Debt-to-Equity Ratio = Amount firm has borrowed (debt) / Amount of Stockholders' capital (equity) NOTE: The larger the Debt-to-Equity Ratio, the less likely that the entity will be able to borrow funds
4. Earnings Test - Indicates how much the entity's profitability will change with the additional pollution control needed to avoid degradation of water quality. Earnings = Pre-tax – Annualized Pollution Control Cost NOTE: Compare earnings result with entity's revenues to measure post-compliance profit rate
Guidelines to evaluate financial tests: ○ Results of all four tests above should be considered jointly ○ Ratios and tests should be compared over several years ○ Financial ratios should also be compared against those of "healthy" entities ○ The role the entity plays in a parent firm's operations should also beconsidered

Table 2-3. Widespread Impacts Analysis – Private entity/facility

1. Define the Affected Community

Evaluate the Discharger's Contribution to the Community:

- Contribution to economic base (e.g., property taxes and employment)
- Provides product or service upon which other businesses or the community depend

2. Evaluate Community's Current Characteristics

Evaluate how community's current socioeconomic health would change if proposed project must avoid degradation to water quality by considering the following factors:

- Median household income
- Unemployment rate
- Rate of industrial development
- Developing and declining industries
- Percent of households below poverty line
- Ability of community to carry more debt
- Local and regional factors

Other applicable information on the local and regional economy that should also be reviewed includes:

- Annual rate of population change
- Current financial surplus as a percentage of total expenditures
- Percentage of property taxes actually collected
- Property tax revenues as a percentage of the market value of real property
- Overall debt outstanding as a percentage of market value of real property
- Overall debt per capita
- Percentage of outstanding debt due within 5 years

3. Evaluate How Community Characteristics Would Change if Discharger Must Avoid Degradation to Water Quality

Evaluate the projected adverse socioeconomic impacts of adding the pollution control to the project to meet antidegradation requirements by considering the following:

- Property Values
- Employment Rate
- Commercial Development Opportunities
- Tax Revenues
- Expenditure on Social Services
- State level impacts such as loss of revenues and increased expenditures

Appendix A.4
Summary of Other Economic and Environmental Impact Categories

1. **Public Need/Social Service**
   - Health/Nursing Care
   - Police/Fire Protection
   - Infrastructure Need
   - Education (primary)

2. **Consistency with Local Zoning and Planning**
   - Sewage Facility Planning
   - Zoning Requirements
   - Land Use Plans
   - Patterns of Growth/Development

3. **Quality of Life**
   - Educational (post-secondary)
   - Cultural
   - Recreational

4. **Housing**
   - Quantity
   - Affordability

5. **Employment**
   - Number and Type of Jobs Relative to Local Unemployment Rate and Local Labor Force
   - State Local Mean Qualified Income

6. **Tax Revenues**
   - Tax Revenue Income for Relative to Increased Private Demand for Services
   - Public and Private Change in Property Value or Tax Status

7. **Development Potential**
   - Potential to Spur Increased Growth

8. **Sensitivity of Water Use**
   - Presence of Threatened and Endangered Species
   - Public Water Supply Use
   - Water Contact Sports

9. **Nature of Pollutants**
   - Synthetic
   - Bioaccumulative
   - Naturally Occurring

10. **Proposed Degree of Change in Water Quality**
    - Available Dilution
    - Amount of Assimilative Capacity Used

11. Proximity to Wetlands or Floodplain

Presence of Wetlands
Location with Respect to Stream Channel

12. Duration of Discharge

Permanent
Continuous
Short-term

13. Reliability of Treatment Technology

High Tech/Experimental
Energy Intensive
Maintenance Intensive
Natural System
Overall Reliability

14. Compliance Record

Current Violations
Historical Violations
Overall Record

15. Secondary Beneficial Impacts

Groundwater Recharge
Post-Construction Storm Water
Hydromodifications
Thermal Modification
Construction on Previously Undisturbed Lands
Discharge to Previously Undegraded Waters

Appendix A.5
List of Agencies Involved in Intergovernmental Coordination

Interagency Coordination for Antidegradation Review

In accordance with 20.6.2.2001 NMAC, and to the extent practicable, the Department will provide joint public notice with the EPA that the Department is reviewing a draft NPDES permit (which contains the antidegradation review) for the purpose of preparing a state certification or denial pursuant to Section 401 of the CWA. When joint notice is impractical, the Department provides notice that it is reviewing a draft NPDES permit for purpose of preparing a state certification or denial pursuant to Section 401 of the CWA by mailing or emailing the notice, as appropriate, to:

- the NPDES permit applicant or permittee;
- any user identified in the permit application of a privately-owned treatment works;
- any affected federal agency, such as EPA Region 6, the U.S. Fish & Wildlife Service and affected federal public land managers (i.e., U.S. Forest Service, BLM, and National Park Service);
- any affected state agency, such as the NM Office of the State Engineer, New Mexico Game & Fish Department, NM State Land Office, and New Mexico State Parks - EMNRD;
- any affected tribal agency;
- any affected local agency, including each applicable county department of health, environmental services or comparable department;
- any affected Council of Government (COG);
- any federal and state agencies with jurisdiction over fish, shellfish, and wildlife resources;
- the New Mexico Historic Preservation Office;
- the U.S. Army Corps of Engineers; and,
- any person who requests public notice in writing.

Appendix A.6
Antidegradation Policy and Implementation Plan (20.6.4.8 NMAC)

20.6.4.8 ANTIDEGRADATION POLICY AND IMPLEMENTATION PLAN:

A. Antidegradation Policy: This antidegradation policy applies to all surface waters of the state.

(1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state.

(2) Where the quality of a surface water of the state exceeds levels necessary to support the propagation of fish, shellfish, and wildlife, and recreation in and on the water, that quality shall be maintained and protected unless the commission finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic and social development in the area in which the water is located. In allowing such degradation or lower water quality, the state shall assure water quality adequate to protect existing uses fully. Further, the state shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable BMPs for nonpoint source control. Additionally, the state shall encourage the use of watershed planning as a further means to protect surface waters of the state.

(3) No degradation shall be allowed in waters designated by the commission as outstanding national resource waters (ONRWs), except as provided in Subparagraphs (a) through (e) of this paragraph and in Paragraph (4) of this Subsection A.

(a) After providing a minimum 30-day public review and comment period, the commission determines that allowing temporary and short-term degradation of water quality is necessary to accommodate public health or safety activities in the area in which the ONRW is located. Examples of public health or safety activities include but are not limited to replacement or repair of a water or sewer pipeline or a roadway bridge. In making its decision, the commission shall consider whether the activity will interfere with activities implemented to restore or maintain the chemical, physical or biological integrity of the water. In approving the activity, the commission shall require that:

(i) the degradation shall be limited to the shortest possible time and shall not exceed six months;

(ii) the degradation shall be minimized and controlled by best management practices or in accordance with permit requirements as appropriate; all practical means of minimizing the duration, magnitude, frequency and cumulative effects of such degradation shall be utilized;

(iii) the degradation shall not result in water quality lower than necessary to protect any existing use in the ONRW; and

(iv) the degradation shall not alter the essential character or special use that makes the water an ORNW.

(b) Prior to the commission making a determination, the department or appropriate oversight agency shall provide a written recommendation to the commission. If the commission approves the activity, the department or appropriate oversight agency shall oversee implementation of the activity.

(c) Where an emergency response action that may result in temporary and short-term degradation to an ONRW is necessary to mitigate an immediate threat to public health or safety, the emergency response action may proceed prior to providing notification required by Subparagraph (a) of this paragraph in accordance with the following:

(i) only actions that mitigate an immediate threat to public health or safety may be undertaken pursuant to this provision; non-emergency portions of the action shall comply with the requirements of Subparagraph (a) of this paragraph;

(ii) the discharger shall make best efforts to comply with requirements (i) through (iv) of Subparagraph (a) of this paragraph;

(iii) the discharger shall notify the department of the emergency response action in writing within seven days of initiation of the action;

(iv) within 30 days of initiation of the emergency response action, the discharger shall provide a summary of the action taken, including all actions taken to comply with requirements (i) through (iv) of Subparagraph (a) of this paragraph.

(d) Preexisting land-use activities, including grazing, allowed by federal or state law prior to designation as an ONRW, and controlled by best management practices (BMPs), shall be allowed to continue so long as there are no new or increased discharges resulting from the activity after designation of the ONRW.

(e) Acequia operation, maintenance, and repairs are not subject to new requirements because of ONRW designation. However, the use of BMPs to minimize or eliminate the introduction of pollutants into receiving waters is strongly encouraged.

(4) This antidegradation policy does not prohibit activities that may result in degradation in surface waters of the state when such activities will result in restoration or maintenance of the chemical, physical or biological integrity of the water.

(a) For ONRWs, the department or appropriate oversight agency shall review on a case-by-case basis discharges that may result in degradation from restoration or maintenance activities, and may approve such activities in accordance with the following:

(i) the degradation shall be limited to the shortest possible time;

(ii) the degradation shall be minimized and controlled by best management practices or in accordance with permit requirements as appropriate, and all practical means of minimizing the duration, magnitude, frequency and cumulative effects of such degradation shall be utilized;

(iii) the degradation shall not result in water quality lower than necessary to protect any existing use of the surface water; and

(iv) the degradation shall not alter the essential character or special use that makes the water an ORNW.

(b) For surface waters of the state other than ONRWs, the department shall review on a case-by-case basis discharges that may result in degradation from restoration or maintenance activities, and may approve such activities in accordance with the following:

(i) the degradation shall be limited to the shortest possible time;

(ii) the degradation shall be minimized and controlled by best management practices or in accordance with permit requirements as appropriate, and all practical means of minimizing the duration, magnitude, frequency and cumulative effects of such degradation shall be utilized; and

(iii) the degradation shall not result in water quality lower than necessary to protect any existing use of the surface water.

(5) In those cases where potential water quality impairment associated with a thermal discharge is involved, this antidegradation policy and implementing method shall be consistent with Section 316 of the federal Clean Water Act.

(6) In implementing this section, the commission through the appropriate regional offices of the United States environmental protection agency will keep the administrator

advised and provided with such information concerning the surface waters of the state as he or she will need to discharge his or her responsibilities under the federal Clean Water Act.

B. Implementation Plan: The department, acting under authority delegated by the commission, implements the water quality standards, including the antidegradation policy, by describing specific methods and procedures in the continuing planning process and by establishing and maintaining controls on the discharge of pollutants to surface waters of the state. The steps summarized in the following paragraphs, which may not all be applicable in every water pollution control action, list the implementation activities of the department. These implementation activities are supplemented by detailed antidegradation review procedures developed under the state's continuing planning process. The department:

(1) obtains information pertinent to the impact of the effluent on the receiving water and advises the prospective discharger of requirements for obtaining a permit to discharge;

(2) reviews the adequacy of existing data and conducts a water quality survey of the receiving water in accordance with an annually reviewed, ranked priority list of surface waters of the state requiring total maximum daily loads pursuant to Section 303(d) of the federal Clean Water Act;

(3) assesses the probable impact of the effluent on the receiving water relative to its attainable or designated uses and numeric and narrative criteria;

(4) requires the highest and best degree of wastewater treatment practicable and commensurate with protecting and maintaining the designated uses and existing water quality of surface waters of the state;

(5) develops water quality based effluent limitations and comments on technology based effluent limitations, as appropriate, for inclusion in any federal permit issued to a discharger pursuant to Section 402 of the federal Clean Water Act;

(6) requires that these effluent limitations be included in any such permit as a condition for state certification pursuant to Section 401 of the federal Clean Water Act;

(7) coordinates its water pollution control activities with other constituent agencies of the commission, and with local, state and federal agencies, as appropriate;

(8) develops and pursues inspection and enforcement programs to ensure that dischargers comply with state regulations and standards, and complements EPA's enforcement of federal permits;

(9) ensures that the provisions for public participation required by the New Mexico Water Quality Act and the federal Clean Water Act are followed;

(10) provides continuing technical training for wastewater treatment facility operators through the utility operators training and certification programs;

(11) provides funds to assist the construction of publicly owned wastewater treatment facilities through the wastewater construction program authorized by Section 601 of the federal Clean Water Act, and through funds appropriated by the New Mexico legislature;

(12) conducts water quality surveillance of the surface waters of the state to assess the effectiveness of water pollution controls, determines whether water quality standards are being attained, and proposes amendments to improve water quality standards;

(13) encourages, in conjunction with other state agencies, implementation of the best management practices set forth in the New Mexico statewide water quality management plan and the nonpoint source management program, such implementation shall not be mandatory except as provided by federal or state law;

(14) evaluates the effectiveness of BMPs selected to prevent, reduce or abate sources of water pollutants;

(15) develops procedures for assessing use attainment as required by 20.6.4.15 NMAC and establishing site-specific standards; and

(**16)** develops list of surface waters of the state not attaining designated uses, pursuant to Sections 305(b) and 303(d) of the federal Clean Water Act.

[20.6.4.8 NMAC - Rp 20 NMAC 6.1.1101, 10-12-00; A, 05-23-05; A, 08-01-07; A, 01-14-11]

STATE OF NEW MEXICO
WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF PETITION TO
NOMINATE SURFACE WATERS
DESIGNATED AS SPECIAL TROUT WATERS, OR
WILD AND SCENIC RIVERS, OR LOCATED WITHIN
A WILDERNESS, PARK, MONUMENT OR REFUGE
AS OUTSTANDING NATIONAL RESOURCE WATERS, WQCC 24-46 (R)

NEW MEXICO ENVIRONMENT DEPARTMENT,

PETITIONER.

2024 ONRW Designation Nominations

Table of Contents

List of Tables

List of Figures – Appendix A

ACRONYMS:

BLM	Bureau of Land Management
BMPs	Best Management Practices
BNM	Bandelier National Monument
CCSP	Cimarron Canyon State Park
CHW	Columbine-Hondo Wilderness
CWA	Clean Water Act
EPA	United States Environmental Protection Agency
ESWMA	Edward Sargeant Wildlife Management Area
HUC	hydrologic unit code
IR	CWA §303(d)/ §305(b) Integrated Report
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMDGF	New Mexico Department of Game and Fish
NMSA	New Mexico Statutes Annotated
ONRW	Outstanding National Resource Water
PNHP	Pecos National Historical Park
RC W&S	Rio Chama Wild and Scenic
RGdN NM	Rio Grande Del Norte National Monument
RR W&S	Red River Wild and Scenic
SA WSA	San Antonio Wilderness Study Area
STW	NMDGF Special Trout Water
SWQB	Surface Water Quality Bureau
USFS	United States Forest Service
USGS	United States Geological Survey
VCNP	Valles Caldera National Preserve
WQA	New Mexico Water Quality Act
WQCC	New Mexico Water Quality Control Commission
WQS	Water Quality Standards
WWTP	Wastewater Treatment Plant

I. Introduction

In 2021, Governor Michelle Lujan Grisham issued Executive Order 2021-052 – *Protecting New Mexico's Lands, Watersheds, Wildlife, and Natural Heritage*, setting a goal to conserve "at least 30 percent (30%) of all lands in New Mexico" by the year 2030. The executive order also directed the natural resource state agencies, including the New Mexico Environment Department (NMED), to form the 30 by 30 Committee to "utilize its existing authorities, funding, and programs…to support and implement programs designed to conserve, protect, and enhance…natural environments across the State" to further the conservation goal. Furthermore, the 30 by 30 Committee is charged with ensuring that their department's collective efforts "Prevent degradation of surface and ground water quality across watersheds…and ensure resilient local economies…based on agriculture, fishing and outdoor recreation".

An Outstanding National Resource Water (ONRW) is a stream, lake, or wetland that receives special protection against future degradation under New Mexico's *Standards for Interstate and Intrastate Surface Waters* (Surface Water Quality Standards or WQS), codified at 20.6.4 New Mexico Administrative Code (NMAC). This designation affords the highest protection of water quality under the State's antidegradation policy and mirrors the protections established under federal regulations at 40 C.F.R. § 131 and the federal Clean Water Act (CWA). It is important to note that an ONRW designation does not prevent or preclude discharges or anthropogenic activities from occurring, but activities such as these require validation so that they will not cause water quality degradation of the ONRW. Although most types of degradation of water quality is not permitted in ONRWs, certain activities are allowed including:

- temporary, short-term activities to maintain public health or safety,
- existing land use activities,
- acequia operation, maintenance, and repair; and
- watershed restoration activities.

The Water Quality Control Commission (Commission or WQCC) is authorized under the New Mexico Water Quality Act (WQA) (NMSA 1978, § 74-6-4(D)) to adopt and amend WQS for surface waters of the State "based on credible scientific data and other evidence". Additionally, the adoption of amendments to the State's WQS must comply with the other requirements of the WQA (NMSA 1978, § 74-6-6), the State Rules Act (NMSA 1978 §§ 14-4-1 to -11), the Small Business Regulatory Relief Act (NMSA 1978 §§ 14-4A-1 to -6) and the Commission's Rulemaking Procedures (20.1.6 NMAC).

In accordance with 20.6.4.9 NMAC, any person may nominate a surface water of the state as an ONRW by filing a petition with the Commission in accordance with the requirements in 20.6.4.9(A) NMAC, 20.1.6.200 NMAC, and other applicable statutes, regulations, or procedures. Pursuant to 20.6.4.9(B) and (C) NMAC, a surface water of the state may be designated and classified as an ONRW where the Commission determines it will benefit the state of New Mexico and it meets at least one of the eligibility criteria listed in 20.6.4.9(B)(1)-(3) NMAC.

The Commission codified requirements for ONRW nomination and designation during the 2005 Triennial Review (May 2005). The Commission also designated its first river segment as an ONRW (Rio Santa Barbara) at that time (WQCC Docket 03-05(R)). Since then, the Commission has designated waters as ONRWs through the public hearing and rulemaking process four additional times. Most recently, the

Commission adopted waters in the Upper Rio Grande (WQCC Docket 21-51(R)) and Upper Pecos Rivers (WQCC Docket 21-62(R)). Third parties developed and presented these petitions to the Commission. NMED Surface Water Quality Bureau (SWQB) staff worked with these parties to ensure the rulemaking process was adhered to and provided testimony during their proceedings. Additionally, SWQB agreed to continue working with third parties to identify and nominate additional ONRWs eligible for nomination under 20.6.4.9(B)(1). This petition and list of nominated waters is the result of that collaborative effort.

New Mexico's water resources continue to face stressors that contribute to limited and decreasing water supplies. Water plays a key role in ecosystem function and process and maintaining adequate water quality and flow are essential to maintaining habitat, wildlife, and fish species, which in turn are sources of many economic, cultural and spiritual values. Water is consistently recognized across communities in New Mexico as a critically important resource worth protecting.

II. Procedures for Nominating an ONRW - 20.6.4.9(A)(1) – (6) NMAC

SWQB will file a Petition for Rulemaking Hearing (Petition) with the Commission to nominate specific surface waters of the state for designation as ONRWs. These waters meet the criteria listed in 20.6.4.9(B)(1) NMAC and the ONRW designation will protect them from degradation for the immediate and future benefit of the local community, and the State. As required by 20.1.6.200(B) NMAC, SWQB will submit a copy of this nomination, which includes the proposed language amendments to 20.6.4.9(D) NMAC in Appendix C, as well as the full 20.6.4 NMAC with proposed amendments to the Commission as an attachment to the Petition.

This nomination and its appendices provide the information, data, and evidence to demonstrate to the Commission that the nominated waters meet the requirements and criteria to support an ONRW designation as described below.

Paragraphs 1 through 6 of 20.6.4.9(A) NMAC set forth the requirements and procedures for nominating ONRWs. The procedures allow any person to nominate a surface water of the state for designation as an ONRW by filing a petition with the Commission pursuant to their regulations for rulemaking at 20.1.6 NMAC. A petition to designate a surface water of the state as an ONRW shall include:

1. a map of the surface water of the state, including the location and proposed upstream and downstream boundaries (Appendix A),
2. a written statement and evidence based on scientific principles in support of the nomination, including specific reference to one or more of the applicable ONRW criteria listed in Subsection B of 20.6.4.9 NMAC,
3. water quality data including chemical, physical or biological parameters, if available, to establish a baseline condition for the proposed ONRW (Appendix B1 – B4),
4. a discussion of activities that might contribute to the reduction of water quality in the proposed ONRW,
5. any additional evidence to substantiate such a designation, including a discussion of the economic impact of the designation on the local and regional economy within the state of New Mexico and the benefit to the state, and
6. an affidavit of publication of notice of the petition in a newspaper of general circulation in the affected counties and in a newspaper of general statewide circulation (Appendix D).

SWQB addressed and satisfied all procedures prescribed by 20.6.4.9 NMAC and 20.1.6 NMAC for petitioning the Commission for Rulemaking and nominating surface waters for designation as ONRWs as demonstrated in the following sections.

III. SWQB Nomination of ONRWs

A. 20.6.4.9(A)(1) NMAC - Maps of Surface Water Nomination

Table 1 lists the nominated stream reaches and their associated estimated mileage, upstream and downstream boundary descriptions, the United States Geological Service (USGS) 8-Digit Hydrological Unit Code (HUC) Name, 20.6.4.9(B)(1) NMAC nominating criteria, and an Appendix A map figure reference number. A petition to nominate an ONRW must include a map of the surface water of the state, including the location and proposed upstream and downstream boundaries according to 20.6.4.9(A)(1) NMAC. As indicated, Appendix A contains the maps of the nominated surface waters from Table 1.

SWQB developed an associated "Public Comment Draft - Select Statewide 20.6.4.9.B(1) NMAC Streams (2024)" geographic information system (GIS) layer for NMED SWQB OpenEnviroMap[1]. SWQB created representative lines depicting the nominated streams utilizing several GIS layers including but not limited to (data source in parentheses):

- National Park Service – Boundaries (U.S. National Park Service)
- National Hydrography Dataset (U.S. Geological Survey)
- National Landscape Conservation System Wilderness Areas (U.S. Bureau of Land Management)
- New Mexico Surface Land Ownership (U.S. Bureau of Land Management)
- Special Trout Waters – Streams (New Mexico Department of Game and Fish)
- United States Forest Service – Boundaries (U.S. Forest Service)
- Wild & Scenic Rivers (U.S. Forest Service)

Table 1. Nominated Water Bodies

Water Body	Stream Miles	Downstream Boundary	Upstream Boundary	USGS 8-Digit HUC	Nominating Criteria	Appendix A Map Figure
Rio Chamita (ESWMA)	8.47	ESWMA boundary	Colorado border	Rio Chama	STW	1
Sixto Creek (ESWMA)	0.97	Rio Chamita confluence	Colorado border	Rio Chama	STW	1
Rio Chama (ESWMA)	3.31	ESWMA boundary	Wolf Creek confluence	Rio Chama	STW	1
Nabor Creek (ESWMA)	3.37	Rio Chamita confluence	Colorado border	Rio Chama	STW	1
Rio Chama	3.37	Heron Reservoir outlet	Cottonwood Flats	Rio Chama	STW	2

[1]Available at https://gis.web.env.nm.gov/oem/?map=swqb.

Water Body	Stream Miles	Downstream Boundary	Upstream Boundary	USGS 8-Digit HUC	Nominating Criteria	Appendix A Map Figure
Rio Chama (W&S)*	11.64	USFS Wilderness Streams – Rio Chama ONRW	Rio Nutrias confluence	Rio Chama	RC W&S	3
Rio Chama (W&S)*	11.99	USFS boundary	USFS Wilderness Streams – Rio Chama ONRW	Rio Chama	RC W&S	3
Rio de Los Pinos	2.53	USFS road 87A	2.5 miles upstream to private land	Conejos	STW	4
Rio San Antonio	8.59	Downstream SA WSA boundary	Upstream SA WSA boundary	Conejos	RGdN NM, SA WSA	4
Tanques Creek	2.77	Rio Nutrias confluence	headwaters	Conejos	STW	5
Canada Tio Grande	4.89	Rio Pinos confluence	headwaters	Conejos	STW	5
Cabresto Creek	16.21	USFS boundary	headwaters	Upper Rio Grande	STW	6
Red River (W&S)	4.00	Rio Grande confluence	4 miles upstream	Upper Rio Grande	RR W&S	7
Columbine Creek	5.31	Red River confluence	headwaters	Upper Rio Grande	CHW, STW	8
Deer Creek	3.28	Columbine Creek confluence	headwaters	Upper Rio Grande	CHW, STW	8
Placer Fork	4.08	Columbine Creek confluence	headwaters	Upper Rio Grande	CHW, STW	8
Willow Fork	2.61	Placer Fork confluence	headwaters	Upper Rio Grande	CHW	8
Goose Creek	5.34	Red River confluence	headwaters	Upper Rio Grande	CHW	8
Bear Canyon	2.76	Red River confluence	headwaters	Upper Rio Grande	CHW	8
Long Canyon	2.54	Rio Hondo confluence	headwaters	Upper Rio Grande	CHW	8
Gavilan Canyon	2.29	Rio Hondo confluence	headwaters	Upper Rio Grande	CHW, STW	8
Italianos Creek	3.12	Rio Hondo confluence	headwaters	Upper Rio Grande	CHW, STW	8
Manzanita Creek	3.36	Rio Hondo confluence	headwaters	Upper Rio Grande	CHW	8
Yerba Creek	3.15	Rio Hondo confluence	headwaters	Upper Rio Grande	CHW, STW	8
Lama Canyon	1.70	CHW boundary	headwaters	Upper Rio Grande	CHW	8
San Cristobal Creek	4.94	CHW boundary	headwaters	Upper Rio Grande	CHW	8
Lobo Creek	3.55	CHW boundary	headwaters	Upper Rio Grande	CHW	8

Water Body	Stream Miles	Downstream Boundary	Upstream Boundary	USGS 8-Digit HUC	Nominating Criteria	Appendix A Map Figure
Gallina Creek	1.32	CHW boundary	headwaters	Upper Rio Grande	CHW	8
Frijoles Creek	3.72	Rito de la Olla confluence	headwaters	Upper Rio Grande	STW	9
Palociento Creek	2.80	Rito de la Olla confluence	headwaters	Upper Rio Grande	STW	9
West Fork Luna Creek	2.98	Luna Creek	headwaters	Upper Rio Grande	STW	9
Cimarron River	8.48	Tolby Creek confluence	CCSP boundary	Cimarron	CCSP, STW	10
Pecos River	2.95	PNHP boundary	PNHP boundary	Pecos Headwaters	PNHP	11
Rito de los Indios	4.56	San Antonio Creek confluence	headwaters	Jemez	VCNP, STW	12
La Jara Creek	5.70	East Fork Jemez confluence	headwaters	Jemez	VCNP	12
Sulphur Creek	5.65	VCNP boundary	headwaters	Jemez	VCNP	12
San Luis Creek	5.75	San Antonio Creek confluence	headwaters	Jemez	VCNP	12
Jaramillo Creek	12.02	East Fork Jemez confluence	headwaters	Jemez	VCNP, STW	12
Rio Cebolla	12.26	Calaveras Creek confluence	headwaters	Jemez	STW	12
Rio Guadalupe	6.30	Deer Creek confluence	Stable Creek confluence	Jemez	STW	13
Rito de los Frijoles	14.35	Rio Grande confluence	headwaters	Rio Grande-Santa Fe	BNM	14
Alamo Canyon	15.15	Rio Grande confluence	headwaters	Rio Grande-Santa Fe	BNM	14
Capulin Creek**	7.20	Downstream BNM boundary	Dome Wilderness	Rio Grande-Santa Fe	BNM, STW	14
Capulin Creek**	3.45	Dome Wilderness	headwaters	Rio Grande-Santa Fe	STW	14
Medio Creek**	3.10	Downstream BNM boundary	Dome Wilderness	Rio Grande-Santa Fe	BNM	14
Lummis Canyon	8.62	Alamo Canyon confluence	headwaters	Rio Grande-Santa Fe	BNM	14

NOTES and ACRONYM:

* Existing ONRW stream reaches in Chama River Canyon Wilderness 20.6.4.9(D)(3)(a)(iii)

** Existing ONRW stream reaches in Dome Wilderness 20.6.4.9(D)(3)(a)(v)

BNM	Bandelier National Monument
CCSP	Cimarron Canyon State Park
CHW	Columbine-Hondo Wilderness
ESWMA	Edward Sargent Wildlife Management Area
PNHP	Pecos National Historical Park

RC W&S	Rio Chama Wild and Scenic
RGdN NM	Rio Grande Del Norte National Monument
RR W&S	Red River Wild and Scenic
SA WSA	San Antonio Wilderness Study Area
STW	NMDGF Special Trout Water
VCNP	Valles Caldera National Preserve

B. 20.6.4.9(A)(2) NMAC - Statement and Evidence in Support of the Nomination

A petition to nominate an ONRW must include a written statement and evidence based on scientific principles in support of the nomination, including specific reference to one or more of the applicable ONRW criteria listed in 20.4.6.9(B) NMAC. All nominated stream reaches in this Petition fall under the criteria in 20.6.4.9(B)(1) NMAC which states:

> *the water is a significant attribute of a state special trout water, national or state park, national or state monument, national or state wildlife refuge or designated wilderness area, or is part of a designated wild river under the federal Wild and Scenic Rivers Act.*

The specific criterion in 20.6.4.9.B(1) NMAC for each nominated stream reach is included in Table 1. Some nominated stream reaches fall under more than one criterion, highlighting their importance to the ecosystem in maintaining habitat for plants and wildlife while providing attractive outdoor recreational opportunities. For some nominated stream reaches, like special trout waters (STW) or Wild and Scenic Rivers (W&S), the waters are an integral part of its existing designation and uses. For parks, monuments, refuges and wilderness areas, the nominated waters play a significant role in maintaining the health of the surrounding ecosystems and living organisms and create or enhance recreational opportunities and experiences in surrounding areas. As noted previously and displayed in the maps provided in Appendix A, many of the nominated waters are near previously designated ONRWs and share many of the same ecological characteristics that support native flora and fauna and recreational opportunities that benefit local economies, outdoor enthusiasts, and other visitors. ONRW designation will complement and enhance the management goals of the existing land or water designations and benefit protection, conservation, or restoration efforts in and downstream of the nominated waters.

Of the currently nominated water bodies, 28 of 46, or nearly 60%, are designated as STW (25) or W&S rivers (3). STW designations enhance unique fishing opportunities and promote native trout conservation. STWs are managed by the NMDGF with different goals in mind including to produce trophy sized trout, improve conservation of native trout, or to enhance the overall trout population structure and density. Fishing regulations are tailored to the water body and include modified bag limits, catch-and-release for native species like Rio Grande cutthroat trout, and restricted tackle. It is also illegal to disturb rocks, plants, or sediment to attract fish increasing the protection of the physical habitat[2].

Similarly, Wild and Scenic Rivers possess “outstandingly remarkable” characteristics including unique scenic, recreational, geologic, fish and wildlife, historic, cultural,” or other similar values. While the two designations share similar, mutually reinforcing criteria, ONRW designation would complement and strengthen water quality protections for W&S rivers. The federal Wild and Scenic Rivers Act does not provide water quality-based protections such as designated uses, water quality criteria, or antidegradation requirements. However, the State affords surface waters designated as ONRWs the

[2] Available at https://www.wildlife.state.nm.us/fishing/game-fish/cold-water-regulations-2/.

highest level of water quality-based protection under the New Mexico's Antidegradation Policy and Implementation Plan in 20.6.4.8 NMAC and are classified as Tier III waters in the State's Water Quality Management Plan and Continuing Planning Policy (WQMP-CPP).

Streams and lakes in wilderness areas, refugees, preserves and parks play a significant role in supporting wildlife habitat and living organisms, as well as providing ample recreation opportunities for visitors. They also provide scenic, scientific and historic value especially in an arid state like New Mexico. For wilderness areas, these values have specifically been recognized during the designation process for protection of the lands and watersheds.

As outlined above, each of the nominated stream segments meet the criteria in 20.6.4.9(B)(1) NMAC. Therefore, ONRW designation would benefit the state of New Mexico because enhanced water quality protection will help maintain and support:

1. a clean water supply for present and future generations of New Mexicans,
2. healthy, functioning ecosystems, preserve habitat, and support biodiversity,
3. the recreational benefits in these areas, and
4. the designated uses of the waters under in 20.6.4 NMAC.

C. 20.6.4.9(A)(3) NMAC - Water Quality Data

A petition must include water quality data, including chemical, physical, or biological parameters, *if available* (emphasis added), to establish baseline conditions for the proposed water bodies.

SWQB monitors water quality around the State to generate the primary source of surface water quality data statewide. The core mission of SWQB's Monitoring Program is the collection of relevant water quality data in New Mexico's surface waters utilizing scientific methods to determine whether surface waters are meeting their designated uses codified in the WQS at 20.6.4 NMAC. SWQB uploads data to the U.S. Environmental Protection Agency's (EPA) Water Quality Exchange for public download via the Water Quality Portal[3]. SWQB Monitoring Assessment and Standards Section fulfills surface water quality monitoring needs to the extent possible given available resources, NMED priorities, and strategic goals.

Monitoring staff develop and implement field sampling plans to ensure all necessary chemical, biological, and physical data needed to determine attainment of New Mexico's water quality standards are collected during water quality surveys. SWQB utilizes a rotational watershed monitoring approach. Monitoring focuses primarily on physical, chemical, and biological conditions in perennial waters, and includes sampling for pollutants that have numeric or narrative water quality criteria in New Mexico. Available SWQB-collected water quality data, including chemical data (i.e., nutrients, heavy metals, total dissolved solids, total suspended solids, and E. coli); field data (i.e., dissolved oxygen, flow, specific conductance, temperature, and pH); benthic macroinvertebrate data; long-term temperature and dissolved oxygen deployment data; and geomorphology habitat data (e.g., wetted bank width, substrate size classes, pool depth, etc.) are provided in Appendix B1 – B4.

SWQB compares collated water quality data to current water quality standards using consistent, documented processes. New Mexico's listing methodology is described in the Comprehensive

[3] Available at: https://www.epa.gov/waterdata/water-quality-data.

Assessment and Listing Methodology (CALM)[4]. This document explains how SWQB evaluates surface water quality data and other information within defined assessment units (AUs) to determine whether surface water quality standards are being met. AUs can represent a single lake or reservoir, length of a stream reach or river, or surface waters within a delineated area such as a watershed. SWQB generally defines AUs through various factors such as hydrologic or watershed boundaries, WQS found in 20.6.4 NMAC, geology, topography, incoming tributaries, surrounding land use/land management, etc. AUs are intended to represent surface waters with assumed homogenous water quality. Some of the nominated stream reaches in this demonstration are portions of an AU while the majority are the entire AU. The CWA requires SWQB to identify impaired waterbodies and provide a report on water conditions to the public and EPA every two years. This report is commonly referred to as the CWA 303(d) / 305(b) Integrated Report (IR)[5]. A summary of current water quality standards attainment based on the 2024-2026 IR is provided in Table 2. Many of the proposed stream reaches are meeting all monitored water quality standards for their designated uses.

Table 2. Summary of Water Quality Condition

Water Body*	Associated AU	NMAC Reference	Condition - IR Category**	Cause(s) of Water Quality Impairment
Rio Chamita (ESWMA)	Rio Chamita (Rio Chama to CO border)	20.6.4.119	Impaired - 4A	Total Ammonia, E. coli, Nutrients, Temperature
Sixto Creek (ESWMA)	Sixto Creek (Rio Chamita to CO border)	20.6.4.119	Impaired - 4A	Temperature
Rio Chama (ESWMA)	Rio Chama (Little Willow Creek to CO border)	20.6.4.119	Impaired - 4A	Temperature
Nabor Creek (ESWMA)	Nabor Creek (Rio Chamita to CO border)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Rio Chama	Rio Chama (El Vado Reservoir to Rito de Tierra Amarilla)	20.6.4.119	Impaired - 4A	E. coli, Nutrients, Temperature
Rio Chama (W&S)	Rio Chama (Abiquiu Reservoir to El Vado Reservoir)	20.6.4.118	Not Impaired - 1	None
Rio Chama (W&S)	Rio Chama (Abiquiu Reservoir to El Vado Reservoir)	20.6.4.118	Not Impaired - 1	None
Rio de Los Pinos	Rio de los Pinos (New Mexico reaches)	20.6.4.123	Impaired - 5/5A	Total Recoverable Aluminum, Temperature
Rio San Antonio	Rio San Antonio (CO border to Montoya Canyon)	20.6.4.123	Impaired - 5/5A	Total Recoverable Aluminum, Dissolved Oxygen, Temperature
Tanques Creek	Tanques Creek (Rio Nutritas to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Canada Tio Grande	Canada Tio Grande (Rio San Antonio to headwaters)	20.6.4.123	Impaired - 5/5A	Dissolved Oxygen, E. coli, Temperature
Cabresto Creek	Cabresto Creek (Red River to headwaters)	20.6.4.123	Impaired - 5/5A	Dissolved Oxygen
Red River (W&S)	Red River (Rio Grande to Placer Creek)	20.6.4.122	Impaired - 5/5A	Turbidity
Columbine Creek	Columbine Creek (Red River to headwaters)	20.6.4.123	Not Impaired - 1	None

[4] Available at: https://www.env.nm.gov/surface-water-quality/calm/.
[5] Available at: https://www.env.nm.gov/surface-water-quality/303d-305b/.

Water Body*	Associated AU	NMAC Reference	Condition - IR Category**	Cause(s) of Water Quality Impairment
Deer Creek	Deer Creek (Columbine Creek to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Placer Fork	Placer Fork (Columbine Creek to headwaters)	20.6.4.123	Not Impaired - 2	None
Willow Fork	Willow Fork (Placer Fork to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Goose Creek	Goose Creek (Red River to headwaters)	20.6.4.123	Not Impaired - 1	None
Bear Canyon	Bear Canyon (Red River to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Long Canyon	Long Canyon (Rio Hondo to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Gavilan Canyon	Gavilan Canyon (Rio Hondo to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Italianos Creek	Italianos Creek (Rio Hondo to headwaters)	20.6.4.123	Not Impaired - 2	None
Manzanita Creek	Manzanita Creek (Rio Hondo to headwaters)	20.6.4.123	Not Impaired - 2	None
Yerba Creek	Yerba Creek (Rio Hondo to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Lama Canyon	Lama Canyon (wilderness boundary to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
San Cristobal Creek	San Cristobal Creek (Rio Grande to headwaters)	20.6.4.123	Not Impaired - 1	None
Lobo Creek	Lobo Creek (wilderness boundary to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Gallina Creek	Gallina Creek (wilderness boundary to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Frijoles Creek	Frijoles Creek (Rito de la Olla to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Palociento Creek	Palociento Creek (Rito de la Olla to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
West Fork Luna Creek	West Fork Luna Creek (Luna Creek to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Cimarron River	Cimarron River (Turkey Creek to Eagle Nest Lake)	20.6.4.309	Impaired - 5/5A	Nutrients, Temperature, Turbidity
Pecos River	Pecos River (Canon de Manzanita to Alamitos Canyon)	20.6.4.217	Impaired - 5/5A	Dissolved oxygen, Temperature
Rito de los Indios	Rito de los Indios (San Antonio Creek to headwaters)	20.6.4.108	Impaired - 5/5A	Total Recoverable Aluminum, Nutrients, Temperature
La Jara Creek	La Jara Creek (East Fork Jemez to headwaters)	20.6.4.108	Impaired - 5/5B	Total Recoverable Aluminum, Temperature
Sulphur Creek	Sulphur Creek (Redondo Creek to headwaters)	20.6.4.124	Impaired - 5/5B	Dissolved Aluminum
San Luis Creek	San Luis Creek (San Antonio Creek to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)

Water Body*	Associated AU	NMAC Reference	Condition - IR Category**	Cause(s) of Water Quality Impairment
Jaramillo Creek	Jaramillo Creek (East Fork Jemez to headwaters)	20.6.4.108	Impaired - 5/5A	Total Recoverable Aluminum, E. coli, Nutrients, Sedimentation, Turbidity
Rio Cebolla	Rio Cebolla (Fenton Lake to headwaters)	20.6.4.108	Impaired - 5/5C	Total Recoverable Aluminum, Nutrients, Turbidity
Rio Guadalupe	Rio Guadalupe (Jemez River to confluence with Rio Cebolla)	20.6.4.108	Impaired - 4A	Nutrients, Specific Conductance, Temperature, Turbidity
Rito de los Frijoles	Rito de los Frijoles (Rio Grande to headwaters)	20.6.4.121	Impaired - 5/5C	DDT - Fish Consumption Advisory
Alamo Canyon	Alamo Canyon (Rio Grande to headwaters)	20.6.4.121	Not Assessed - 3/3A	Unknown (no data)
Capulin Creek	Capulin Creek (Rio Grande to headwaters)	20.6.4.121	Not Impaired - 1	None
Capulin Creek	Capulin Creek (Rio Grande to headwaters)	20.6.4.121	Not Impaired - 1	None
Medio Creek	Medio Creek (Rio Grande to headwaters)	20.6.4.98	Not Assessed - 3/3A	Unknown (no data)
Lummis Canyon	Lummis Canyon (Alamo Canyon to headwaters)	20.6.4.98	Not Assessed - 3/3C	Unknown (no data)

NOTES:
*Water bodies cross referenced to Table 1.
**IR Category definitions[6]: 1-2 = Not Impaired for parameters monitored, 3 = Not Assessed (no data), 4 – 5 = Impaired for one or more parameters monitored

D. 20.6.4.9(A)(4) NMAC - Activities that Might Reduce Water Quality

A petition to nominate an ONRW must describe activities that may contribute to the reduction of water quality in the proposed ONRW 20.6.4.9(A)(4) NMAC. The existing and potential activities discussed below could reduce water quality in the nominated waters.

i. Climate Change

As the climate warms, so do rivers and streams. High stream temperature is the most common water impairment in New Mexico and is especially dangerous to aquatic life. Hotter water holds less oxygen, thus reducing the amount of dissolved oxygen available for fish. In addition, hotter climates can result in higher evaporation rates and lower stream flows, which can result in the concentration of pollutants in rivers and streams. Climate change also affects the global hydrologic cycle, and therefore the quality, quantity, and timing of stream flows. Drying events due to the altered hydrologic cycle can be especially detrimental to aquatic life. Erosion is expected to increase because of higher peak flows as well as from increased intensity and frequency of wildfires. In turn, sediment loads are expected to increase, affecting municipal water supplies and aquatic habitats. Healthy watersheds buffer the impacts of disturbances such as fire, floods, drought, and other disruptions, and, in doing so, yield water of high

[6] More detailed descriptions available at: https://www.env.nm.gov/surface-water-quality/calm/

quality farther downstream in the watershed. This resilience is especially noticeable when it is gone, as in the aftermath of catastrophic fire or extensive defoliation and soil erosion. The vicious cycle of climate change and drought damage watershed health in many ways. Higher temperatures can both increase and impair plant transpiration. Reduced precipitation exacerbates this effect, and, over time, such landscapes become denuded, either suddenly through fire or gradually through decreased soil moisture and plant death. Widespread bare soil is a major detriment to watersheds because it is vulnerable to erosion and consequent silting of streams, and, most importantly, because it has lost its ability to hold water and process its contaminants. From a water quality perspective, bare soil must be prevented or reversed in a watershed to enhance watershed resilience and hydrologic function and maintain a healthy watershed that supplies clean water in the face of climate change.

ii. Wildfires

As discussed above, climate change exacerbates the threat of wildfires, and is expected to continue to do so throughout the Southwest, in particular. Wildfire is a natural process needed for a healthy environment, but the natural wildfire regime has been disrupted resulting in wildfires that burn hotter, larger, and longer. Wildfire season has grown longer, and wildfire impacts have worsened. Recently New Mexico experienced its largest forest fire ever in the Hermits Peak/Calf Canyon Fire in 2022. Debris flow and soil erosion following wildfire can reduce water quality by increasing sediment load, resulting in increased turbidity, increased temperature, increased specific conductance, and changes in dissolved oxygen. Ash and debris flows following wildfires can also have detrimental impacts on fish populations. Species resilience following these disturbance events may depend on maintaining habitat connectivity that provide refuge and critical dispersal corridors for aquatic species. Unfortunately, watershed recovery in high-intensity burn scars is often a long, slow, process; however, healthy watersheds that experience lower-intensity burns recover more quickly.

iii. Dams

Dams have many positive and necessary attributes; however, they can also negatively affect water quality and the natural processes of a river or stream. Changing the ecosystem from a river to a lake can have effects on fish, water temperature, and dissolved oxygen. The stagnant water along with nutrients and abundant sunlight often lead to the right conditions for producing large amounts of plants and algae, which is more likely to result in eutrophication. These conditions also increase the likelihood of harmful algal blooms that can produce toxins dangerous to human and animal health. Because the water slows as it approaches the dam, sediments collect upstream of a dam including in the lake, which can change the substrate composition of the river or stream both upstream and downstream of the dam; this results in excess sediments upstream of the dam and what is known as “sediment-starved” rivers or streams downstream of the dam. The collected sediment can contain contaminants that may be released over time into the lake and then flow downstream. Dams disconnect the watershed and act as a barrier to aquatic species from travelling throughout the watershed. The water at the bottom of a reservoir is normally much cooler than the surface; sometimes this will lead to cool water temperatures at the outflow of the dam. The altered flow downstream of a dam can affect aquatic life by altering the physical conditions of the river or stream. The timing of the dam releases and downstream flows can also interfere with natural cycles of aquatic life.

iv. Hard Rock Mining

More than 40 percent of stream reaches in western watersheds are contaminated by acid mine drainage and associated heavy metals. Acid mine drainage from mining activities have caused massive fish kills and have poisoned migratory birds at many sites across the west. Mine drainage can also affect the reproduction of aquatic plants and animals and contaminate drinking water.

v. Development and Transportation

Increased sediment loading from roads and development can impair water quality. The relationship between road building in formerly undisturbed areas and increased sediment yield in streams is well established. When impervious surfaces cover greater areas in a watershed, runoff quantity and velocity increases, which results in increased erosion and loading of sediment and other contaminants, such as metals, organics, and PCBs. Any increase in sediment in streams affects inflow of oxygen, increases water temperature, and negatively impacts food availability. Not only do these factors decrease fish populations and increase fish stress, but they also degrade the fishing experience, reducing water clarity. In addition, increased sediment loading in a stream can contribute to increased conductivity. A rapid or larger than normal increase in conductivity, in turn, can adversely affect aquatic organisms if they do not have the time or capacity to adapt.

vi. Increased Recreational Use without Proper Management

Recreation is an essential part of what makes these rivers deserving candidates for ONRW designation. However, to ensure this resource is available for future generations, recreation in and around waterbodies must be properly managed and accompanied by robust water quality protections. Poorly managed recreational use of a watershed can lead to increased erosion and other water quality issues, such as excess E. coli, nutrients, and other contaminants in and along the water body.

vii. Illegal Waste Disposal

Illegal dumping of trash and other waste is a threat to water quality across much of New Mexico, including the nominated waters.

viii. Point Source Discharges

The National Pollutant Discharge Elimination System (NPDES) permit program regulates point source pollution discharges to surface waters. In New Mexico the NPDES program is administered by EPA with the assistance of SWQB staff that review and certify that permits comply with New Mexico law. Additionally, SWQB staff conduct compliance evaluation inspections of NPDES permit holders on behalf of EPA. Four of the nominated waters have existing point sources with individual NPDES permits. Three permits are for fish hatcheries, two are for wastewater treatment plants (WWTP), and one for a closed mining facility undergoing cleanup and remediation activities.

Table 3 lists nominated waterbodies with existing individual National Pollutant Discharge Elimination System (NPDES) permits, major dams, or recent wildfire burn scar (since 2017) within the 12-digit USGS HUC upstream (or contributing tributaries) of the proposed stream reach.

Table 3. Identified Activities with the Potential to Reduce Water Quality

Water Body	NPDES permits	Dams	Recent Wildfires
Rio Chama	NMDGF Los Ojos State Fish Hatchery, NM0030139	N/A	N/A
Rio Chama (W&S)	N/A	El Vado Dam	N/A
Rio Chama (W&S)	N/A	El Vado Dam	Indios (2024)
Red River (W&S)	NMDGF Red River State Fish Hatchery, NM0030147 Chevron Mining, Inc. Questa Mine, NM0022306	N/A	N/A

Cimarron River	N/A	Eagle Nest Dam	Ute Park/Cimarron (2018)
Pecos River	Village of Pecos WWTP, NM0029041 NMDGF Lisboa Fish Hatchery, NM0030121	N/A	Rincon (2021) Calf Canyon (2022)
Rio Cebolla	NMDGF Seven Springs Fish Hatchery, NM0030112	N/A	N/A
Rio Guadalupe	N/A	N/A	Venado (2018)
Alamo Canyon	N/A	N/A	Cerro Pelado (2022)
Capulin Creek	N/A	N/A	Cerro Pelado (2022)

E. 20.6.4.9(A)(5) NMAC – Additional Evidence to Substantiate Designation

A petition may set forth additional evidence to substantiate such a designation, including a discussion of the economic impact of the designation on the local and regional economy within the State of New Mexico and the benefit to the state. 20.6.4.9.A(5) NMAC. ONRW designation can help protect not only the waters of the nominated waterbodies but also the contributing watershed and surrounding ecosystems and communities that rely on these waters. Additionally, many of the local economies near the nominated waters rely on agriculture, tourism and outdoor recreation that benefit from clean water, scenic views, and the opportunities that clean water and healthy watersheds afford.

The economic impact of national forests on the surrounding local and regional economies has been demonstrated in past adoptions of ONRWs. The University of New Mexico's Bureau of Business and Economic Research (BBER) has evaluated the two national forests that the waters in this proposal are located within: the Carson National Forest and Santa Fe National Forest. The BBER reports described the socioeconomic impact on forest users, and the impact of each forest on the surrounding local and regional economy. Past ONRW petitions provided key information and tables from the BBER reports that attempted to quantify the direct, indirect and induced financial benefits of ranching, timber harvesting, recreation and forest service operations on regional and local economies for each national forest. The BBER reports covered the full range of activities that occur within national forests. Because this nomination is for waters within wilderness areas, special trout waters, parks, monuments, and wild and scenic rivers where the range of activities is a subset of those that occur within the entire national forest, the economic benefits of existing activities in these areas are a subset of those for the entire national forests. No documentation was available from BBER or the U.S. Forest Service (USFS) regarding economic benefits of these areas alone.

This proposed ONRW designation of waters will have little to no detrimental economic impact on existing uses within these areas because there are no new requirements that will apply to existing activities. Therefore, existing economic benefits experienced by the various sectors that rely on the national forests are expected to continue if the proposed waters are designated as ONRWs.

Under the current WQS, discharges from "preexisting land-use activities" that are controlled by best management practices (BMPs) and do not have new or increased discharges are exempt from any additional requirements as a result of ONRW designation per 20.6.4.8.A(4)(e) NMAC. NMED does not propose to alter the protection given to existing uses under the current regulations but intends to maintain this protection. For example, NMED recently revised its Memorandum of Understanding (MOU) with USFS outlining the responsibilities of each agency to oversee and manage waters, and consequently

water quality, within the National Forest System (NFS) to protect and improve the quality of the state's waters to assure clean water for downstream communities. The MOU details the responsibilities of each party to work toward these common and mutually beneficial goals, providing specific requirements and actions and explicitly addressing ONRWs on NFS land. The MOU acknowledges USFS as the Commission's Designated Management Agency for implementation of the New Mexico Nonpoint Source Pollution Management Program on NFS lands. Additionally, NMED and USFS hold an annual planning and collaboration meeting to maintain communication, evaluate goals and priorities, and direct work to protect or restore water quality on NFS lands. Furthermore, NMED and USFS require site specific BMPs to be developed and implemented for projects that could impact water quality on or downstream of NFS lands.

While ONRW designation is not expected to result in detrimental economic impacts to existing land uses, the designation will produce benefits to the state. By designating waters as ONRWs, New Mexico takes an important step to ensuring water quality protection of streams that ultimately feed downstream public drinking water supplies, agriculture, recreation, cultural and other important uses. Snowpack in the mountains high in the watersheds melts and snowmelt provides much of the annual streamflow in New Mexico. Healthy watersheds filter contaminants from water and provide other important benefits such as flood control, wildfire mitigation and drought resilience. These are valuable and irreplaceable benefits that are difficult to quantify and can be easily overlooked and taken for granted.

ONRW designation can help to protect wildlife habitat provided by designated waters. Additionally, the designation can help to preserve rivers and streams enjoyed by numerous New Mexicans and tourists, annually. Although economic information is not available for recreational and wildlife uses of wilderness areas, parks, special trout waters, or wild and scenic rivers individually, the state derives a significant amount of economic benefits from Recreational Vehicle camping, fishing, hunting, hiking, birding and other outdoor recreation activities.

Outdoor recreation also boosts and diversifies New Mexico's economy overall. In 2019, Governor Michelle Lujan Grisham and the New Mexico Legislature created an Outdoor Recreation Division (ORD) within the Economic Development Department, and an accompanying Outdoor Recreation Infrastructure Fund. Through 2021, ORD invested nearly $12 million dollars to bolster access to the outdoors, conserve outdoor recreation assets, create new jobs, and support outdoor infrastructure improvements. The U.S. Department of Commerce's Bureau of Economic Analysis (BEA) reported that the economic output for New Mexico's outdoor recreation was 2.1% of the State's Gross Domestic Product (GDP), or $2.3 billion. Compared to the previous year, this was a $400 million increase year-over-year, outpacing the national average growth rate in the industry by 2.5%. Employment in the outdoor recreation sector in New Mexico also realized a substantial increase in 2021, up to 28,475 accounting for an 18.2% increase from 2020.

F. 20.6.4.9(A)(6) NMAC – Affidavit of Publication

A petition must provide an affidavit of publication of notice of the petition in a newspaper of general circulation in the affected counties and a newspaper of general statewide circulation. The notice of petition was published on July 19, 2024, in the Santa Fe New Mexican, and on July 20, 2024, in the Albuquerque Journal. Additionally, a listserv email was sent to approximately 1,900 subscribers and direct emails were sent to federal, state, and tribal representatives and interested parties. A copy of the notice of the petition and affidavits of publication are provided as Appendix D. NMED was unable to

publish notice of the petition in the Los Alamos Monitor, The Taos News, and the Las Vegas Optic as these newspapers are not vendors to provide services to the state.

If granted a hearing in this matter, SWQB will provide a public notice of rulemaking and associated information in accordance with the State Rules Act (NMSA 1978 §§ 14-4-1 to -11) and the Commission's Rulemaking Procedures (20.1.6 NMAC).

IV. SWQB Stakeholder Engagement and Public Comment Period

NMED held a public comment period from July 20 through August 19, 2024. Instructions for providing comment were included in the public notice. In addition, NMED held a virtual public meeting on August 8, 2024, providing a presentation on the current nomination and the anticipated procedural steps for rulemaking. Appendix E1 contains the slides presented at this meeting. Public participation opportunities were highlighted, and staff provided a live demonstration of how to: find rule making material and supporting documents, use our GIS Mapper, navigate various NMED websites and information repositories, and submit comment through NMED's Smart Comment Portal. A summary of the public meeting including participants and questions received can be found in Appendix E2.

NMED received significant interest and support for the nomination with 656 submissions via email and an additional 76 submissions through the Smart Comment Portal (Appendix E3). Public comment through the Smart Comment Portal was categorized into six bins based on the nature of the comment or affiliation of the commentor. NMED received: generally supportive comments (32), comments supportive of specific waters (5), comments suggesting other waters (26), comments and letters from Non-Governmental Organizations (10), comments about private land (2) and comments on mining (1). All 656 email submissions (form letters) support the ONRW designation without modification to the list of waters provided in the public review draft of the nomination. Of note, the Big Tesuque River was suggested by 22 commentors to be included on the list but it does not meet the criteria of 20.6.4.9(B)(1) NMAC. NMED met twice with citizens of the Village of Tesuque to discuss their concerns and suggestions, the criteria used to nominate waters as ONRWs, and the process to nominate waters.

NMDGF provided a comment letter (Appendix E4) via email on the public review draft list of waters. NMED and NMDGF met before and after their submittal, to discuss concerns and specific requests to remove waters. As a result, NMED reevaluated Special Trout Water nominations and retained those that are headwater streams, those that meet additional 20.6.4.9(1) NMAC criteria, and those that had public comment in specific support of the water. This resulted in the removal of three segments, two on the Rio Chama, just below El Vado and Abiquiu Dams, and one segment on the Red River.

If granted a hearing, NMED will provide a full response to comments in the Notice of Intent (to Present Technical Testimony) filed with the WQCC in conjunction with the rulemaking.

Appendix A. Maps of Nominated Surface Waters

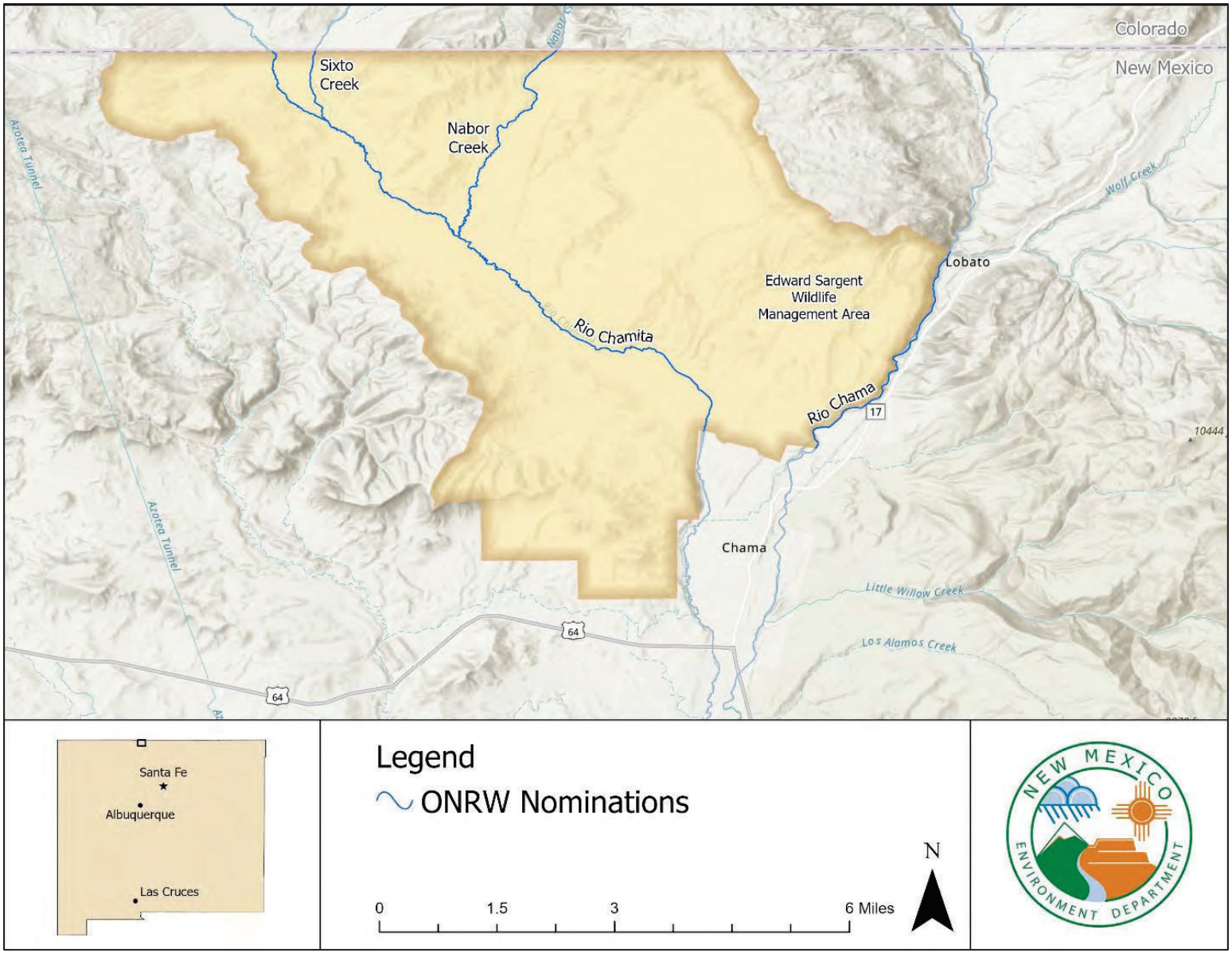


Figure 1. Edward Sargeant Wildlife Management Area Nominations

NMED Exhibit 4

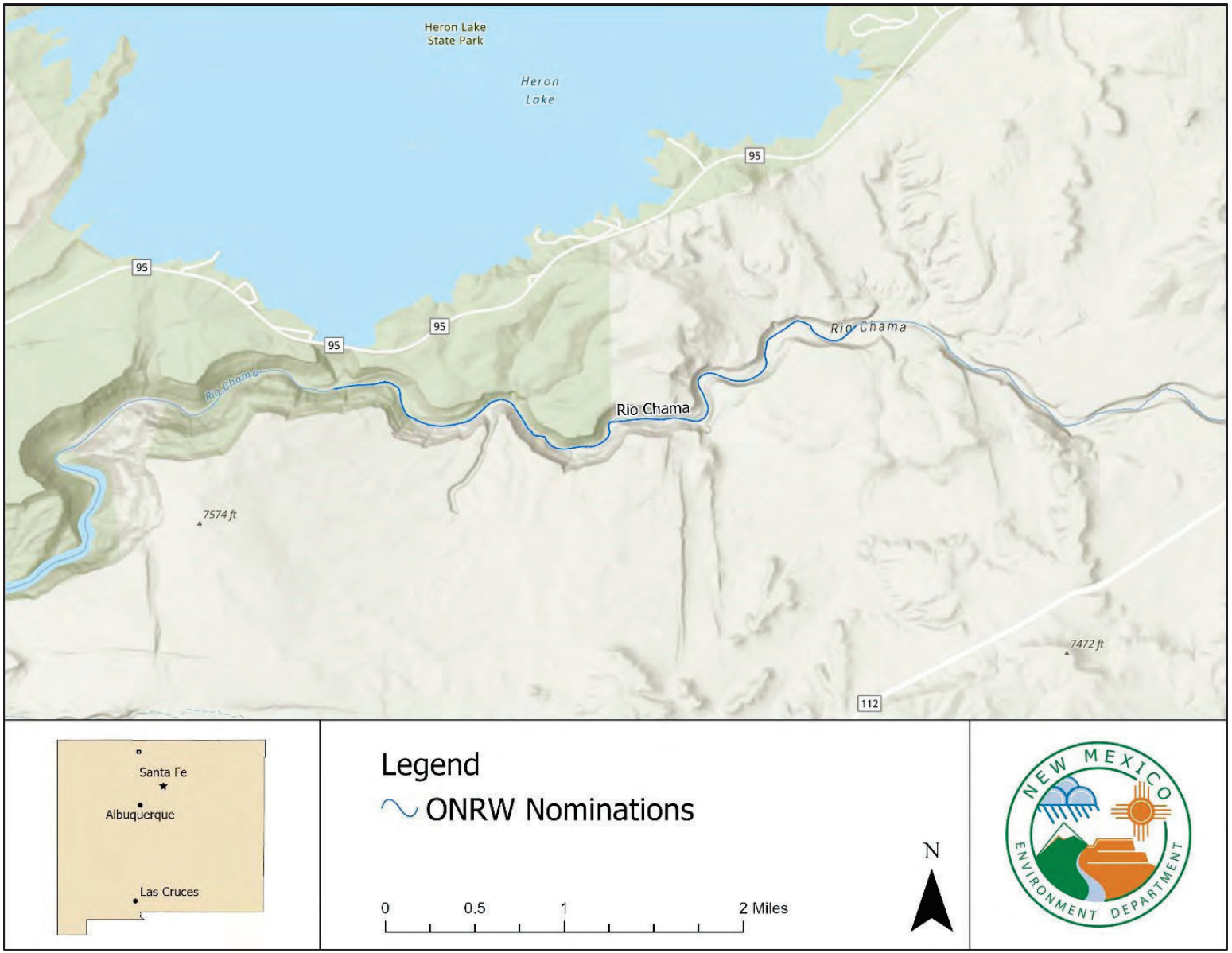


Figure 2. Rio Chama Above Heron Reservoir Outlet Special Trout Water Nomination

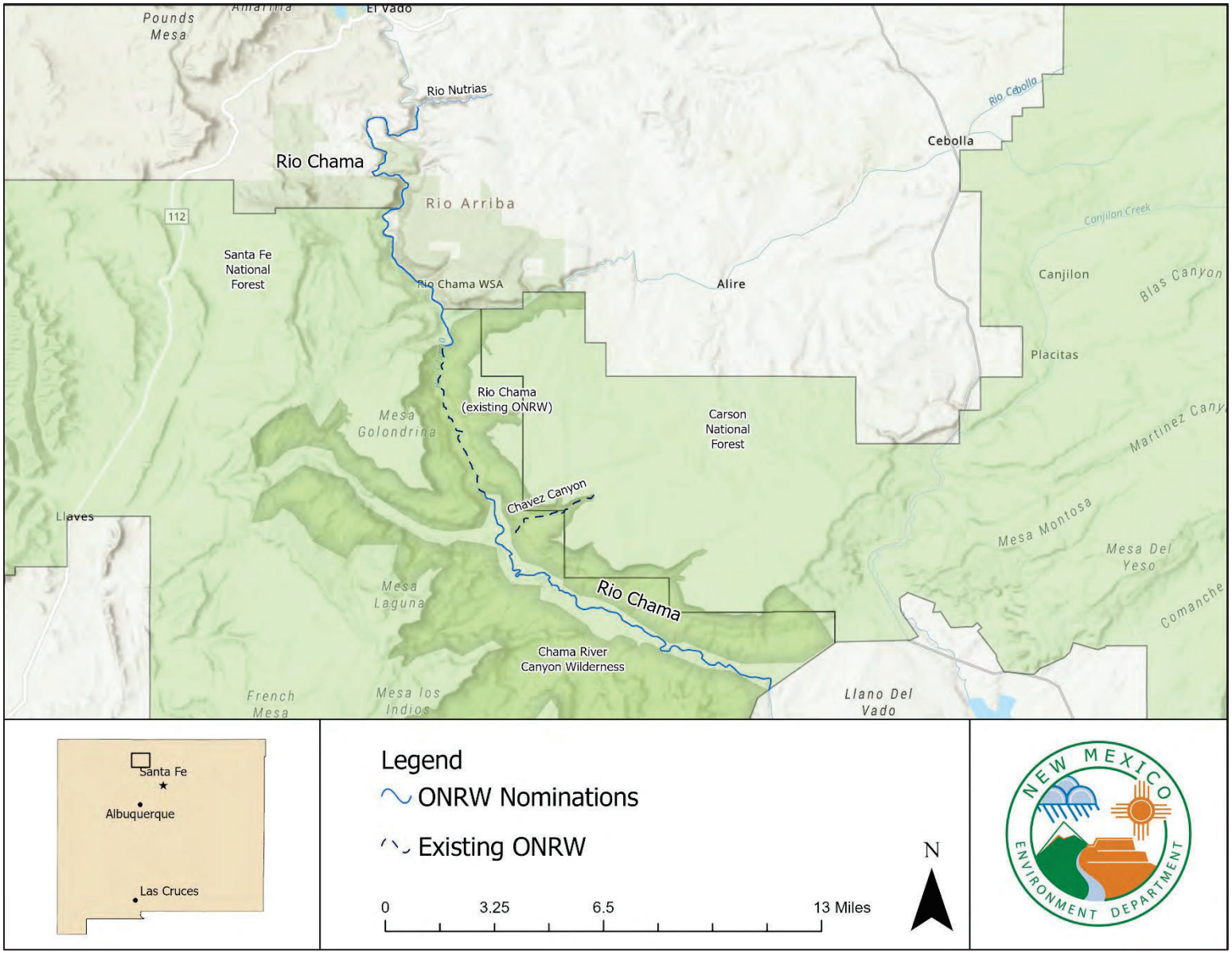


Figure 3. Rio Chama Wild and Scenic Nomination

NMED Exhibit 4

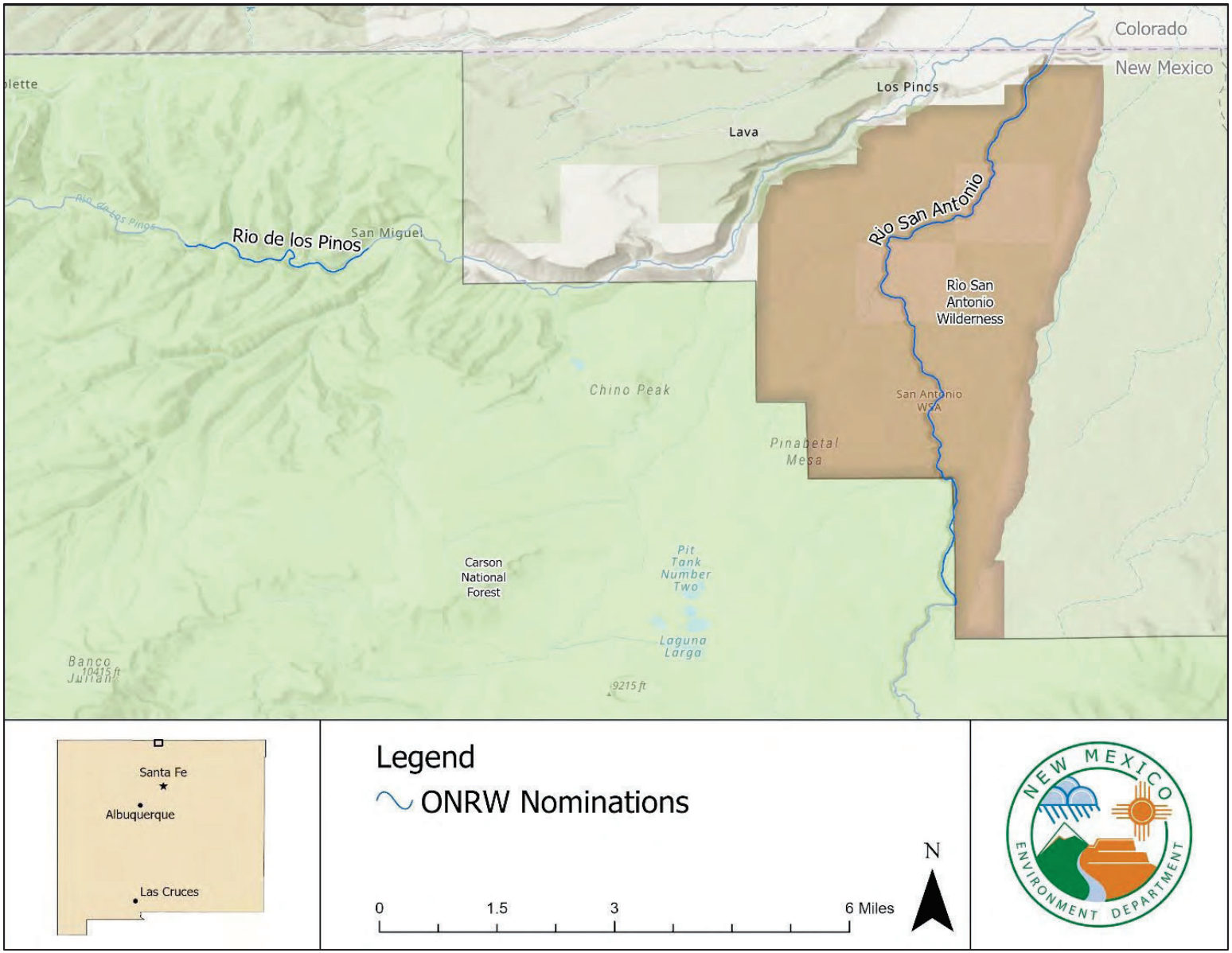


Figure 4. Rio de Los Pinos Special Trout Water and Rio San Antonio Wilderness Nominations

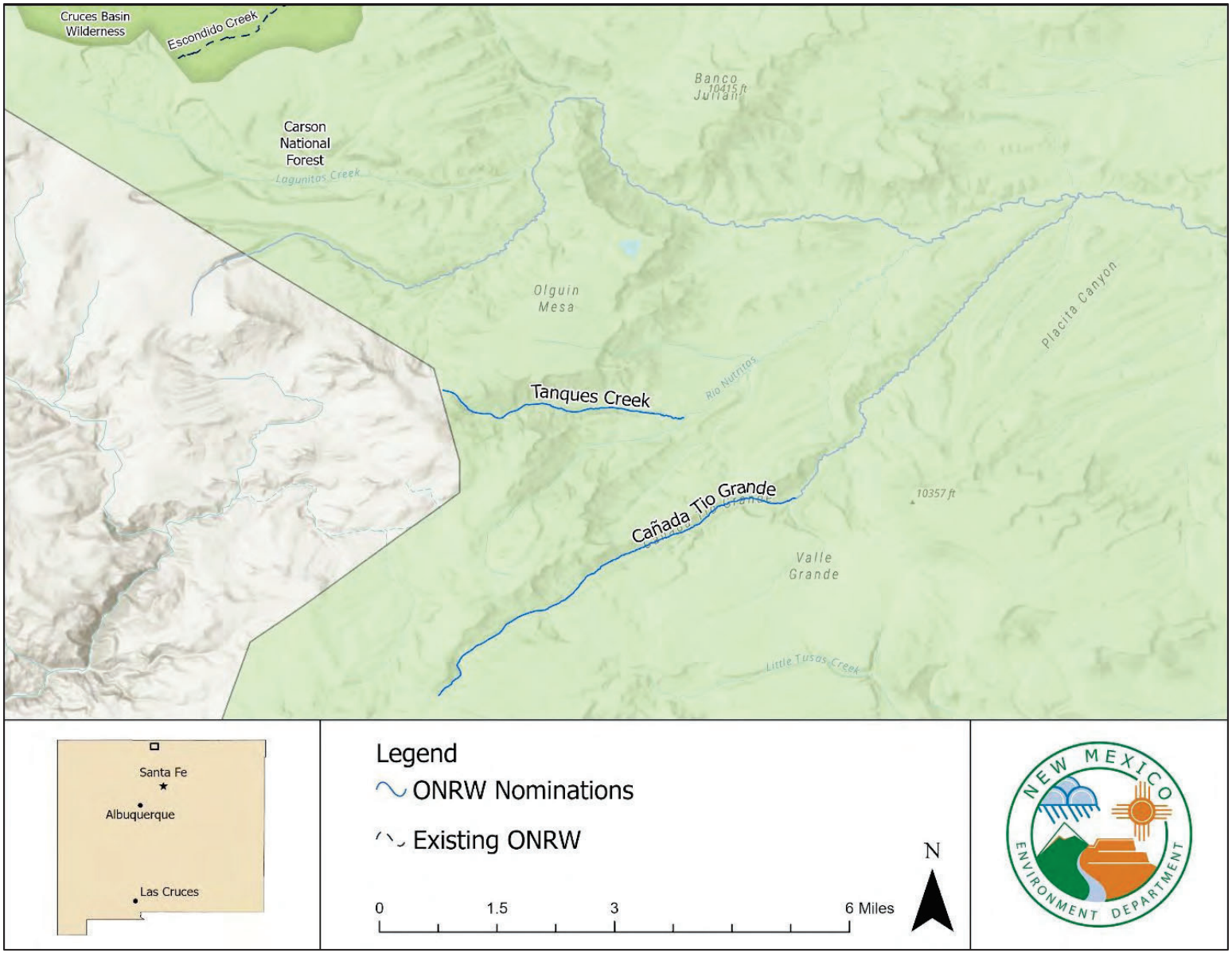


Figure 5. Canada Tio Grande and Tanques Creek Special Trout Water Nominations

NMED Exhibit 4

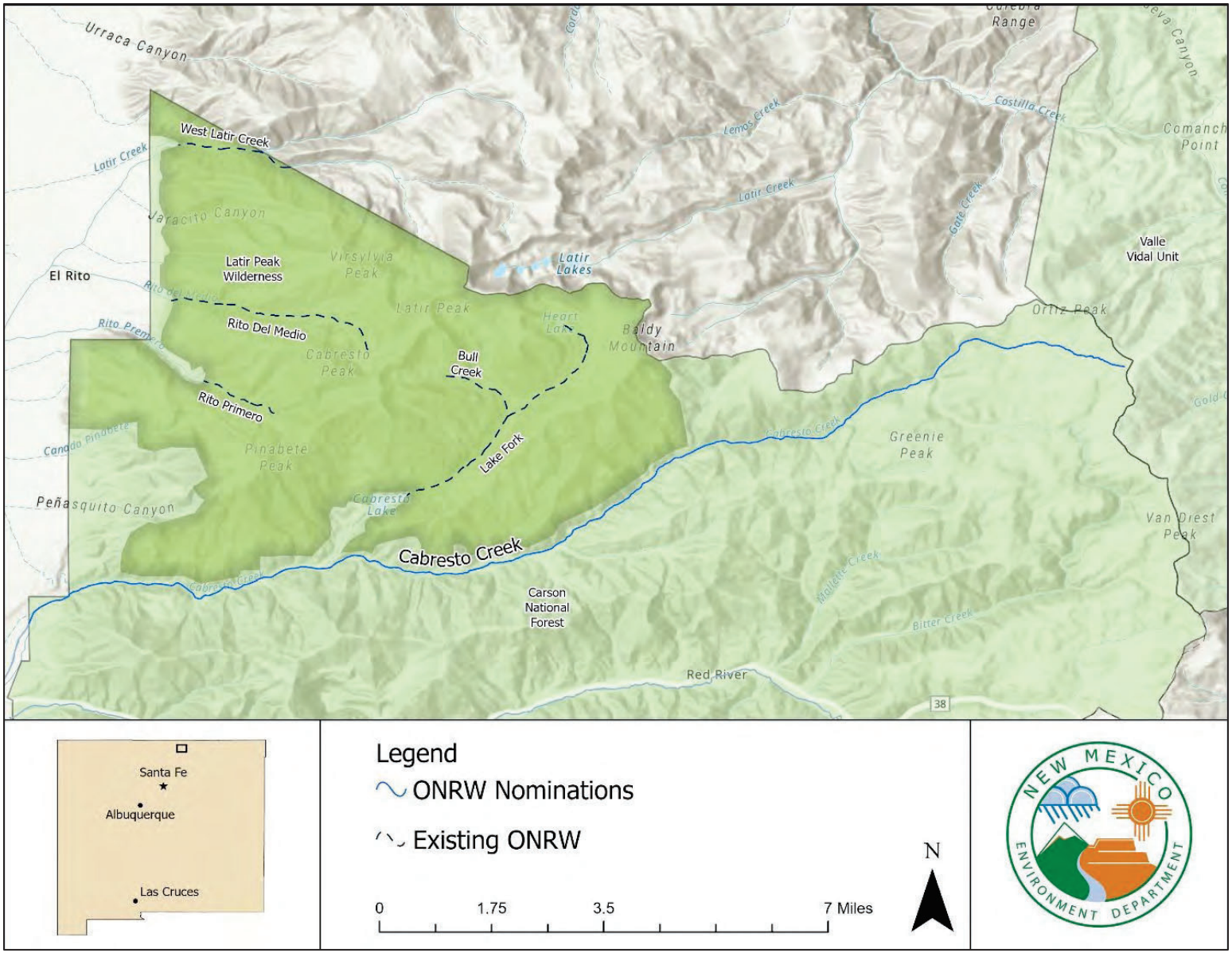


Figure 6. Cabresto Creek Special Trout Water Nomination

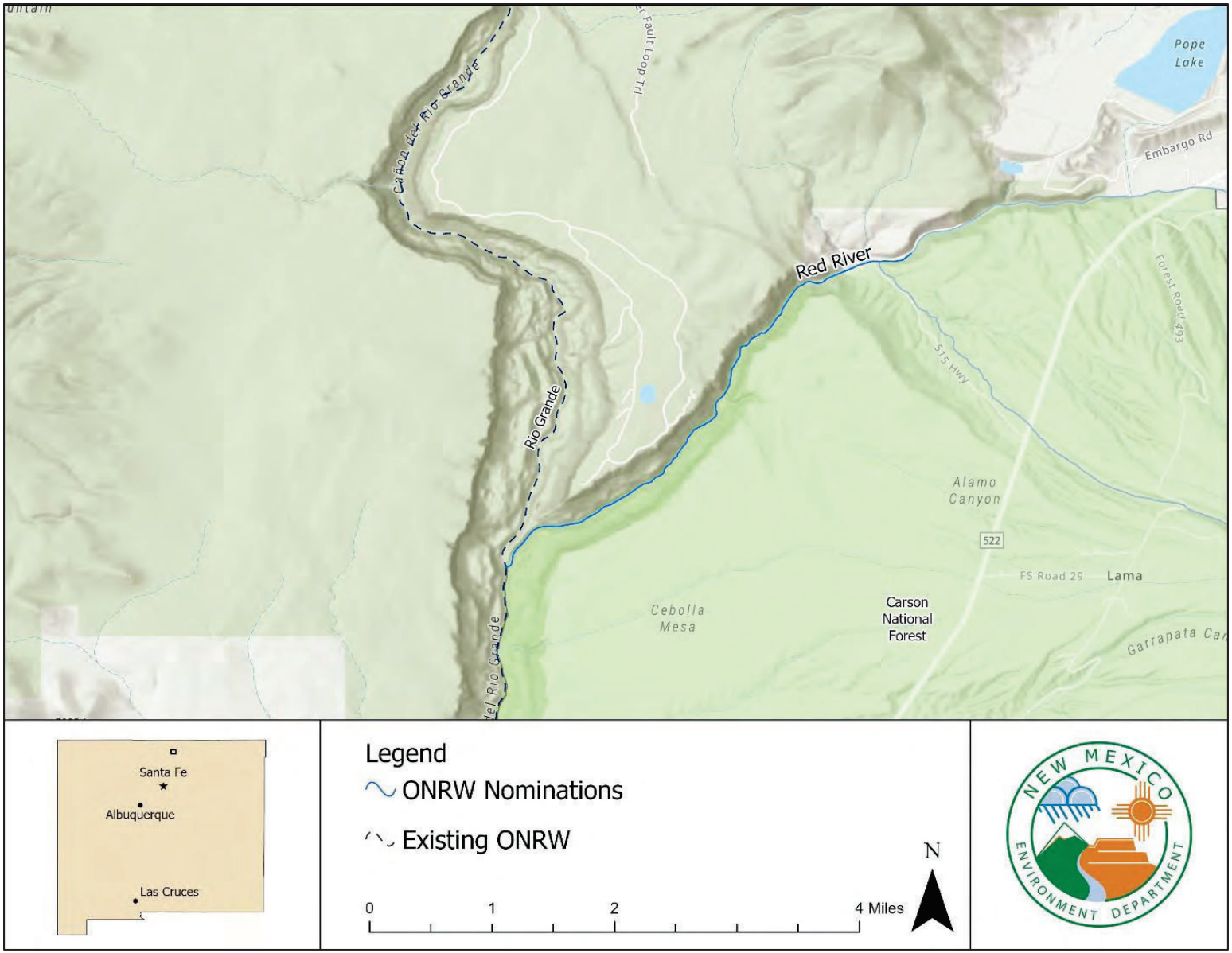


Figure 7. Red River Wild and Scenic Nomination

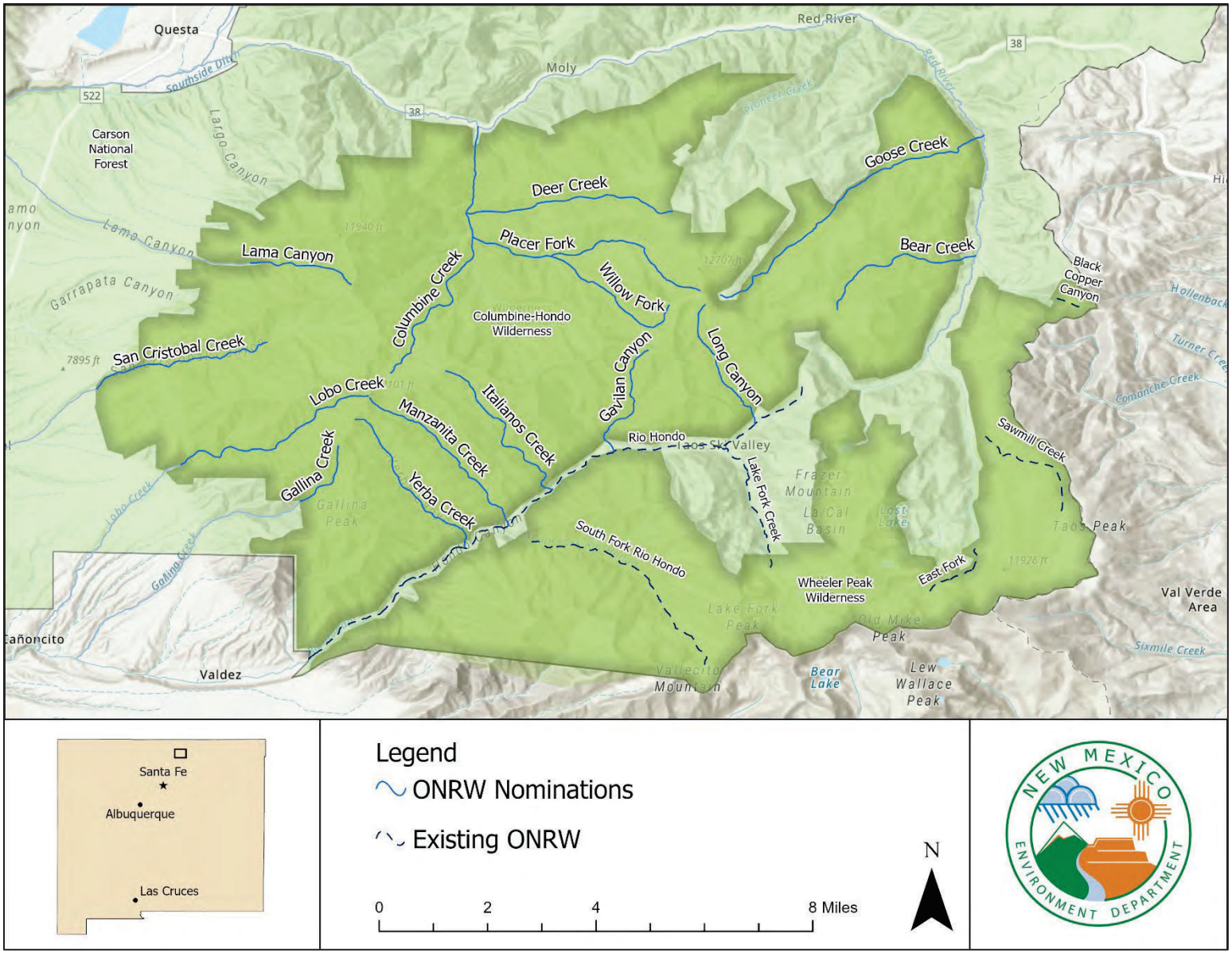


Figure 8. Columbine-Hondo Wilderness and Special Trout Water Nominations

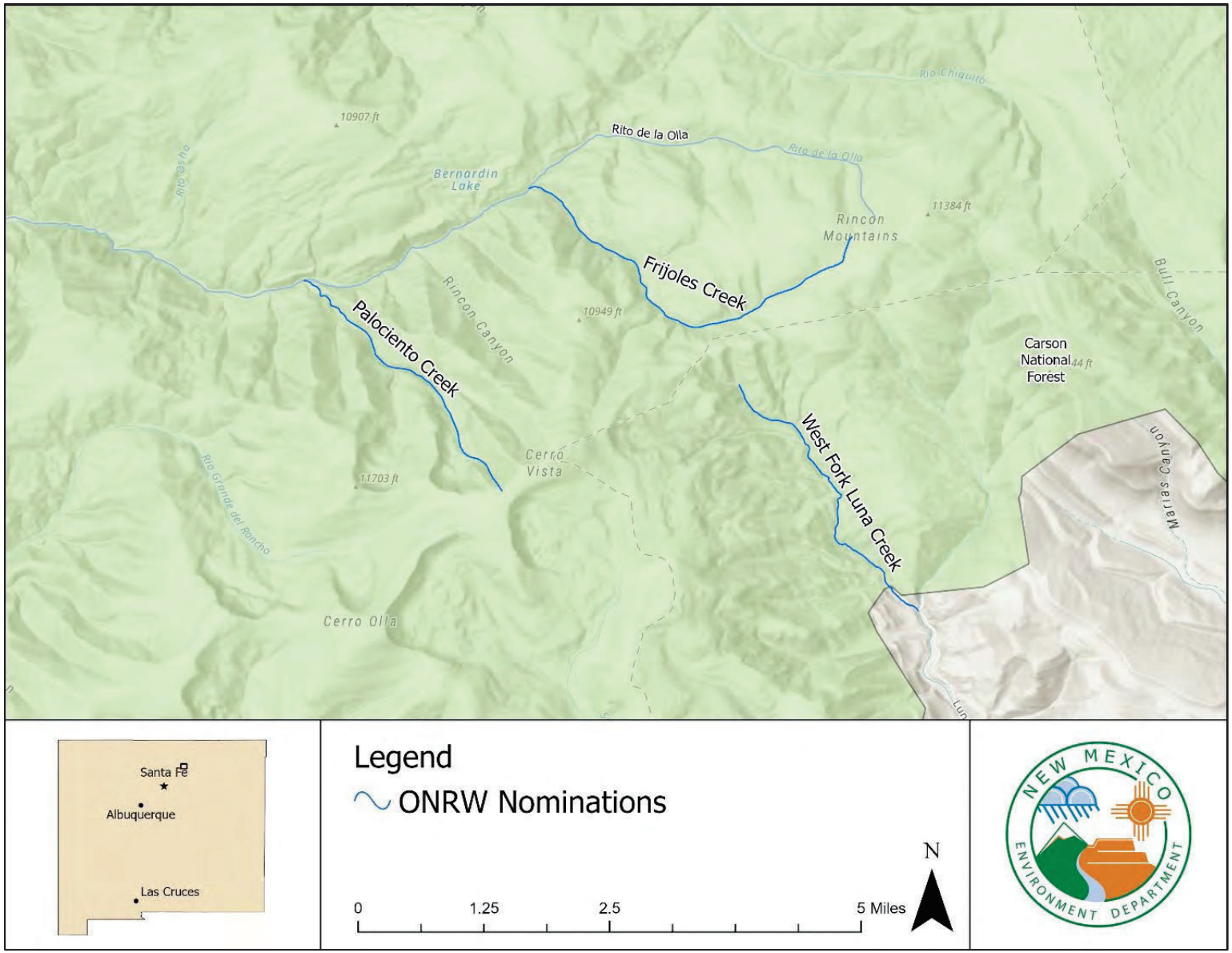


Figure 9. Frijoles Creek, Palociento Creek, and West Fork Luna Creek Special Trout Water Nominations

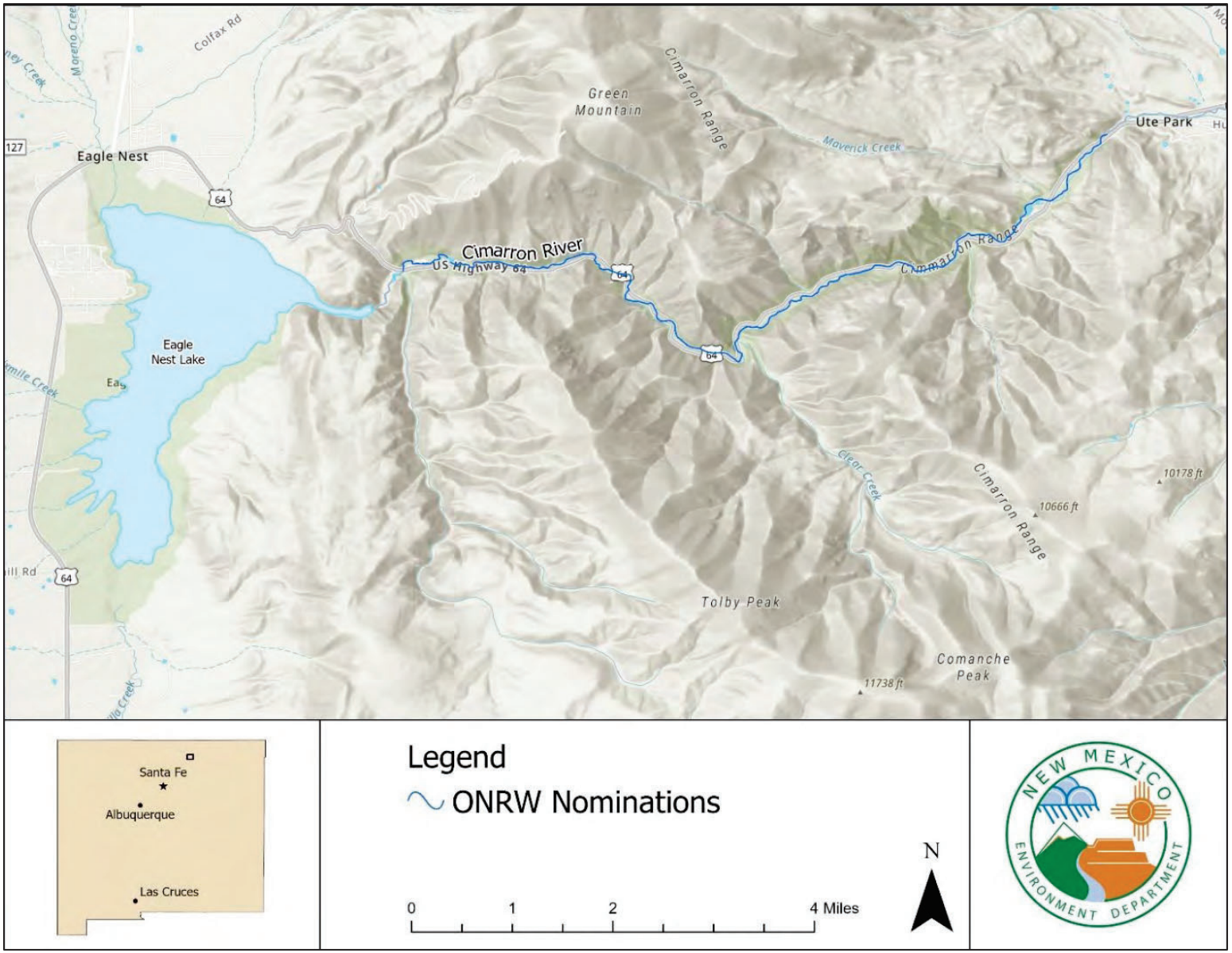


Figure 10. Cimarron River State Park and Special Trout Water Nomination

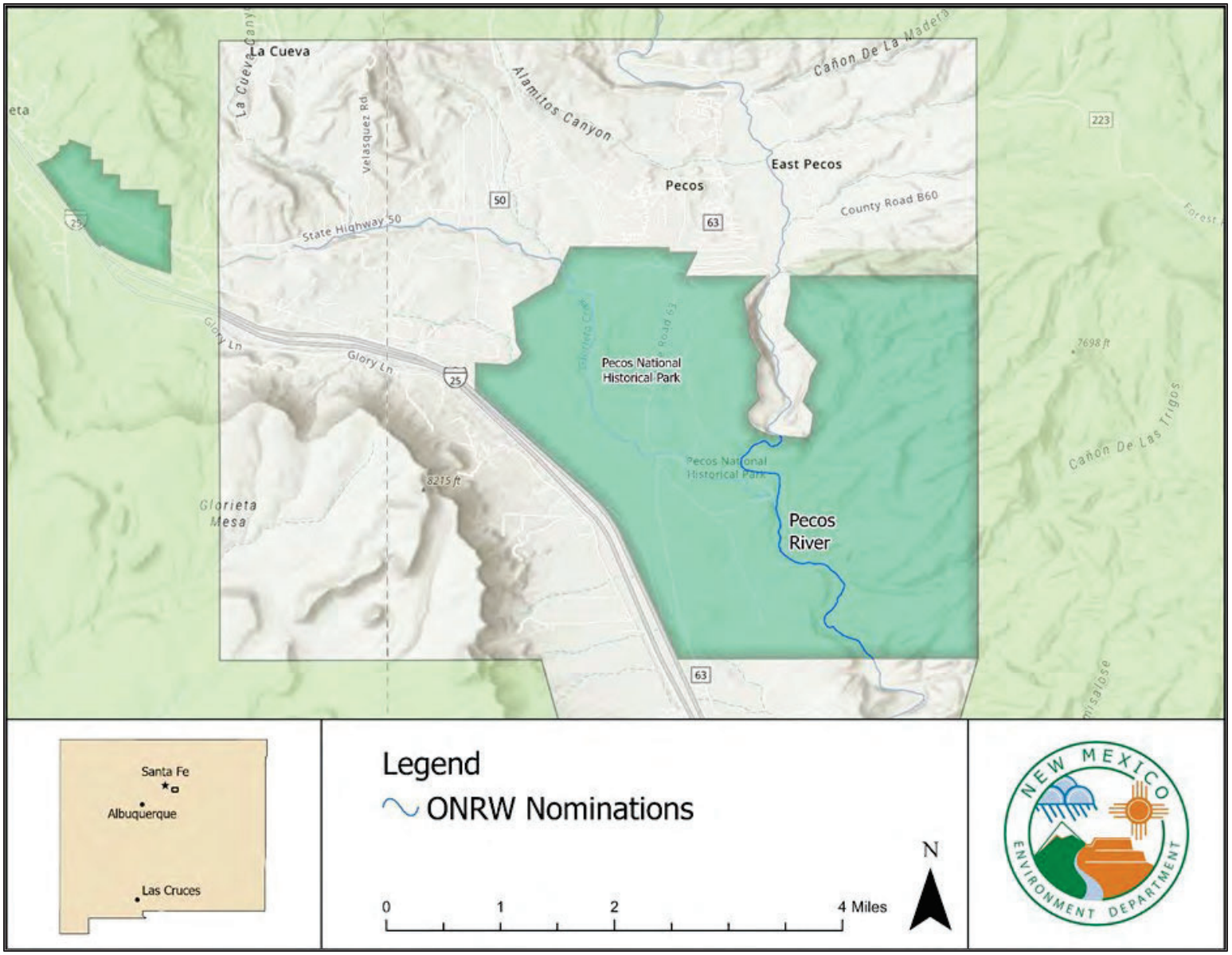


Figure 11. Pecos National Historical Park Nomination

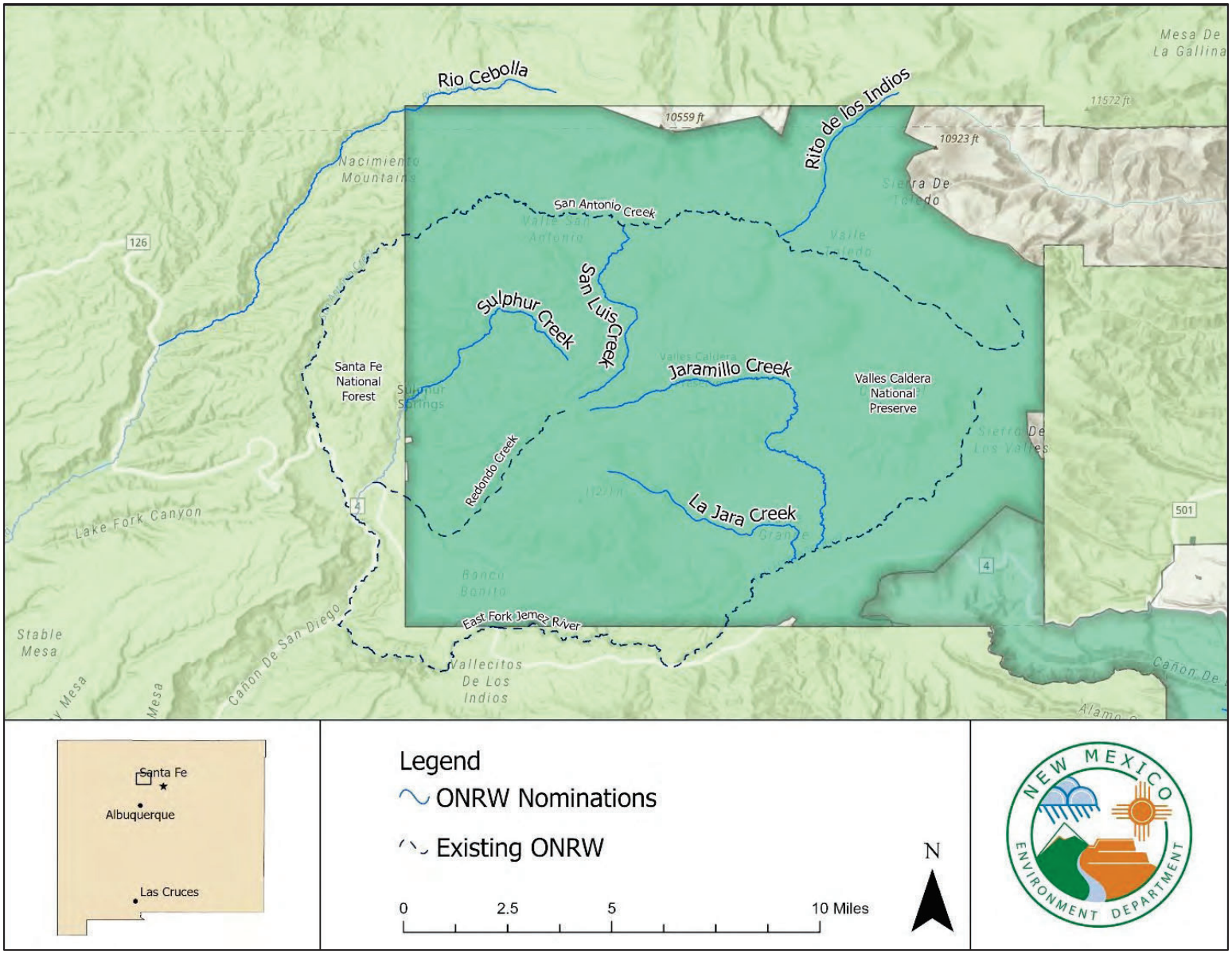


Figure 12. Valles Caldera National Preserve and Rio Cebolla Special Trout Water Nominations

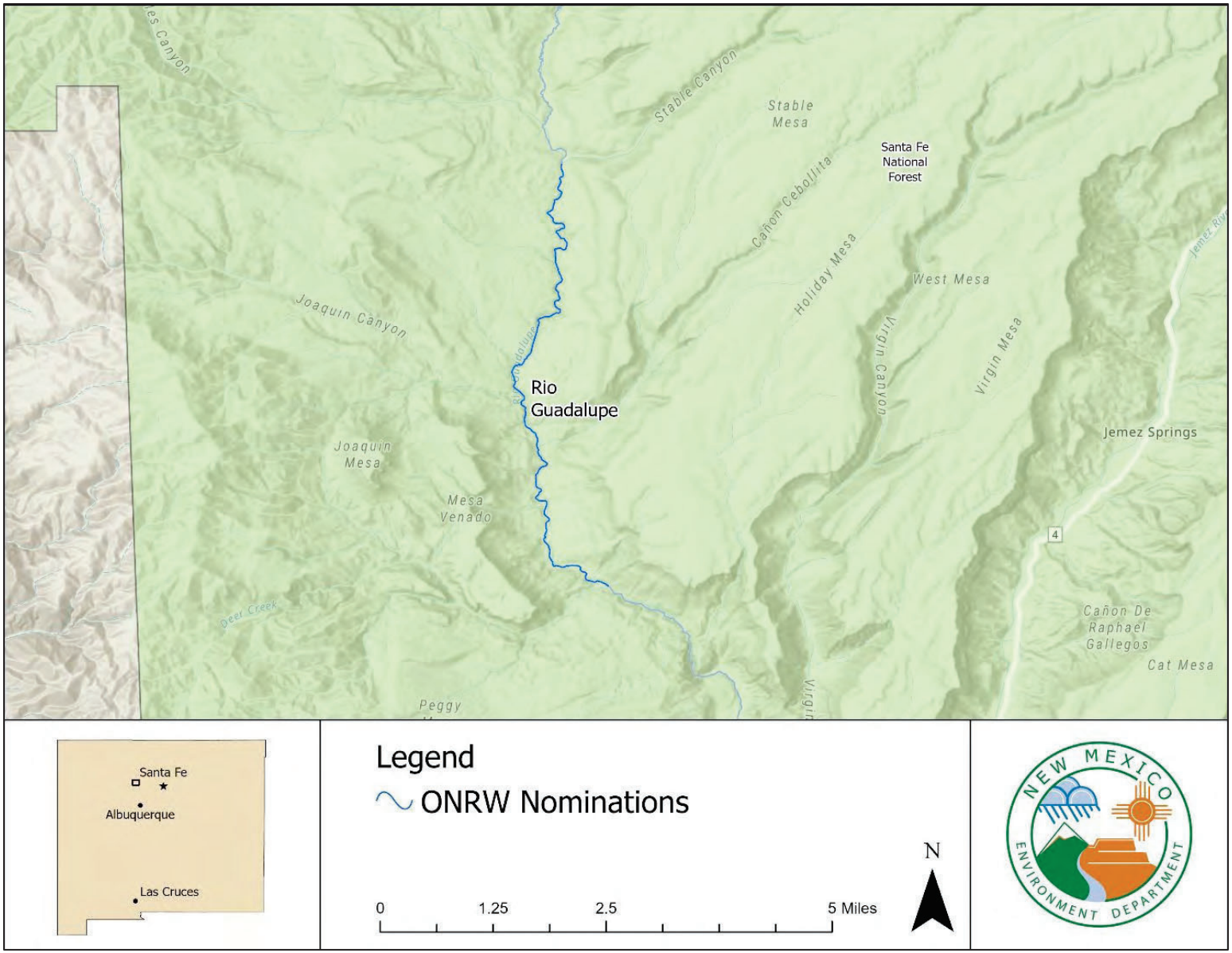


Figure 13. Rio Guadalupe Special Trout Water Nomination

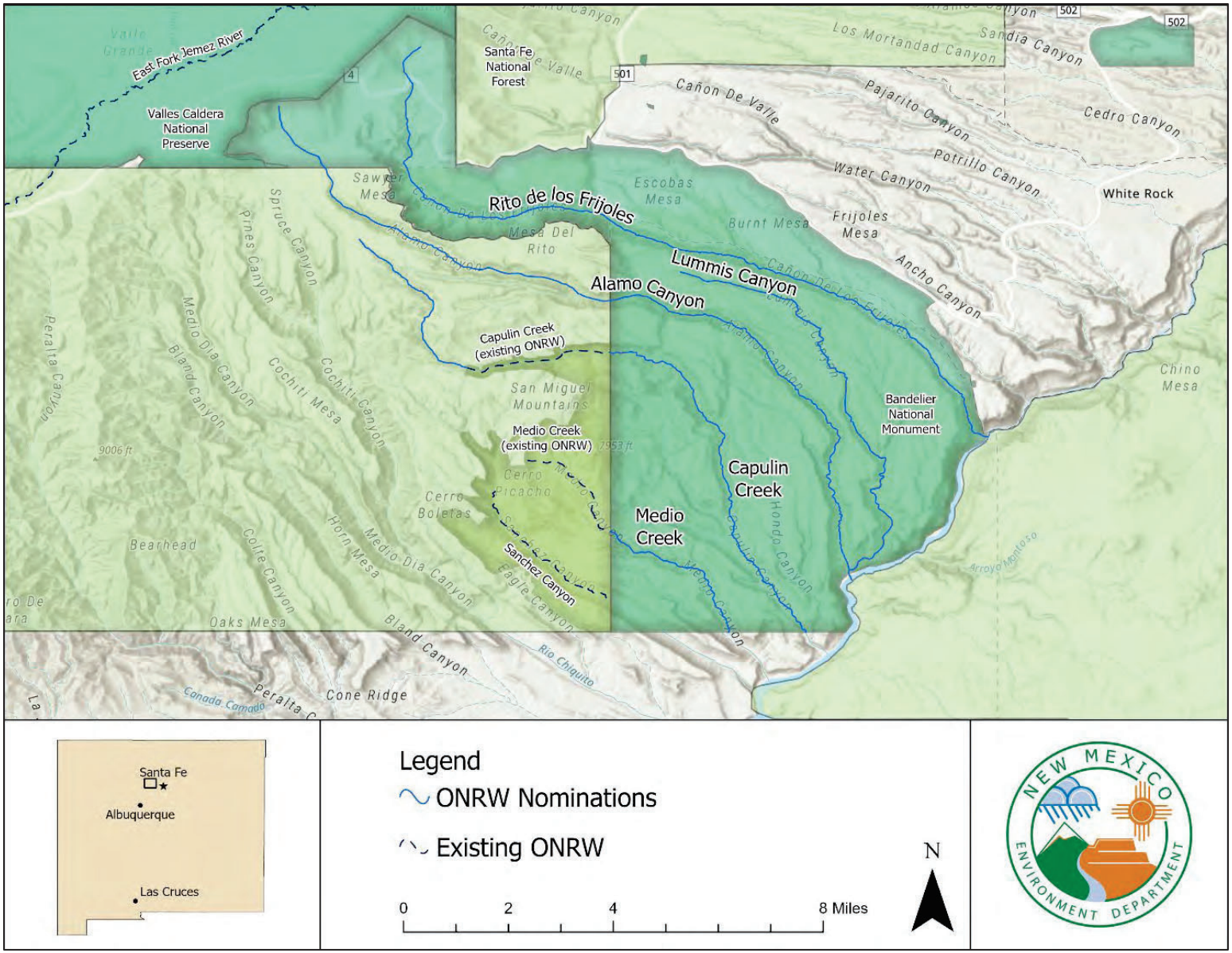


Figure 14. Bandelier National Monument and Upper Capulin Creek Special Trout Water Nominations

Appendix B1-B4. Baseline Water Quality Data

These files contain large amounts of data and are available for download in .pdf format at https://www.env.nm.gov/surface-water-quality/2024onrw/. Microsoft Excel electronic versions of data tables are also available upon request.

Appendix C. Proposed Amendments to 20.6.4.9 NMAC

Proposed new language provided in redline format.

20.6.4.9 OUTSTANDING NATIONAL RESOURCE WATERS:

A. Procedures for nominating an ONRW: Any person may nominate a surface water of the state for designation as an ONRW by filing a petition with the commission pursuant to 20.1.6 NMAC, Rulemaking Procedures - Water Quality Control Commission. A petition to designate a surface water of the state as an ONRW shall include:

(1) a map of the surface water of the state, including the location and proposed upstream and downstream boundaries;

(2) a written statement and evidence based on scientific principles in support of the nomination, including specific reference to one or more of the applicable ONRW criteria listed in Subsection B of this section;

(3) water quality data including chemical, physical or biological parameters, if available, to establish a baseline condition for the proposed ONRW;

(4) a discussion of activities that might contribute to the reduction of water quality in the proposed ONRW;

(5) any additional evidence to substantiate such a designation, including a discussion of the economic impact of the designation on the local and regional economy within the state of New Mexico and the benefit to the state; and

(6) affidavit of publication of notice of the petition in a newspaper of general circulation in the affected counties and in a newspaper of general statewide circulation.

B. Criteria for ONRWs: A surface water of the state, or a portion of a surface water of the state, may be designated as an ONRW where the commission determines that the designation is beneficial to the state of New Mexico, and:

(1) the water is a significant attribute of a state special trout water, national or state park, national or state monument, national or state wildlife refuge or designated wilderness area, or is part of a designated wild river under the federal Wild and Scenic Rivers Act; or

(2) the water has exceptional recreational or ecological significance; or

(3) the existing water quality is equal to or better than the numeric criteria for protection of aquatic life and contact uses and the human health-organism only criteria, and the water has not been significantly modified by human activities in a manner that substantially detracts from its value as a natural resource.

C. Pursuant to a petition filed under Subsection A of this section, the commission may classify a surface water of the state or a portion of a surface water of the state as an ONRW if the criteria set out in Subsection B of this section are met.

D. Waters classified as ONRWs: The following waters are classified as ONRWs:

(1) Rio Santa Barbara, including the west, middle and east forks from their headwaters downstream to the boundary of the Pecos Wilderness; and

(2) the waters within the United States forest service Valle Vidal special management unit including:

(a) Rio Costilla, including Comanche, La Cueva, Fernandez, Chuckwagon, Little Costilla, Powderhouse, Holman, Gold, Grassy, LaBelle and Vidal creeks, from their headwaters downstream to the boundary of the United States forest service Valle Vidal special management unit;

(b) Middle Ponil creek, including the waters of Greenwood Canyon, from their headwaters downstream to the boundary of the Elliott S. Barker wildlife management area;

(c) Shuree lakes;

(d) North Ponil creek, including McCrystal and Seally Canyon creeks, from their headwaters downstream to the boundary of the United States forest service Valle Vidal special management unit; and

(e) Leandro creek from its headwaters downstream to the boundary of the United States forest service Valle Vidal special management unit.

(3) the named perennial surface waters of the state, identified in Subparagraph (a) below, located within United States department of agriculture forest service wilderness. Wilderness are those lands designated by the United States congress as wilderness pursuant to the Wilderness Act. Wilderness areas included in this designation are the Aldo Leopold wilderness, Apache Kid wilderness, Blue Range wilderness, Chama River Canyon wilderness, Cruces Basin wilderness, Dome wilderness, Gila wilderness, Latir Peak wilderness, Pecos wilderness, San Pedro Parks wilderness, Wheeler Peak wilderness, and White Mountain wilderness.

(a) The following waters are designated in the Rio Grande basin:

(i) in the Aldo Leopold wilderness: Byers Run, Circle Seven creek, Flower canyon, Holden Prong, Indian canyon, Las Animas creek, Mud Spring canyon, North Fork Palomas creek, North Seco creek, Pretty canyon, Sids Prong, South Animas canyon, Victorio Park canyon, Water canyon;

(ii) in the Apache Kid wilderness Indian creek and Smith canyon;

(iii) in the Chama River Canyon wilderness: Chavez canyon, Ojitos canyon, Rio Chama;

(iv) in the Cruces Basin wilderness: Beaver creek, Cruces creek, Diablo creek, Escondido creek, Lobo creek, Osha creek;

(v) in the Dome wilderness: Capulin creek, Medio creek, Sanchez canyon/creek;

(vi) in the Latir Peak wilderness: Bull creek, Bull Creek lake, Heart lake, Lagunitas Fork, Lake Fork creek, Rito del Medio, Rito Primero, West Latir creek;

(vii) in the Pecos wilderness: Agua Sarca, Hidden lake, Horseshoe lake (Alamitos), Jose Vigil lake, Nambe lake, Nat lake IV, No Fish lake, North Fork Rio Quemado, Rinconada, Rio Capulin, Rio de las Trampas (Trampas creek), Rio de Truchas, Rio Frijoles, Rio Medio, Rio Molino, Rio Nambe, Rio San Leonardo, Rito con Agua, Rito Gallina, Rito Jaroso, Rito Quemado, San Leonardo lake, Santa Fe lake, Santa Fe river, Serpent lake, South Fork Rio Quemado, Trampas lake (East), Trampas lake (West);

(viii) in the San Pedro Parks wilderness: Agua Sarca, Cañon Madera, Cave creek, Cecilia Canyon creek, Clear creek (North SPP), Clear creek (South SPP), Corralitos creek, Dove creek, Jose Miguel creek, La Jara creek, Oso creek, Rio Capulin, Rio de las Vacas, Rio Gallina, Rio Puerco de Chama, Rito Anastacio East, Rito Anastacio West, Rito de las Palomas, Rito de las Perchas, Rito de los Pinos, Rito de los Utes, Rito Leche, Rito Redondo, Rito Resumidero, San Gregorio lake;

(ix) in the Wheeler Peak wilderness: Black Copper canyon, East Fork Red river, Elk lake, Horseshoe lake, Lost lake, Sawmill creek, South Fork lake, South Fork Rio Hondo, Williams lake.

(b) The following waters are designated in the Pecos River basin:

(i) in the Pecos wilderness: Albright creek, Bear creek, Beatty creek, Beaver creek, Carpenter creek, Cascade canyon, Cave creek, El Porvenir creek, Hollinger

creek, Holy Ghost creek, Horsethief creek, Jack's creek, Jarosa canyon/creek, Johnson lake, Lake Katherine, Lost Bear lake, Noisy brook, Panchuela creek, Pecos Baldy lake, Pecos river, Rio Mora, Rio Valdez, Rito Azul, Rito de los Chimayosos, Rito de los Esteros, Rito del Oso, Rito del Padre, Rito las Trampas, Rito Maestas, Rito Oscuro, Rito Perro, Rito Sebadilloses, South Fork Bear creek, South Fork Rito Azul, Spirit lake, Stewart lake, Truchas lake (North), Truchas lake (South), Winsor creek;

(ii) in the White Mountain wilderness: Argentina creek, Aspen creek, Bonito creek, Little Bonito creek, Mills canyon/creek, Rodamaker creek, South Fork Rio Bonito, Turkey canyon/creek.

(c) The following waters are designated in the Gila River basin:

(i) in the Aldo Leopold wilderness: Aspen canyon, Black Canyon creek, Bonner canyon, Burnt canyon, Diamond creek, Falls canyon, Fisherman canyon, Running Water canyon, South Diamond creek;

(ii) in the Gila wilderness: Apache creek, Black Canyon creek, Brush canyon, Canyon creek, Chicken Coop canyon, Clear creek, Cooper canyon, Cow creek, Cub creek, Diamond creek, East Fork Gila river, Gila river, Gilita creek, Indian creek, Iron creek, Langstroth canyon, Lilley canyon, Little creek, Little Turkey creek, Lookout canyon, McKenna creek, Middle Fork Gila river, Miller Spring canyon, Mogollon creek, Panther canyon, Prior creek, Rain creek, Raw Meat creek, Rocky canyon, Sacaton creek, Sapillo creek, Sheep Corral canyon, Skeleton canyon, Squaw creek, Sycamore canyon, Trail canyon, Trail creek, Trout creek, Turkey creek, Turkey Feather creek, Turnbo canyon, West Fork Gila river, West Fork Mogollon creek, White creek, Willow creek, Woodrow canyon.

(d) The following waters are designated in the Canadian River basin: in the Pecos wilderness Daily creek, Johns canyon, Middle Fork Lake of Rio de la Casa, Middle Fork Rio de la Casa, North Fork Lake of Rio de la Casa, Rito de Gascon, Rito San Jose, Sapello river, South Fork Rio de la Casa, Sparks creek (Manuelitas creek).

(e) The following waters are designated in the San Francisco River basin:

(i) in the Blue Range wilderness: Pueblo creek;

(ii) in the Gila wilderness: Big Dry creek, Lipsey canyon, Little Dry creek, Little Whitewater creek, South Fork Whitewater creek, Spider creek, Spruce creek, Whitewater creek.

(f) The following waters are designated in the Mimbres Closed basin: in the Aldo Leopold wilderness Corral canyon, Mimbres river, North Fork Mimbres river, South Fork Mimbres river.

(g) The following waters are designated in the Tularosa Closed basin: in the White Mountain wilderness Indian creek, Nogal Arroyo, Three Rivers.

(h) The wetlands designated are identified on the *Maps and List of Wetlands Within United States Forest Service Wilderness Areas Designated as Outstanding National Resource Waters* published at the New Mexico state library and available on the department's website.

(4) The following waters are designated in the headwaters Pecos river watershed:

(a) The Pecos river from Dalton Canyon creek to the Pecos wilderness boundary;

(b) In the Dry Gulch-Pecos river subwatershed, Dalton Canyon creek from the Pecos river upstream to the headwaters, Wild Horse creek from Dalton Canyon creek

upstream to the headwaters, Macho Canyon creek from the Pecos river upstream to the headwaters and Sawyer creek from the Pecos river upstream to the headwaters;

(c) In the Indian creek-Pecos river subwatershed, Indian creek from the Pecos river upstream to the headwaters, Holy Ghost creek from the Pecos river upstream to the Pecos wilderness boundary, Doctor creek from Holy Ghost creek upstream to the headwaters, Davis creek from the Pecos river upstream to the headwaters and Willow creek from the Pecos river upstream to the headwaters;

(d) In the Rio Mora subwatershed, Rio Mora from the Pecos river upstream to the Pecos wilderness boundary and Bear creek from the Rio Mora upstream to the Pecos wilderness boundary;

(e) In the Rio Mora-Pecos river subwatershed, Carpenter creek from the Pecos river upstream to the Pecos wilderness boundary, Winsor creek from the Pecos river upstream to the Pecos wilderness boundary and Jack's creek from the Pecos river upstream to the Pecos wilderness boundary; and,

(f) In the Panchuela creek subwatershed, Panchuela creek from the Pecos river upstream to the Pecos wilderness boundary;

(g) Unnamed tributaries to waters in Subparagraphs (a) through (f), Paragraph (4) of this Subsection (D) as identified in the *Maps and Lists for Unnamed Tributaries to Perennial Waters and Wetlands in the Headwaters Pecos River Watershed,* published at the New Mexico state library and available on the department's website.

(h) Unnamed wetlands adjacent to waters in Subparagraphs (a) through (f), Paragraph (4) of this Subsection (D) as identified in the *Maps and Lists for Unnamed Tributaries to Perennial Waters and Wetlands in the Headwaters Pecos River Watershed*, published at the New Mexico state library and available on the department's website.

(5) the Rio Grande from directly above the Rio Pueblo de Taos to the New Mexico-Colorado state border.

(6) the Rio Hondo from the Carson National Forest boundary to its headwaters; and Lake Fork creek from the Rio Hondo to its headwaters.

(7) the East Fork Jemez river from San Antonio creek to its headwaters; San Antonio creek from the East Fork Jemez river to its headwaters; and Redondo creek from Sulphur creek to its headwaters.

(8) the following waters located within a national or state park, national or state monument, or national or state wildlife refuge:

(a) in the Valles Caldera national preserve: La Jara creek, Sulphur creek, San Luis creek, Jaramillo creek, and Rito de los Indios;

(b) in the Bandelier national monument: Rito de los Frijoles, Lummis canyon, Alamo canyon, Capulin creek, and Medio creek;

(c) in the Cimarron canyon state park: Cimarron river;

(d) in the Pecos national historical park: Pecos river;

(e) in the Rio Grande del Norte national monument: Rio San Antonio.

(9) the following waters located within a designated wilderness area: in the Columbine – Hondo wilderness areas: Columbine creek, Deer creek, Placer fork, Willow fork, Goose creek, Bear creek, Long canyon, Gavilan canyon, Italianos creek, Yerba creek, Manzanita creek, Gallina creek, Lobo creek, San Cristobal creek, and Lama canyon.

(10) the following wild rivers as designated by the federal Wild and Scenic Rivers Act:

(a) Rio Chama from the US forest service boundary to confluence with the Rio Nutrias;

(b) Red River from the confluence with the Rio Grande to four miles upstream.

(11) the following state special trout waters not already included in Paragraphs 8 through 10 of this Subsection:

(a) in the Edward Sargent wildlife management area: Rio Chamita, Nabor creek, Sixto creek, and Rio Chama;

(b) Rio Chama from Heron Reservoir outlet to Cottonwood flats;

(c) Rio de los Pinos from United States forest service road 87A to private land 2.5 miles upstream, Tanques creek, Canada Tio Grande;

(d) Cabresto creek from United States forest service boundary to headwaters, Frijoles creek, Palociento creek, and West Fork Luna creek;

(e) Rio Cebolla from Calaveras creek to its headwaters, Rio Gaudalupe from the confluence with Deer creek upstream to confluence with Stable creek;

(f) Capulin creek from the Dome wilderness boundary to headwaters.

[20.6.4.9 NMAC - Rn, Subsections B, C and D of 20.6.4.8 NMAC, 5/23/2005; A, 5/23/2005; A, 7/17/2005; A, 2/16/2006; A, 12/1/2010; A, 1/14/201; A 4/23/2022; A, 09/24/2022; A, XX/XX/XXXX]

Appendix D. Public Notice and Affidavits of Publication

NOTICE OF PETITION TO NOMINATE SURFACE WATERS OF THE STATE FOR DESIGNATION AS OUTSTANDING NATIONAL RESOURCE WATERS

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) gives public notice of a draft petition to nominate (nomination) certain surface waters of the state as outstanding national resource waters (ONRW). Accordingly, NMED developed regulatory language to amend *Standards for Interstate and Intrastate Surface Waters*, 20.6.4 NMAC, to designate these waters as ONRWs. The waters qualify for ONRW designation as significant attributes of a Special Trout Water; a designated wild river; a national or state park, monument, or wildlife refuge; or a designated Wilderness area. ONRWs are entitled to the highest protection from pollution under the New Mexico Water Quality Control Commission's (WQCC) surface water quality standards at 20.6.4 NMAC.

NMED will hold a 30-day public comment period on this proposed action starting on July 20, 2024, and ending on August 19, 2024 at 5:00 PM MDT. Comments will be accepted via mail, email, and NMED's smart comment portal at https://nmed.commentinput.com/comment/search. The draft nomination, amended regulatory language, and all other related information may be found on NMED's website through the Smart Comment Portal or at https://www.env.nm.gov/surface-water-quality/wqs/. The petition and appendices contain a list of waters nominated, maps, baseline water quality data, and other supporting information for the nomination. Additionally, an interactive GIS map with the proposed ONRWs is available at https://gis.web.env.nm.gov/oem/?map=swqb.

At the conclusion of the public comment period, NMED will consider input received and if appropriate, make amendments to its nomination. NMED intends on filing a petition and requesting a public rulemaking hearing at the September 2024 regular meeting of the WQCC. If the WQCC grants a public hearing, the SWQB will publish a notice of rulemaking at least 60 days prior to the hearing in the New Mexico Register, in the Albuquerque Journal, and on NMED's website. That notice will include the date, time, and place of the hearing and how to participate in the hearing, including instructions for joining virtually, submitting public comment, and filing technical testimony.

For more information and to submit comments contact Michael Baca, Water Quality Standards Coordinator, NMED SWQB, P.O. Box 5469, Santa Fe, NM, 87502, (505) 470-1652 or michael.baca1@env.nm.gov. To stay up to date with the latest news from NMED, please sign up for our listserv at https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Parts 5 and 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non-discrimination programs, policies or procedures, you may contact: Kate Cardenas, NMED Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 or nd.coordinator@env.nm.gov. If you believe that you have been discriminated against with respect to a NMED program or activity, please contact the Non-Discrimination Coordinator.

NMED Exhibit 4

AVISO DE PETICIÓN PARA NOMINAR AGUAS SUPERFICIALES DEL ESTADO PARA SU DESIGNACIÓN COMO AGUAS DE RECURSO NACIONAL EXCEPCIONAL

La Oficina de Calidad de Aguas Superficiales (SWQB, por sus siglas en inglés) del Departamento de Medio Ambiente de Nuevo México (NMED, por sus siglas en inglés) da aviso público de un borrador de petición para nominar (nominación) ciertas aguas superficiales del estado como Aguas de Recursos Nacionales Excepcionales (ONRW, por sus siglas en inglés). En consecuencia, el NMED ha desarrollado un lenguaje regulatorio para enmendar los *Estándares para aguas superficiales interestatales y estatales, 20.6.4 NMAC*, para designar estas aguas como ONRW. Las aguas califican para la designación ONRW como atributos significativos de un agua especial para truchas; un río silvestre designado; un parque, monumento o refugio de vida silvestre nacional o estatal; o una zona silvestre designada. Las ONRW tienen derecho a la más alta protección contra la contaminación según los estándares de calidad de las aguas superficiales de la Comisión de Control de Calidad del Agua de Nuevo México (WQCC, por sus siglas en inglés) en 20.6.4 NMAC.

El NMED celebrará un período de comentarios públicos de 30 días sobre esta acción propuesta a partir del 20 de julio de 2024 y finalizará el 19 de agosto de 2024 a las 5:00 p.m. MDT. Los comentarios se aceptarán por correo postal, correo electrónico y el portal de comentarios inteligente de NMED en https://nmed.commentinput.com/comment/search. El borrador de la nominación, el lenguaje regulatorio enmendado y toda información relacionada se pueden encontrar en el sitio web de NMED a través del portal de comentarios inteligente o en https://www.env.nm.gov/surface-water-quality/wqs/. La petición y los apéndices contienen una lista de aguas nominadas, mapas, datos de referencia sobre la calidad del agua y otra información de respaldo para la nominación. Además, hay disponible un mapa SIG interactivo con los ONRW propuestos en https://gis.web.env.nm.gov/oem/?map=swqb.

Al finalizar el período de comentarios públicos, el NMED considerará los comentarios recibidos y, si corresponde, hará enmiendas a su nominación. El NMED tiene la intención de presentar una petición y solicitar una audiencia pública de reglamentación en la reunión ordinaria de la WQCC de septiembre de 2024. Si la WQCC concede una audiencia pública, la SWQB publicará un aviso de reglamentación al menos 60 días antes de la audiencia en el Registro de Nuevo México, en el Albuquerque Journal y en el sitio web de NMED. Ese aviso incluirá la fecha, hora y lugar de la audiencia y cómo participar en la audiencia, incluidas instrucciones para unirse virtualmente, enviar comentarios públicos y presentar testimonios técnicos.

Para obtener más información y para enviar comentarios, comuníquese con Michael Baca, coordinador de estándares de calidad del agua, NMED SWQB, P.O. Box 5469, Santa Fe, NM, 87502, (505) 470-1652 o michael.baca1@env.nm.gov. Para mantenerse actualizado con las últimas noticias de NMED, regístrese en nuestro servidor de listas en https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

El NMED no discrimina por motivos de raza, color, origen nacional, discapacidad, edad o sexo en la administración de sus programas o actividades, según lo exigen las leyes y regulaciones aplicables. NMED es responsable de coordinar los esfuerzos de cumplimiento y recibir consultas relacionadas con los requisitos de no discriminación implementados por 40 C.F.R. Partes 5 y 7, incluido el Título VI de la Ley de Derechos Civiles de 1964, según enmendada; Sección 504 de la Ley de Rehabilitación de 1973; la Ley de Discriminación por Edad de 1975, el Título IX de las Enmiendas a la Educación de 1972 y la Sección 13 de las Enmiendas a la Ley Federal de Control de la Contaminación del Agua de 1972. Si tiene alguna pregunta sobre este aviso o cualquiera de los programas, políticas o procedimientos de no

NMED Exhibit 4

discriminación de NMED, puede comunicarse con: Kate Cardenas, coordinadora de no discriminación de NMED, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 o nd.coordinator@env.nm.gov. Si cree que ha sido discriminado con respecto a un programa o actividad de NMED, comuníquese con la coordinadora de no discriminación.

Affidavit of Publication

STATE OF NEW MEXICO } SS
COUNTY OF BERNALILLO }

Ad Cost:	$167.81
Ad Number:	73960
Account Number:	1009628
Classification:	GOVERNMENT LEGALS

I, Bernadette Gonzales, the undersigned, Legal Representative of the Albuquerque Journal, on oath, state that this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 3, chapter 167, Session Laws of 1937, and payment of fees has been made of assessed and a copy of which is hereto attached, was published in said publication in the daily edition, 1 times(s) on the following date(s):

July 20, 2024

That said newspaper was regularly issued and circulated on those dates.
SIGNED:

Legal Representative

Subscribed to and sworn to me this 22th day of July 2024.

David Lindsey Montoya
Notary Public
County Bernalillo
ID#: 1140229
My commission expires: 04-26-2027

STATE OF NEW MEXICO
NOTARY PUBLIC
DAVID LINDSEY MONTOYA
COMMISSION NUMBER 1140229
EXPIRATION DATE 04-26-2027

NM DEPT OF ENVIRONMENT
SURFACE WATER QUALITY BUREAU
PO BOX 5469
SANTA FE, NM 87502

NOTICE OF PETITION TO NOMINATE SURFACE WATERS OF THE STATE FOR DESIGNATION AS OUTSTANDING NATIONAL RESOURCE WATERS

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) gives public notice of a draft petition to nominate (nomination) certain surface waters of the state as outstanding national resource waters (ONRW). Accordingly, NMED developed regulatory language to amend Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC, to designate these waters as ONRWs. The waters qualify for ONRW designation as significant attributes of a Special Trout Water; a designated wild river; a national or state park, monument, or wildlife refuge; or a designated Wilderness area. ONRWs are entitled to the highest protection from pollution under the New Mexico Water Quality Control Commission's (WQCC) surface water quality standards at 20.6.4 NMAC.

NMED will hold a 30-day public comment period on this proposed action starting on July 20, 2024, and ending on August 19, 2024 at 5:00 PM MDT. Comments will be accepted via mail, email, and NMED's smart comment portal at https://nmed.commentinput.com/comment/search. The draft nomination, amended regulatory language, and all other related information may be found on NMED's website through the Smart Comment Portal or at https://www.env.nm.gov/surface-water-quality/wqs/. The petition and appendices contain a list of waters nominated, maps, baseline water quality data, and other supporting information for the nomination. Additionally, an interactive GIS map with the proposed ONRWs is available at https://gis.web.env.nm.gov/oem/?map=swqb.

At the conclusion of the public comment period, NMED will consider input received and if appropriate, make amendments to its nomination. NMED intends on filing a petition and requesting a public rulemaking hearing at the September 2024 regular meeting of the WQCC. If the WQCC grants a public hearing, the SWQB will publish a notice of rulemaking at least 60 days prior to the hearing in the New Mexico Register, in the Albuquerque Journal, and on NMED's website. That notice will include the date, time, and place of the hearing and how to participate in the hearing, including instructions for joining virtually, submitting public comment, and filing technical testimony.

For more information and to submit comments contact Michael Baca, Water Quality Standards Coordinator, NMED SWQB, P.O. Box 5469, Santa Fe, NM, 87502, (505) 470-1652 or michael.baca1@env.nm.gov. To stay up to date with the latest news from NMED, please sign up for our listserv at https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Parts 5 and 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non-discrimination programs, policies or procedures, you may contact: Kate Cardenas, NMED Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 or nd.coordinator@env.nm.gov. If you believe that you have been discriminated against with respect to a NMED program or activity, please contact the Non-Discrimination Coordinator.

Journal: July 20, 2024

Affidavit of Publication

STATE OF NEW MEXICO } SS
COUNTY OF BERNALILLO }

Ad Cost:	$191.70
Ad Number:	73970
Account Number:	1009628
Classification:	GOVERNMENT LEGALS

I, Bernadette Gonzales, the undersigned, Legal Representative of the Albuquerque Journal, on oath, state that this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 3, chapter 167, Session Laws of 1937, and payment of fees has been made of assessed and a copy of which is hereto attached, was published in said publication in the daily edition, 1 times(s) on the following date(s):

July 20, 2024

That said newspaper was regularly issued and circulated on those dates.
SIGNED:

Legal Representative

Subscribed to and sworn to me this 22th day of July 2024.

David Lindsey Montoya
Notary Public

County Bernalillo
ID#: 1140229
My commission expires: 04-26-2027

STATE OF NEW MEXICO
NOTARY PUBLIC
DAVID LINDSEY MONTOYA
COMMISSION NUMBER 1140229
EXPIRATION DATE 04-26-2027

NM DEPT OF ENVIRONMENT
SURFACE WATER QUALITY BUREAU
PO BOX 5469
SANTA FE, NM 87502

AVISO DE PETICIÓN PARA NOMINAR AGUAS SUPERFICIALES DEL ESTADO PARA SU DESIGNACIÓN COMO AGUAS DE RECURSO NACIONAL EXCEPCIONAL

La Oficina de Calidad de Aguas Superficiales (SWQB, por sus siglas en inglés) del Departamento de Medio Ambiente de Nuevo México (NMED, por sus siglas en inglés) da aviso público de un borrador de petición para nominar (nominación) ciertas aguas superficiales del estado como Aguas de Recursos Nacionales Excepcionales (ONRW, por sus siglas en inglés). En consecuencia, el NMED ha desarrollado un lenguaje regulatorio para enmendar los Estándares para aguas superficiales interestatales y estatales, 20.6.4 NMAC, para designar estas aguas como ONRW. Las aguas califican para la designación ONRW como atributos significativos de un agua especial para truchas; un río silvestre designado; un parque, monumento o refugio de vida silvestre nacional o estatal; o una zona silvestre designada. Las ONRW tienen derecho a la más alta protección contra la contaminación según los estándares de calidad de las aguas superficiales de la Comisión de Control de Calidad del Agua de Nuevo México (WQCC, por sus siglas en inglés) en 20.6.4 NMAC.

El NMED celebrará un período de comentarios públicos de 30 días sobre esta acción propuesta a partir del 20 de julio de 2024 y finalizará el 19 de agosto de 2024 a las 5:00 p.m. MDT. Los comentarios se aceptarán por correo postal, correo electrónico y el portal de comentarios inteligente de NMED en https://nmed.commentinput.com/comment/search. El borrador de la nominación, el lenguaje regulatorio enmendado y toda información relacionada se pueden encontrar en el sitio web de NMED a través del Smart Comment Portal o en https://www.env.nm.gov/surface-water-quality/wqs/. La petición y los apéndices contienen una lista de aguas nominadas, mapas, datos de referencia sobre la calidad del agua y otra información de respaldo para la nominación. Además, hay disponible un mapa SIG interactivo con los ONRW propuestos en https://gis.web.env.nm.gov/oem/?map=swqb.

Al finalizar el período de comentarios públicos, el NMED considerará los comentarios recibidos y, si corresponde, hará enmiendas a su nominación. El NMED tiene la intención de presentar una petición y solicitar una audiencia pública de reglamentación en la reunión ordinaria de la WQCC de septiembre de 2024. Si la WQCC concede una audiencia pública, la SWQB publicará un aviso de reglamentación al menos 60 días antes de la audiencia en el Registro de Nuevo México, en el Albuquerque Journal y en el sitio web de NMED. Ese aviso incluirá la fecha, hora y lugar de la audiencia y cómo participar en la audiencia, incluidas instrucciones para unirse virtualmente, enviar comentarios públicos y presentar testimonios técnicos.

Para obtener más información y para enviar comentarios, comuníquese con Michael Baca, coordinador de estándares de calidad del agua, NMED SWQB, P.O. Box 5469, Santa Fe, NM, 87502, (505) 470-1652 o michael.baca1@env.nm.gov. Para mantenerse actualizado con las últimas noticias de NMED, regístrese en nuestro servidor de listas en https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

El NMED no discrimina por motivos de raza, color, origen nacional, discapacidad, edad o sexo en la administración de sus programas o actividades, según lo exigen las leyes y regulaciones aplicables. NMED es responsable de coordinar los esfuerzos de cumplimiento y recibir consultas relacionadas con los requisitos de no discriminación implementados por 40 C.F.R. Partes 5 y 7, incluido el Título VI de la Ley de Derechos Civiles de 1964, según enmendada; Sección 504 de la Ley de Rehabilitación de 1973; la Ley de Discriminación por Edad de 1975, el Título IX de las Enmiendas a la Educación de 1972 y la Sección 13 de las Enmiendas a la Ley Federal de Control de la Contaminación del Agua de 1972. Si tiene alguna pregunta sobre este aviso o cualquiera de los programas, políticas o procedimientos de no discriminación de NMED, puede comunicarse con: Kate Cardenas, coordinadora de no discriminación de NMED, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 o nd.coordinator@env.nm.gov. Si cree que ha sido discriminado con respecto a un programa o actividad de NMED, comuníquese con la coordinadora de no discriminación.

Journal: July 20, 2024

SANTA FE NEW MEXICAN

Founded 1849

NMED SURFACE WATER
PO BOX 5469
SANTA FE, NM 87502-5469

ACCOUNT:	S2004	
AD NUMBER:	76932	
LEGAL NO	92862	P.O.#:66700-0000043564
1 TIME(S)	$197.20	
AFFIDAVIT	10.00	
TAX	16.96	
TOTAL	224.16	

AFFIDAVIT OF PUBLICATION

STATE OF NEW MEXICO
COUNTY OF SANTA FE

I, Veronica Gonzalez, being first duly sworn declare and say that I am Legal Advertising Representative of THE SANTA FE NEW MEXICAN, a daily newspaper published in the English language, and having a general circulation in the Counties of Santa Fe, Rio Arriba, San Miguel, and Los Alamos, State of New Mexico and being a newspaper duly qualified to publish legal notices and advertisements under the provisions of Chapter 167 on Session Laws of 1937; that the Legal No 92862 a copy of which is hereto attached was published in said newspaper 1 day(s) between 07/19/2024 and 07/19/2024 and that the notice was published in the newspaper proper and not in any supplement; the first date of publication being on the 19th day of July, 2024 and that the undersigned has personal knowledge of the matter and things set forth in this affidavit.

/S/ _____
LEGAL ADVERTISEMENT RESPRESENTATIVE

Subscribed and sworn to before me on this 23rd day of July, 2024

Notary _____

Commission Expires: March 14, 2027

NATHANIEL CRISTOFER MARTINEZ
Notary Public - State of New Mexico
Commission # 1139927
My Comm. Expires Mar 14, 2027

LEGAL #76932

LEGAL #92862

NOTICE OF PETITION TO NOMINATE SURFACE WATERS OF THE STATE FOR DESIGNATION AS OUTSTANDING NATIONAL RESOURCE WATERS

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) gives public notice of a draft petition to nominate (nomination) certain surface waters of the state as outstanding national resource waters (ONRW). Accordingly, NMED developed regulatory language to amend Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC, to designate these waters as ONRWs. The waters qualify for ONRW designation as significant attributes of a Special Trout Water; a designated wild river; a national or state park, monument, or wildlife refuge; or a designated Wilderness area. ONRWs are entitled to the highest protection from pollution under the New Mexico Water Quality Control Commission's (WQCC) surface water quality standards at 20.6.4 NMAC.

NMED will hold a 30-day public comment period on this proposed action starting on July 20, 2024, and ending on August 19, 2024 at 5:00 PM MDT. Comments will be accepted via mail, email, and NMED's smart comment portal at https://nmed.commentinput.com/comment/search. The draft nomination, amended regulatory language, and all other related information may be found on NMED's website through the Smart Comment Portal or at https://www.env.nm.gov/surface-water-quality/wqs/. The petition and appendices contain a list of waters nominated, maps, baseline water quality data, and other supporting information for the nomination. Additionally, an interactive GIS map with the proposed ONRWs is available at https://gis.web.env.nm.gov/oem/?map=swqb.

At the conclusion of the public comment period, NMED will consider input received and if appropriate, make amendments to its nomination. NMED intends on filing a petition and requesting a public rulemaking hearing at the September 2024 regular meeting of the WQCC. If the WQCC grants a public hearing, the SWQB will publish a notice of rulemaking at least 60 days prior to the hearing in the New Mexico Register, in the Albuquerque Journal, and on NMED's website. That notice will include the date, time, and place of the hearing and how to participate in the hearing, including instructions for joining virtually, submitting public comment, and filing technical testimony.

For more information and to submit comments contact Michael Baca, Water Quality Standards Coordinator, NMED SWQB, P.O. Box 5469, Santa Fe, NM. 87502, (505) 470-1652 or michael.baca1@env.nm.gov. To stay up to date with the latest news from NMED, please sign up for our listserv at https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Parts 5 and 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's nondiscrimination programs, policies or procedures, you may contact: Kate Cardenas, NMED Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 or nd.coordinator@env.nm.gov. If you believe that you have been discriminated against with respect to a NMED program or activity, please contact the Non-Discrimination Coordinator.

PUB: July 19, 2024

SANTA FE NEW MEXICAN

Founded 1849

NMED SURFACE WATER
PO BOX 5469
SANTA FE, NM 87502-5469

ACCOUNT:	S2004	
AD NUMBER:	76935	
LEGAL NO	92863	P.O.#:66700-0000043564
1 TIME(S)	$223.72	
AFFIDAVIT	10.00	
TAX	19.14	
TOTAL	252.86	

AFFIDAVIT OF PUBLICATION

STATE OF NEW MEXICO
COUNTY OF SANTA FE

I, Veronica Gonzalez, being first duly sworn declare and say that I am Legal Advertising Representative of THE SANTA FE NEW MEXICAN, a daily newspaper published in the English language, and having a general circulation in the Counties of Santa Fe, Rio Arriba, San Miguel, and Los Alamos, State of New Mexico and being a newspaper duly qualified to publish legal notices and advertisements under the provisions of Chapter 167 on Session Laws of 1937; that the Legal No 92863 a copy of which is hereto attached was published in said newspaper 1 day(s) between 07/19/2024 and 07/19/2024 and that the notice was published in the newspaper proper and not in any supplement; the first date of publication being on the 19th day of July, 2024 and that the undersigned has personal knowledge of the matter and things set forth in this affidavit.

/s/ _____
LEGAL ADVERTISEMENT RESPRESENTATIVE

Subscribed and sworn to before me on this 23rd day of July, 2024

Notary _____

Commission Expires: March 14, 2027

NATHANIEL CRISTOFER MARTINEZ
Notary Public - State of New Mexico
Commission # 1139927
My Comm. Expires Mar 14, 2027

LEGAL #76935

LEGAL #92863

AVISO DE PETICIÓN PARA NOMINAR AGUAS SUPERFICIALES DEL ESTADO PARA SU DESIGNACIÓN COMO AGUAS DE RECURSO NACIONAL EXCEPCIONAL

La Oficina de Calidad de Aguas Superficiales (SWQB, por sus siglas en inglés) del Departamento de Medio Ambiente de Nuevo México (NMED, por sus siglas en inglés) da aviso público de un borrador de petición para nominar (nominación) ciertas aguas superficiales del estado como Aguas de Recursos Nacionales Excepcionales (ONRW, por sus siglas en inglés). En consecuencia, el NMED ha desarrollado un lenguaje regulatorio para enmendar los Estándares para aguas superficiales interestatales y estatales, 20.6.4 NMAC, para designar estas aguas como ONRW. Las aguas califican para la designación ONRW como atributos significativos de un agua especial para truchas; un río silvestre designado; un parque, monumento o refugio de vida silvestre nacional o estatal; o una zona silvestre designada. Las ONRW tienen derecho a la más alta protección contra la contaminación según los estándares de calidad de las aguas superficiales de la Comisión de Control de Calidad del Agua de Nuevo México (WQCC, por sus siglas en inglés) en 20.6.4 NMAC.

El NMED celebrará un período de comentarios públicos de 30 días [illegible] sobre esta acción propuesta a partir del 20 de julio de 2024 y finalizará el 19 de agosto de 2024 a las 5:00 p.m. MDT. Los comentarios se aceptarán por correo postal, correo electrónico y el portal de comentarios inteligente de NMED en https://nmed.commentinput.com/comment/search. El borrador de la nominación, el lenguaje regulatorio enmendado y toda información relacionada se pueden encontrar en el sitio web de NMED a través del Smart Comment Portal o en https://www.env.nm.gov/surface-water-quality/wqs/. La petición y los apéndices contienen una lista de aguas nominadas, mapas, datos de referencia sobre la calidad del agua y otra información de respaldo para la nominación. Además, hay disponible un mapa SIG interactivo con los ONRW propuestos en https://gis.web.env.nm.gov/oem/?map=swqb.

Al finalizar el período de comentarios públicos, el NMED considerará los comentarios recibidos y, si corresponde, hará enmiendas a su nominación. El NMED tiene la intención de presentar una petición y solicitar una audiencia pública de reglamentación en la reunión ordinaria de la WQCC de septiembre de 2024. Si la WQCC concede una audiencia pública, la SWQB publicará un aviso de reglamentación al menos 60 días antes de la audiencia en el Registro de Nuevo México, en el Albuquerque Journal y en el sitio web de NMED. Ese aviso incluirá la

fecha, hora y lugar de la audiencia y cómo participar en la audiencia, incluidas instrucciones para unirse virtualmente, enviar comentarios públicos y presentar testimonios técnicos.

Para obtener más información y para enviar comentarios, comuníquese con Michael Baca, coordinador de estándares de calidad del agua, NMED SWQB, P.O. Box 5469, Santa Fe, NM, 87502, (505) 470-1652 o michael.baca1@env.nm.gov. Para mantenerse actualizado con las últimas noticias de NMED, regístrese en nuestro servidor de listas en https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

El NMED no discrimina por motivos de raza, color, origen nacional, discapacidad, edad o sexo en la administración de sus programas o actividades, según lo exigen las leyes y regulaciones aplicables. NMED es responsable de coordinar los esfuerzos de cumplimiento y recibir consultas relacionadas con los requisitos de no discriminación implementados por 40 C.F.R. Partes 5 y 7, incluido el Título VI de la Ley de Derechos Civiles de 1964, según enmendada; Sección 504 de la Ley de Rehabilitación de 1973; la Ley de Discriminación por Edad de 1975, el Título IX de las Enmiendas a la Educación de 1972 y la Sección 13 de las Enmiendas a la Ley Federal de Control de la Contaminación del Agua de 1972. Si tiene alguna pregunta sobre este aviso o cualquiera de los programas, políticas o procedimientos de no discriminación de NMED, puede comunicarse con: Kate Cardenas, coordinadora de no discriminación de NMED, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 o nd.coordinator@env.nm.gov. Si cree que ha sido discriminado con respecto a un programa o actividad de NMED, comuníquese con la coordinadora de no discriminación.

PUB: July 19, 2024

Appendix E1-E4. Stakeholder Engagement and Public Comment

Appendix E1 –Public Meeting PowerPoint Slides – August 8, 2024.

What is an Outstanding National Resource Water (ONRW)?

- Designated by the Water Quality Control Commission (WQCC)
  - Public Comment and Rulemaking process
  - Designated uses and water quality criteria remain unchanged
- Highest Level of Water Quality Protection
  - i.e., CWA Antidegradation - Tier 3 Water
- EPA acknowledges and supports protections

2

NMED Exhibit 4

3

Outstanding National Resource Waters

Prohibited

- Discharges that would cause degradation to ONRW
- Restoration activities that would not result in enhanced chemical, physical or biological integrity of the ONRW
- Temporary and short-term activities not necessary for public health and safety

Permitted

- Discharges that do not degrade the ONRW (existing or baseline conditions)
- Activities that will result in restoration of the chemical, physical or biological integrity of the ONRW
- Temporary and short-term activities that are necessary to accommodate public health or safety
- Pre-existing land use activities that are controlled by best management practices
- Acequia operation, maintenance and repairs

4

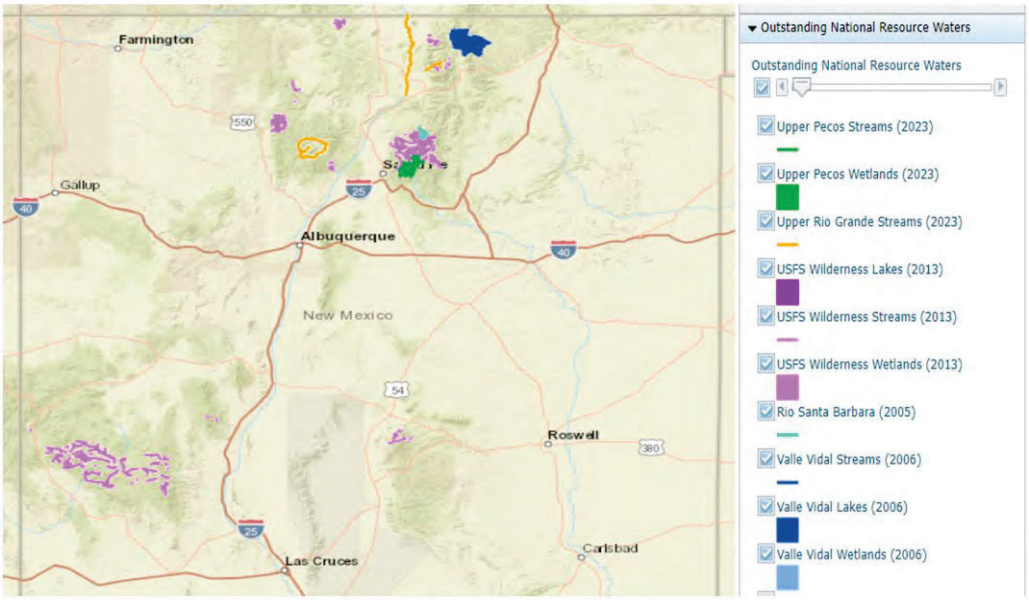
NMED Exhibit 4

Nominating an ONRW

- Any person may nominate an ONRW by petitioning the WQCC
- Can be petitioned at any time
- ONRW Designation is a rulemaking
- Must include elements and demonstration (20.6.4.9 NMAC)

5

Previously Designated ONRWs



NMED Exhibit 4

Outstanding National Resource Waters

Eligible Criteria (20.6.4.9(B) NMAC):

- Beneficial to the State

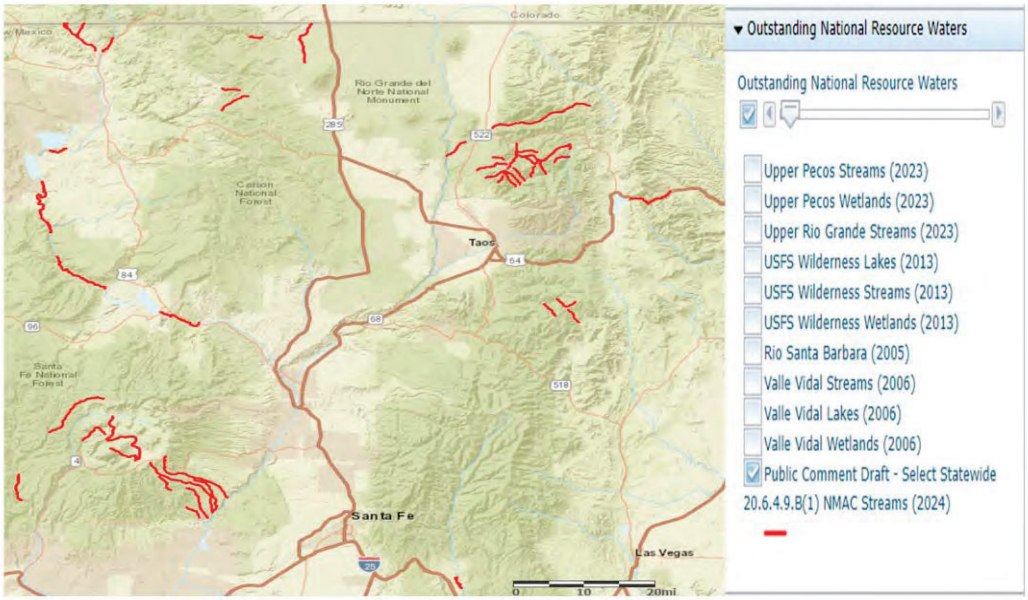
  And **One** of the Following
- **Special Designation – This Effort**
  - State Special Trout Water
  - National or State Park
  - National or State Monument
  - National or State Wildlife Refuge
  - Designated Wilderness Area
  - Designated Wild and Scenic River
- Exceptional Ecological or Recreational Significance
- Exceptional Water Quality
  - not modified by anthropogenic activities

Nomination (20.6.4.9(A) NMAC):

- Map(s) (Appendix A)
- Criteria Demonstrated through Evidence Based on Scientific Principles (Nomination)
- Activities that Might Reduce Water Quality (Nomination)
- Additional Evidence to Substantiate the Designation (Nomination)
- Water Quality Data to Establish Baseline (Appendix B)
- Affidavit of Public Notice of the Petition (Appendix D)

7

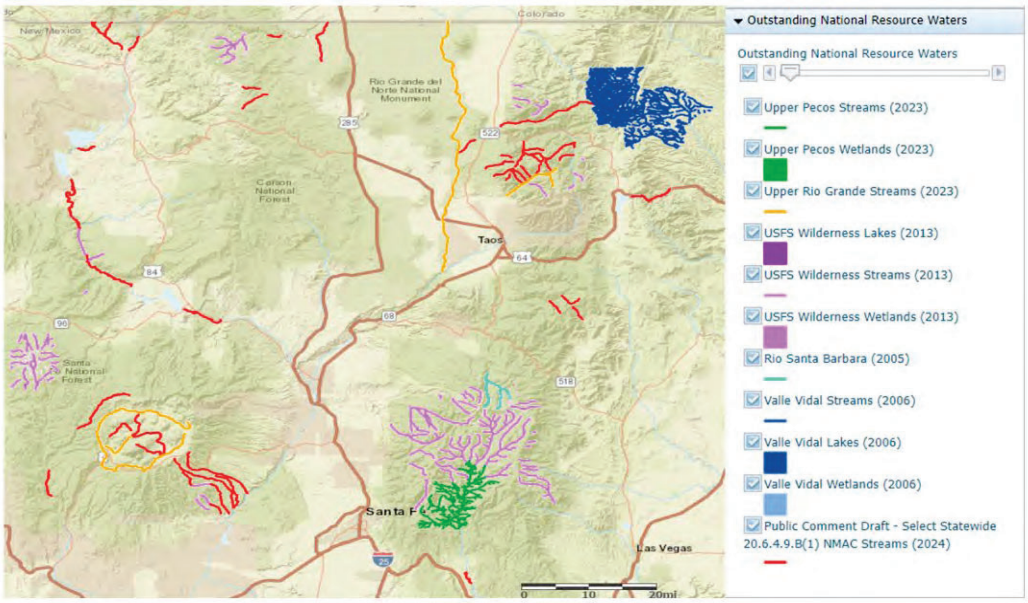
2024 ONRW Designation Nomination



8

NMED Exhibit 4

2024 ONRW Designation Nominations



9

How You Can Participate

Ask questions, or provide input and feedback:

- Do you support or oppose the nominated waters for ONRW designation?
- Provide anecdotal or scientific water quality information
- Are you familiar with or visited the nominated waters in the past?
- Do they hold special significance for you or your family?
- Anything else you think should be considered?

- Provide Public Comment to SWQB
  - July 20 – August 19, 2024
  - Public Comment Portal or email
- Attend SWQB and WQCC meetings
- Provide comment at WQCC meetings
  - Rulemaking Petition expected September 10, 2024
  - Request a December 2024 hearing
- Provide expert testimony at WQCC hearing
  - Instructions provided in the public notice of rulemaking
  - Anticipated publication in newspapers and NM Register
    - September 27, 2024
- Provide written or oral comment to WQCC
  - through the conclusion of rulemaking hearing
  - December 2024

10

NMED Exhibit 4

11 Where Can I Find Information?

SWQB Webpages:
https://www.env.nm.gov/surface-water-quality/wqs/
https://www.env.nm.gov/surface-water-quality/2024onrw/
https://www.env.nm.gov/surface-water-quality/onrws/
https://gis.web.env.nm.gov/oem/?map=swqb

NMED Webpages:
https://www.env.nm.gov/events-calendar/
https://nmed.commentinput.com/comment/search

WQCC Webpages:
https://www.env.nm.gov/opf/water-quality-control-commission/
https://www.env.nm.gov/opf/docketed-matters/

12 Smart Comment Demonstration

https://nmed.commentinput.com/comment/search

13

SWQB OpenEnviroMap Demo

https://gis.web.env.nm.gov/oem/?map=swqb

14

Questions?
For Additional Information Contact

Standards, Planning & Reporting Team
Surface Water Quality Bureau
New Mexico Environment Department
michael.baca1@env.nm.gov or 505.470.1652

https://www.env.nm.gov/surface-water-quality/2024onrw

Appendix E2 – 2024 ONRW Designation Nominations Public Meeting Summary – August 8, 2024.

Public Meeting Information

August 8, 2024, 5:30 – 7:00 PM, Virtual via WebEx.
Meeting link: https://nmed-oit.webex.com/nmed-oit/j.php?MTID=mf7ccfd4d254b3acd72374a10a7bfc8e8
Meeting number: 2630 314 1686
Meeting password: fWACFjmY384
Join by phone: +1-415-655-0001 Toll
Access Code: 26303141686
Join from a video or application: Dial 26303141686@nmed-oit.webex.com.
You can also dial 173.243.2.68 and enter your meeting number.

Meeting Summary

Michael Baca, New Mexico Environment Department (NMED), Surface Water Quality Bureau began the meeting at 5:35 PM with a brief introduction, background information, and goals of the meeting. Nathaniel Kamm, NMED, and Michael Baca provided a presentation on the current nomination followed by a demonstration of accessing material and information, navigating websites, and submitting public comment. Two people asked questions and four others provided supportive comments or praise for NMED's efforts. See below for more detailed information.

Participant List

Ann Callison
Bess
Call-in-User1
Call-in-User2
Chris Romero
Christine Schmidt
Claire Libin
Collen Cunningham, NMISC
Dal Moellenberg
Dan Roper
Elissa E
Elizabeth Stuffings, NMED
J.Hall
Jason Martinez, NMED
Kerry Mitchell
Kristin Kinic
Lucas Graunke, NMED
Lynette Guevara, NMED
Mellisa Houser
Oscar Simpson
Sally
Steven Fry, Amigos Bravos
Susan A Lucas Kamat, NMED
Thao Romero
Guest
iPhone

Chat Messages

Lynette Guevara 8/8/2024 5:55 PM • Frijoles, Palociento and West Fork Luna

Shelly Lemon 8/8/2024 5:57 PM • I believe these are in wilderness (headwaters) upstream of communities
Oh, they are special trout waters desginated by Game and Fish

Nate Kamm - NMED 8/8/2024 6:03 PM • Here are the links included on this slide:

Water Quality Standards (nm.gov)
2024 ONRW Designation Nominations (nm.gov)
Outstanding National Resource Waters (nm.gov)
OpenEnviroMap (nm.gov)
Events Calendar (nm.gov)
Choose Comment Item (commentinput.com)
Water Quality Control Commission (nm.gov)
Docketed Matters (nm.gov)

Shelly Lemon 8/8/2024 6:08 PM • you can click on it and it provides information in the stream segment

Kerry Mitchell 8/8/2024 6:15 PM • Just to be clear, is it that a petition can be made based on a special designation or ecological or recreational significance? And if so, can you speak to the relative distribution of the criteria that the successful petitions are based on?

Shelly Lemon 8/8/2024 6:21 PM • Rio Santa Barbara was wilderness. Upper Rio Grande Streams were ecological and recreational.
Upper Pecos was a combination of criteria (met one or two or three of the criteria)

Steven Fry - Amigos Bravos 8/8/2024 6:24 PM • I cant unmute. Just wanted to say that I appreciate your efforts Michael, Shelly, and the rest of the team. These waters provide some of the best trout habitat and fishing opportunities in the state but also incredibly critical for the wider ecosystems and the communities that rely on them. Proud to support this petition and look forward to working with NMED throughout the rest of the process

Kerry Mitchell 8/8/2024 6:24 PM • Yes - but fyi I still can't uncut.
unmute

Bess 8/8/2024 6:25 PM • Ditto on the thanks

Shelly Lemon 8/8/2024 6:28 PM • Thank you so much for taking time out of your day to learn more about this nomination and talk with us.

Dan Roper 8/8/2024 6:28 PM • Thanks again!

Sally 8/8/2024 6:29 PM • Thank you!

Susan A. Lucas Kamat, NMED (she/her) 8/8/2024 6:29 PM • Thanks Mike & Nate!

Questions and Comments

Chris Romero- Looking at slide 8, what are the streams that show up near the Colfax and Mora County line? Do they run through communities? How far from the headwaters does a segment have to be in order to meet eligibility requirements?

SWQB Response: (See chat as well). These streams, Frijoles, Palociento, and West Fork Luna meet the special trout water criteria. For this action, we will request that the WQCC designate all of the

nominated waters as ONRWs because they meet the criteria under 9(B)(1) and it will benefit the state. There are no other restrictions or requirements under that eligibility criteria.

Call-in-user 1, Rachel Allen, American Rivers – just checking to see if she is able to raise her hand on the phone. May want to comment later. Commented in support of the nominations at the end of the meeting.

Dan Roper, Trout Unlimited – Thanked the Department and the interested parties for moving the petition forward and recognized the importance of protecting these waters for future generations.

Appendix E3 - Comments Submitted via Smart Comment Portal and Email

Submitted via Smart Comment Portal

On Behalf of NGO

Paul Tashjian

See Appendix E.2 for comment.

Elle Benson

Dear Michael Baca,
On behalf of the Theodore Roosevelt Conservation Partnership (TRCP), I am writing in support of the New Mexico Environment Department's 2024 effort to designate 245 miles of stream that meet New Mexico's criteria at 20.6.4.9.B(1) NMAC ("Criteria One Waters") as Outstanding National Resource Waters ("ONRWs"). Criteria One Waters are waterbodies that have already been identified as important to New Mexico or the nation, such as special trout waters or waters in state or federal or national parks. ONRW protections would provide much needed water quality protections to these important water resources that are highly valued by the hunting and fishing community.

In the light of the recent Supreme Court's Sackett Decision, it is imperative that New Mexico protect the water quality of our streams. ONRW protections prohibit increased pollution to our waters while ensuring traditional and historic uses. These waters are the lifeblood for New Mexicans, serving as water sources for downstream domestic use, acequias and irrigation needs, and recreational activities that draw visitors from all over the world to New Mexico. In addition, these waters ensure the integrity of critical habitat for plants and wildlife that make New Mexico the Land of Enchantment. Our culture, economy, and ecosystems all rely on clean water and this designation will protect these streams for today's residents as well as for future generations.

Therefore, the TRCP joins the large coalition of community organizations, state and local government officials, farmers and ranchers, and recreationists in asking the New Mexico Environment Department to safeguard the water quality of these waters by nominating them as Outstanding National Resource Waters under the federal Clean Water Act. Thank you for your consideration. Respectfully, Elle Benson, Rio Grande Program Manager, Theodore Roosevelt Conservation Partnership

Martha Cooper

See Appendix E.2 for comment.

Bryan Bird

See Appendix E.2 for comment.

Judy Calman

Audubon supports the New Mexico Environment Department's 2024 effort to designate 245 miles of stream that meet New Mexico's criteria at 20.6.4.9.B(1) NMAC ("Criteria One Waters") as Outstanding National Resource Waters ("ONRWs"). Criteria One Waters are waterbodies that have already been identified as important to New Mexico or the nation, such as special trout waters or waters in state or federal or national parks. ONRW protections would provide much needed water quality protections to these important water resources.

Audubon's mission is to protect birds and the places they need. In New Mexico, where 80% of at-risk bird species are riparian habitat-dependent, this work necessarily focuses on water. 400 different species of birds in our state require healthy rivers and waterways to survive. As climate change progresses, protecting these areas becomes even more critical.

In the light of the recent Supreme Court's Sackett Decision, it is imperative that New Mexico protect the water quality of our streams. ONRW protections prohibit increased pollution to our waters while ensuring traditional and historic uses. These waters are the lifeblood for New Mexicans, serving as water sources for downstream domestic use, acequias and irrigation needs, and recreational activities that draw visitors from all over the world to New Mexico. In addition, these waters ensure the integrity of critical habitat for plants and wildlife that make New Mexico the Land of Enchantment. Our culture, economy, and ecosystems all rely on clean water and this designation will protect these streams for today's residents as well as for future generations.

Audubon joins the large coalition of community organizations, state and local government officials, farmers and ranchers, and recreationists in asking the New Mexico Environment Department to safeguard the water quality of these waters by nominating them as Outstanding National Resource Waters under the federal Clean Water Act. Very Sincerely, Judy Calman New Mexico Policy Director Audubon Southwest

Rachel Conn
Dear New Mexico Environment Departement,

Amigos Bravos is pleased to support NMED's 2024 ONRW Designation Nomination. ONRWs are a critical tool in protecting the water quality of New Mexico's streams, especially in response to the recent Supreme Court Sackett vs EPA decision which removed federal protections for up to 95% of our state's rivers and streams and 88% of our state wetlands. ONRW designations protect traditional community water uses by stopping new and increased water pollution while protecting pre-existing uses, even if they are sources of historic impacts. Once a waterbody is designated as an ONRW it is protected from new water quality pollution from mining, development, transportation, industrial, and other sources. Nominating the streams included in NMED's 2024 Designation will play a significant role in maintaining the health of New Mexico's ecosystems and the communities who rely upon them.

The nominated streams, most of which are Special Trout Waters, provide some of the best trout habitat and fishing opportunities in the state. Therefore, protecting water quality in the nominated waters directly supports our growing outdoor recreational economy.

Designating these streams as ONRWs benefits all New Mexicans and wildlife that call our state home. Amigos Bravos supports this designation and urges the New Mexico Environment Department to move forward with the full petition.

Please let us know if you have any questions or need clarification on our support of the nomination.

Patrick Lane
Thank you and the Department for the opportunity to comment on this important nomination. We'd like to thank the NMED Surface Water Quality Bureau staff for their work on this proposal and look forward to supporting the Department as it pursues designation by the WQCC.

New Mexico Wilderness Alliance (New Mexico Wild)
See Appendix E.4 for the uploaded PDF document for New Mexico Wild's comments. Thank you, Sally Paez, Staff Attorney, New Mexico Wild.

Rachel Ellis
To the New Mexico Environment Department (NMED):

American Rivers supports NMED's 2024 Outstanding National Resource Waters (ONRWs) nomination. In the petition, NMED's nominated streams are already recognized as some of New Mexico's most exceptional rivers and streams in that their: "water is a significant attribute of a state special trout water, national or state park, national or state monument, national or state wildlife refuge or designated wilderness area, or is part of a designated wild river under the federal Wild and Scenic Rivers Act."

We wholeheartedly support ONRW designation for rivers and streams that meet the above criteria as listed under 20.6.4.9(B)(1) NMAC. ONRW status will provide the highest water quality protections to these outstanding streams and rivers. State water quality protection is particularly important in New Mexico considering the recent removal of federal water quality protections from the vast majority of the states' rivers, streams, and wetlands—especially with simultaneously increasing demands on the state's decreasing water supply. Importantly, ONRW designation provides this protection while also allowing for continued existing uses, acequia operations, and watershed restoration.

We agree that ONRW designation complements and strengthens water quality protections within designated Wild and Scenic Rivers. Of note, we do want to clarify language in the petition that states that federal Wild and Scenic Rivers do "not provide any water quality-based protections" (p. 7). Under the Wild and Scenic Rivers Act, a designated river's water quality must be maintained and, where possible, enhanced as described in Section 10(a) of the Act. Water quality protection is a core pillar of the Act. We direct NMED to the "Evaluation of State Water Quality Assessments and the National Wild and Scenic Rivers System" (IWSRCC, 2018) for further information and would be happy to engage in further discussion if helpful.

In conclusion, American Rivers agrees with NMED's assessment that protecting water quality in New Mexico is a vital priority and that this ONRW petition will benefit the people of New Mexico and the ecosystems on which we all rely. We encourage NMED to move forward with the full petition.
Please let me know if you have any questions about our support of the nomination.

Karen Menetrey
This comment is on behalf of Rio Grande Return, a 501c3 non-profit organization:
Rio Grande Return supports designating 245 miles of nominated streams in the Rio Chama, Conejos, Upper Rio Grande, Cimarron, and Pecos headwaters, and Jemez, and Rio Grande-Santa Fe watersheds as Outstanding National Resource Waters (ONRWs).

The nominated streams and their associated floodplains offer tremendous ecological potential for water storage and wildlife habitat as well as exceptional recreational qualities. Rio Grande Return is actively working in several of the watersheds to improve aquatic and riparian ecosystems using low tech process-based restoration. Specifically, we have improved water quality, water storage capacity, and wildlife habitat along Nabor Creek, Rio Chamita, Rio Chama, Rio San Antonio, Rio Cebolla, Rio Guadalupe (in design phase), Rito de Los Indios, Jaramillo Creek, and Sulphur Creek. Designation as ONRWs will help protect and sustain this work and support investments in New Mexico's natural resource infrastructure.

Rio Grande Return agrees that the water in the nominated streams has exceptional recreational or ecological significance and that ONRW designation would be beneficial to the State of New Mexico.

Supportive- Specific Waters

David Fairris

I am a lover of streams and an avid fly fisherman. Several of the streams being proposed for this special status represent virtual "joys of my life." Fishing the Pinos in the fall, for example, or the Red before the summer flow, are important part of my life in Northern New Mexico. Please keep them clean and sacred.

Steve Barrett

I am an avid conservationist, rafter and fly fisher. I support all of the nominated waters and feel water is our most important resource, for people and for the ecosystems that the streams and rivers support.
I am especially concerned about the Rio Chama, both the section below El Vado Dam and what the continued dam construction has done to water quality below, but especially the Chama below Abique Dam. It could be another world class tail water fishery like the San Juan River. Instead it has drastically fluctuating water levels like an irrigation ditch that dewaters it in the winter when brown trout eggs dry out after the spawn or such high flows that it sunfish able.
Thank you, Steve Barrett

Todd Monson

I support for the state's 2024 Outstanding Waters nominations. I enjoy so many of these waters. In particular, I love fishing in many of them: the Rio Chama, Columbine Creek, the Red River, the Pecos River in PNHP, and I am looking forward to exploring some of the others.

Flint Cooper

The New Mexico Environment Department has nominated 245 river and stream miles to be designated as Outstanding Waters, including most of the state's Special Trout Waters. Outstanding Waters, commonly referred to as ONRWs, are a state-led water quality designation, resulting in the highest level of water quality protection afforded to waterways in the state.

This is a BIG opportunity to protect New Mexico's rivers and trout. The list of nominated waters includes popular trout streams like the Rio Chama, Cimarron, Red River, Rio Cebolla, Rio Guadalupe, Rio de Los Pinos, and Pecos River in Pecos National Historic Park. It also includes important Red Chile (Native Trout Conservation) Waters like Cabresto, Columbine, and Frijoles Creeks, to name just a few.

Doug Reaber

I fully support NMEDs actions regarding the nomination of special trout waters. Although I have not fished all of them, those I have had the privilege to fish, including the waters within the Valles Caldera, the Chama, Los Pinos, and Rio Guadalupe are all truly amazing. Thank you for your efforts. These designations will be great for the state!

Private Land

Marcia Fernández

My family owns land in Rio Arriba County. It includes approximately 1/2 mile along the Rio Chama near the confluence of the Rio Nutrias. We believe this to be a very beautiful and important part of northern NM and agree that it should be protected from all pollutants and other things that could potentially

damage it. In reading the documents posted online, I did not see anything that indicated changes or obligations that would impact land owners such as ourselves. Please advise us if there will be anything changes affecting the ways we use this land. Thank you. Marcia Fernández and D.R. " Rip" Anderson

Sandi Wilkie
Our concern would be the possible impact on private landowners and water rights owners. If this designation would affect said citizens, do they have the option to opt out? How will such a designation affect traditional cultural water users? How will such a designation affect water right owners downstream and upstream?

Other/Mining

Lucy Lippard
What a terrible idea to restore mining in the middle of one of New Mexico's favorite beautiful playgrounds for fishing and hiking. Surely this should not go ahead and sanity will win out. Remember the people who enjoy this place and stop catering to corporations.

Suggesting Other Waters

Marke Talley
Please consider placing ORNW protection status on the following streams and lakes:
Las Conchas steam and campground just off the road to theValla Grande, Frijoles Canyon stream and supply lakes in Bandelier National Monument land, Santa Cruz Reservoir near Chimayo, Canjilon Lakes and Streams, Storrie Lake and its tributaries, near Las Vegas, New Mexico.

Scott Larson
The Pecos River should be named a Outstanding National Resource Water from the headwaters to the Pecos National Historical Monument and below. This is an amazing public resource, a productive fishery and generates valuable revenue for the local economy. This valuable resource and ecosystem is under threat from Comexico LLC, a Colorado subsidiary of Australian mining company New World Resources, who want so to drill pilot holes to test for the feasibility of a full mining operation. Haven't we learned from previous incidents that the risk of contamination do not outweigh the benefits of a foreign national company extracting NM resources for their own capital gain? The Gold King Mine (attached image) disaster in the Animas River watershed demonstrates the damage a mining operation can have on an irreplaceable natural resource.

Robert Knight
This urgent, the Pecos in sfnf and the state park should be included. I wholeheartedly support this.

Benjamin Green
I am happy to read that NMED is expanding the list of waters designated ONRW. I supported the initial designations, and support these additions.

I am especially grateful to see the rivers/creeks in the Jemez Mountains listed. These are my home waters. These waters are why human beings inhabit this region, and have for tens of thousands of years. They support lifestyles, human and wildlife.

I am a trout fisher. Trout need clean, cool water to thrive. ONRW will help conserve trout waters throughout the state and my region. The Guadalupe, Cebolla are rivers I fish often, and do conservation

work on in conjunction with New Mexico Trout, Trout Unlimited, and the Forest Service. They deserve extra protections to preserve their value as natural assets.

Yesterday, I fished the Rio Gallina, Rio Puerco, and Canones Creek. These are now wild fisheries with in extraordinary landscapes. Not only do they provide habitat for trout-- now wild rainbows and cutthroats, but they also provide irrigation water. They also deserve consideration for ONRW. I hope to see them on a list soon.

Thank you for considering my comments.

Tesuque Creek

Sabrina Staires

I would like to request that the Big Tesuque Creek be added to the currently nominated bodies of water. The Big Tesuque runs through Santa Fe national forest and is a healthy spring fed creek that contributes to a healthy aquifer. It is vulnerable and valuable. Many people hike, bike and ride near it on their bicycles daily. It is a pristine and beautiful body of water that deserves protection.

I hope that you will deeply consider protecting this valuable asset to New Mexico.

Thank you for considering adding the Big Tesuque to your current nomination cycle.

Kerry Green

I would like to request that the Big Tesuque Creek be added to the currently nominated bodies of water. The Big Tesuque runs through Santa Fe National Forest and is a healthy spring fed creek that contributes to a healthy aquifer. It is vulnerable and valuable. Many people hike, bike and ride near it on their bicycles daily. It is a pristine and beautiful body of water that deserves protection.

I hope that you will deeply consider protecting this valuable asset to New Mexico.

Thank you for considering adding the Big Tesuque to your current nomination cycle.

Glenn Green

I would like to request that the Big Tesuque Creek be added to the currently nominated bodies of water. The Big Tesuque runs through Santa Fe National Forest and is a healthy spring fed creek that contributes to a healthy aquifer. It is vulnerable and valuable. Many people hike, bike and ride near it on their bicycles daily. It is a pristine and beautiful body of water that deserves protection.

I hope that you will deeply consider protecting this valuable asset to New Mexico.

Thank you for considering adding the Big Tesuque to your current nomination cycle.

Sandy Green

I would like to request that the Big Tesuque Creek be added to the currently nominated bodies of water. The Big Tesuque runs through Santa Fe National Forest and is a healthy spring fed creek that contributes to a healthy aquifer. It is vulnerable and valuable. Many people hike, bike and ride near it on their bicycles daily. It is a pristine and beautiful body of water that deserves protection.

I hope that you will deeply consider protecting this valuable asset to New Mexico.

Thank you for considering adding the Big Tesuque to your current nomination cycle.

Corinne Kratz
Please add the Big Tesuque creek to the of bodies of water nominated for protection.

Running through Santa Fe National Forest the Big Tesuque is a lovely spring-fed creek that helps sustain the area's aquifer but is vulnerable to development and diversion. It is currently a place where people can hike, bike and enjoy its relaxing sound and cool peace. This peaceful, valuable body of water requires and deserves protection. Please protect this valuable New Mexico asset by including it in the list of bodies of water for protection.

David Morton
I would like to request that the Big Tesuque Creek be added to the currently nominated bodies of water. The Big Tesuque runs through Santa Fe National Forest and is a healthy spring fed creek that contributes to a healthy aquifer. It is vulnerable and valuable. Many people hike, bike and ride near it on their bicycles daily. It is a pristine and beautiful body of water that deserves protection.

Kimberly Carroll
I would like to request that the Big Tesuque Creek be added to the currently nominated bodies of water. Big Tesuque Creek is a pristine body of water that starts in the Santa Fe National Forest from a spring. I have sat next to that spring in the forest and it is a treasure! The waters from Big Tesuque feed the aquifer where I currently reside in Tesuque Village. The creek runs across the road I now live on. This small but mighty body of water is a life source for many residents, Pueblo lands, animal and plant life. Please consider adding it to the currently nominated bodies of water.

Jamie Gagan
I would like to nominate Big Tesuque Creek and likewise Rio Tesuque in Northwern New Mexico. It is spring fed and descends from the Santa Fe National Forest through the historic villages of Tesuque and Pojoaque, and through 3 Pueblos before reaching the Rio Grande. It is enjoyed by residents, day hikers and abundant wildlife year round. Thank you for your consideration.

Avery Sponholz
I would like to request that the Big Tesuque Creek be added to the currently nominated bodies of water for ONRW status. The Big Tesuque runs through Santa Fe National Forest and is a healthy spring fed creek that contributes to a healthy aquifer. It is vulnerable and valuable. Many people recreate along this waterway as they access the Windsor Trail - the most heavily traveled trail in the state of New Mexico. The Big Tesuque Creek also provides critical flow through the Pueblo of Tesuque.

I hope that you will consider protecting this valuable asset to New Mexico.

Thank you for considering adding the Big Tesuque to your current nomination cycle.

Cathie Sullivan
I would like to nominate the Big Tesuque stream as deserving of ONRW status and protection. In its upper reaches it flows in part through a geologically interesting, physically beautiful and floristically rich area. Some of the canyon rocks are, I understand, up-thrusted then river-eroded 300 million year old

limesomes originally laid down in ancient seabeds. The water is in part from arisian sources and very clean.

Bruce Scott
I request that the Big Tesuque Creek be added to the currently nominated bodies of water. This is a beautiful creek running through the Santa Fe National Forest. It is healthy, spring-fed and gives life to a healthy aquifer. Because it enters a residential area it is vulnerable to the effects of human building and development. We watch thousands of people a year hike and bike it daily from Hyde Park Road into Tesuque. Please help protect this wonderful New Mexico asset.

Thank you for considering adding the Big Tesuque Creek to your current nomination cycle.

IKen Robinson
Thank you for your help today! I very much would love to add the Big Tesuque Creek to the protected list of An Outstanding National Resource Water. The creek rises out of the land in the national forest and streams down into a section of Santa Fe and then drops into Tesuque and then heads farther north. It is pure water from Nature and gives life to countless plants, trees, animals (including deer, bears, foxes, coyotes, rabbits, squirrels, birds of all kinds, cougars, etc), as well as healthy tiny organisms. The creek is beloved and draws to it many hikers. It is a source of refreshment for the entire area and the many diverse people who visit from all over. It brings cool air to the area, too. It is beloved to the people of Santa Fe and Tesuque and beyond, as it is a life line that feeds the aquifer of the area, and it brings immeasurable delight to many people like myself who like to visit it, stand in it, sit by it, and admire it. It brings enormous peace. I once was sitting quietly by the creek behind a bush watching humming birds hover over the water for bugs and cool air, when a local woman walked by on the nearby road. She stopped at the creek, and while facing north and looking over all the trees that stand guard along the water, she gently raised her hands over head, as if she were praying with deep heartfelt intent and gratitude. Beautiful - so touching. As you might imagine, the Big Tesuque Creek fills the heart and spirit and courses through the landscape as a national tribute to the beauty and splendor and caring of New Mexico and her people. Thank you for opening your heart to my and many others' words and love, so that together we can really take care of our amazing water ways!

Elizabeth de Prospero
I am against any contamination of our precious water. Block dumping in the Tesuque creek.

Nancy Waight
I would like to request that the Big Tesuque Creek be added to the currently nominated bodies of water. Big Tesuque Creek is a pristine body of water that starts in the Santa Fe National Forest from a spring. I have sat next to that spring in the forest and it is a treasure! The waters from Big Tesuque feed the aquifer where I currently reside in Tesuque Village. The creek runs across the road I now live on. This small but mighty body of water is a life source for many residents, Pueblo lands, and animal and plant life. Please consider adding it to the currently nominated bodies of water for protection.

Reeve Stein
I would like to request that the Big Tesuque Creek be added to the currently nominated bodies of water. Big Tesuque Creek is a pristine body of water that starts in the Santa Fe National Forest from a spring. I have sat next to that spring in the forest and it is a treasure! The waters from Big Tesuque feed the aquifer where I currently reside in Tesuque Village. The creek runs across the road I now live on. This

small but mighty body of water is a life source for many residents, Pueblo lands, and animal and plant life. Please consider adding it to the currently nominated bodies of water for protection.

Stephen Tanner
Please designate the bodies of water—Big and Little Tesuque Rivers—for increased protection from pollution. My well (and those of many others) draws water from the aquifer supplied by these small, but essential streams originating in the Sangre de Cristo mountains. Many residents of the Village of Tesuque, Tesuque Pueblo and other pueblos use this river water for irrigation as well. Thank you,

Leigh Hoppe
I would like for Big Tesuque Creek to be added to the list of ONRW designated waters. The Creek is currently a pristine body of water that originates in the mountains of Santa Fe and is a source of fresh water to the surrounding communities. Unfortunately it is at great risk of contamination by powerful and careless corporations seeking profits over environmental protection. Your designation may be the only way to protect this valuable resource.

Benjamin Shield
I am writing to formally request the inclusion of Big Tesuque Creek in the current nomination cycle for protected bodies of water.

Big Tesuque Creek flows through the Santa Fe National Forest and is a vibrant, spring-fed creek that plays a crucial role in maintaining a healthy aquifer in the region. Its pristine waters and the surrounding natural beauty make it an invaluable resource for both the ecosystem and the community. The creek is a popular spot for hiking, biking, and other recreational activities, attracting numerous visitors daily who enjoy its serene and unspoiled environment.

Given its vulnerability and the significant benefits it provides, it is imperative to ensure the protection of Big Tesuque Creek. Preserving this water body will not only safeguard the local biodiversity but also continue to offer a clean, natural space for the community and future generations.

I kindly urge you to consider the addition of Big Tesuque Creek to the list of protected bodies of water. Your support in this matter would be greatly appreciated and would contribute immensely to the conservation efforts in New Mexico.

Ann Lopresti
I would like to request that the Big Tesuque Creek be added to the current list of bodies of water nominated for protection. I have hiked along this creek for years and would love to see it remain unaltered by the addition of foreign substances. It is imperative that we advocate for our natural resources as they are dwindling even more. Please do not let corporate convenience prevail over our water. Thank you.

Philip Shields
Big Tesuque Creek

Christopher Bernschein
Please consider adding the Big Tesuque River to the ONRW list. This stream adds to many outdoor recreation areas, supports a variety of wildlife, and is an important water resource in a very dry climate.

Karen Buxbaum
I would like to request that the Big Tesuque Creek (Rio Tesuque) be added to the currently nominated bodies of water. Big Tesuque Creek is a pristine body of water that starts in the Santa Fe National Forest from a spring. The waters from Big Tesuque then feed the aquifer where I currently reside near Tesuque Village. The creek runs across the road I now live on. This small but mighty body of water is a life source for many residents, Pueblo lands, and animal and plant life. Please consider adding it to the currently nominated bodies of water for protection.

Supportive- General

Edwin Barker
I very strongly support the 2024 Outstanding Waters nominations: Pecos Upper Watershed.

My Dad (Roy E Barker) was Director of Fisheries for the Game And Fish Dept in the 1050's and 1960's. This is why I SUPPORT clean water and healthy trout streams in New Mexico.

Eric Swanson
I support designating 245 miles of nominated streams in the Rio Chama, Conejos, Upper Rio Grande, Cimarron, and Pecos headwaters, and Jemez, and Rio Grande-Santa Fe watersheds as Oustanding National Resource Waters (ONRWs).

The nominated streams provide some of the best trout habitat and fishing opportunities in the state and I support protecting these streams to safeguard water quality in these special waters.

I urge the New Mexico Environment Department to move forward with the petition to nominate 245 miles of streams as Outstanding National Resource Waters (ONRWs).

The nominated streams play a significant role in maintaining the health of New Mexico's ecosystems and living organisms and create or enhance recreational opportunities and experiences for all New Mexicans. I support the designation and urge the New Mexico Environment Department to move forward with the full petition.

John Schweitzer
Water is life to all living creatures. The quality of water is critical to those beings that don't have the luxury of us humans to treat it for their use. I strongly support protections on all of our rivers, particularly so in our arid Southwest.

Dr Richard Rubin
I am a fifty year fisherman in Northern NM and retired physician. We need to preserve quality of our waters for quality of life, health, culture, and economy. I vote for ONRWs.

Brian Kwiatkowski
I am writing in support of designating 245 miles of nominated streams in the Rio Chama, Conejos, Upper Rio Grande, Cimarron, and Pecos headwaters, and Jemez, and Rio Grande-Santa Fe watersheds as Outstanding National Resource Waters (ONRWs). These streams provide some of the best ecological function and values in the state, including outstanding water quality, trout habitat, fishing, and recreational opportunities. I urge the New Mexico Environment Department to move forward with the petition to nominate 245 miles of streams as Outstanding National Resource Waters (ONRWs). I support

the designation and urge the New Mexico Environment Department to move forward with the full petition. Thank you for your consideration. Sincerely, B. Kwiatkowski

Sayan Mukherjee
I support designating 245 miles of nominated streams in the Rio Chama, Conejos, Upper Rio Grande, Cimarron, and Pecos headwaters, and Jemez, and Rio Grande-Santa Fe watersheds as Oustanding National Resource Waters (ONRWs). The nominated streams provide some of the best trout habitat and fishing opportunities in the state and I support protecting these streams to safeguard water quality in these special waters.

Lana Green
I agree with the stated proposal of the 2024 ONRW Designation nominations and support all aspects of this effort.

I am a theologian and a retired environmental education teacher, in addition to being a wife, mother and grandmother. Particularly, as a theologian, humankind is mandated to care for and sustain creation as a gift. To tend the garden of the world sustainably means to honor all of its members in love and wisdom. Water, in all her forms is precious gift and demands our wise use and care for generations; even unto the sixth and beyond.

Carina Short
I support designating 245 miles of nominated streams in the Rio Chama, Conejos, Upper Rio Grande, Cimarron, and Pecos headwaters, and Jemez, and Rio Grande-Santa Fe watersheds as Outstanding National Resource Waters (ONRWs).

The nominated streams play a significant role in maintaining the health of New Mexico's ecosystems and living organisms and create or enhance recreational opportunities and experiences for all New Mexicans. I support the designation and urge the New Mexico Environment Department to move forward with the full petition.

Nicholas Archuleta
I support designating 245 miles of nominated streams in the Rio Chama, Conejos, Upper Rio Grande, Cimarron, and Pecos headwaters, and Jemez, and Rio Grande-Santa Fe watersheds as Oustanding National Resource Waters (ONRWs).

The nominated streams provide some of the best trout habitat and fishing opportunities in the state and I support protecting these streams to safeguard water quality in these special waters.

I urge the New Mexico Environment Department to move forward with the petition to nominate 245 miles of streams as Outstanding National Resource Waters (ONRWs).

The nominated streams play a significant role in maintaining the health of New Mexico's ecosystems and living organisms and create or enhance recreational opportunities and experiences for all New Mexicans. I support the designation and urge the New Mexico Environment Department to move forward with the full petition.

Cozette Christian

The nominated streams provide some of the best trout habitat and fishing opportunities in the state and I support protecting these streams to safeguard water quality in these special waters.

Carol Clericuzio
I fully support the petition for this Outstanding National Resource Water nomination.

Carol Sassaman
From wild trout to downstream communities, we all rely on clean water. Outstanding Waters nominations are an excellent tool for protecting water quality and streams in New Mexico, and I support the waters being nominated by the New Mexico Environment Department. This petition represents many of New Mexico's best rivers and streams, from state designated Special Trout Waters to federally designated Wild and Scenic Rivers. Preserving them for future generations is the right thing to do.

Dee Sands
From wild trout to downstream communities, we all rely on clean water. Outstanding Waters nominations are an excellent tool for protecting water quality and streams in New Mexico, and I support the waters being nominated by the New Mexico Environment Department. This petition represents many of New Mexico's best rivers and streams, from state-designated Special Trout Waters to federally designated Wild and Scenic Rivers. Preserving them for future generations is the right thing to do.

David Marsh
I encourage you to support all the ONRW designated waters in New Mexico. This is huge opportunity to conserve critical habitat and ensure we have these wonderful resources for deades to come.

Jeff Young
I support all proposed nominations for the 2024 outstanding waters. I am an avid trout fisherman and regularly fish many of the waters that are up for nomination. These places are special not only for the trout fishery but for clean and cold water that is so valuable for New Mexico and it's residents. Everything flows downstream. Thank you for your consideration. Jeff Young

Debra Oliver
I support designating 245 miles of nominated streams in the Rio Chama, Conejos, Upper Rio Grande, Cimarron, and Pecos headwaters, and Jemez, and Rio Grande-Santa Fe watersheds as Outstanding National Resource Waters (ONRWs).

The nominated streams provide some of the best trout habitat and fishing opportunities in the state and I support protecting these streams to safeguard water quality in these special waters.

I urge the New Mexico Environment Department to move forward with the petition to nominate 245 miles of streams as Outstanding National Resource Waters (ONRWs).

The nominated streams play a significant role in maintaining the health of New Mexico's ecosystems and living organisms and create or enhance recreational opportunities and experiences for all New Mexicans. I support the designation and urge the New Mexico Environment Department to move forward with the full petition.

An ONRW designation for these waters will protect traditional community water uses, and safeguard waterways from mining, development and transportation, pollution, and the impacts of climate change.

ONRW protections acknowledge and respect traditional land uses such as grazing. These protections prohibit new or increased sources of pollution. Therefore, existing, ongoing activities are not negatively impacted.

Please do your utmost to protect clean river waters for all human, plant and animal species for generations to come.

Thank you!

Michael Jozwiakowski
As an active outdoorsman and supporter of Trout Unlimited, I am keenly aware of the importance of clean healthy water for fish populations, and their indication of healthy conditions for humans. I want to express my strong support for all the designated waters in New Mexico, where water is scarce and precious and deserves our protection.

Rich Douville
I strongly support adding further protections for New Mexico's outstanding quality waters trout streams. These are treasures we must preserve for future generations, and they provide a significant economic and social benefit to our communities.

Martha Lennihan
My husband and I strongly support designation and protection of New Mexico's trout rivers and streams. They are a precious and invaluable resource for the public, and future generations. Such surface waters are vulnerable to damage and merit our protection.

Brandon Smith
I support all of the state's 2024 Outstanding Waters nominations because I value clean water and healthy trout streams.

Trevor Loy
I am writing to support all of the state's nominated waterways for 2024 Outstanding Waters. As temperatures continue to rise due to climate change, the availability of clean water is essential in our high desert environment. As an angler, I treasure our access to streams with healthy trout populations. Thank you for taking this step forward for coldwater conservation in New Mexico.

Beth Enson
I strongly support the designation of all these waters as ONRWs! As climate change, increasing tourism, rampant development and fossil fuel extraction threaten our state's environment we must do everything in our power to protect the source of life.

Kyle Ruggles
I support all waters that are nominated.

David Howard
Promoting healthy trout waters, and healthy habitats will teach the next generation to continue the process.

Viviette Hunt

ONRW Designation status is essential to protect the wildlife, farmers, community wells and watershed.

William Petrick
New Mexico is a beautiful state with outstanding beauty and natural resources but not enough protection for its precious streams. Too often they are seen only as sources of water and not for the beauty and life they give to us all. I support giving these nominated streams the protection and support they deserve.

Patricia Worth
Honorable Citizen Leaders,

I support designating 245 miles of nominated streams in the Rio Chama, Conejos, Upper Rio Grande, Cimarron, and Pecos headwaters, and Jemez, and Rio Grande-Santa Fe watersheds as Oustanding National Resource Waters (ONRWs).

The nominated streams provide some of the best trout habitat and fishing opportunities in the state and I support protecting these streams to safeguard water quality in these special waters.

I urge the New Mexico Environment Department to move forward with the petition to nominate 245 miles of streams as Outstanding National Resource Waters (ONRWs).

The nominated streams play a significant role in maintaining the health of New Mexico's ecosystems and living organisms and create or enhance recreational opportunities and experiences for all New Mexicans. I support the designation and urge the New Mexico Environment Department to move forward with the full petition. Respectfully, Patricia Worth RN, IBCLC

Cody Dems
Dear Michael Baca and New Mexico Environment Department,

I support designating 245 miles of nominated streams in the Rio Chama, Conejos, Upper Rio Grande, Cimarron, Pecos headwaters, Jemez, and Rio Grande-Santa Fe watersheds as Outstanding National Resource Waters (ONRWs). I recognize this nomination came about through many conversations led by a diverse coalition of New Mexico based non-profits, departments, and community members, and I trust that their foresight to strengthen water quality protections will benefit all New Mexicans.
I urge the New Mexico Environment Department to move forward with the petition to nominate 245 miles of streams as ONRWs. Thank you for you consideration, Cody Dems.

Robert B Stuewe
I support all the waters in NMED's 2024 Outstanding Waters nomination. The rivers and streams being nominated include many of New Mexico's best trout waters, for both fishing and native trout conservation. Clean water and native trout are important for future generations of New Mexicans.

Brian Long
Water protection is the most important thing for New Mexico, we all depend on it.

I urge the New Mexico Environment Department to move forward with the petition to nominate 245 miles of streams as Outstanding National Resource Waters (ONRWs).

The nominated streams play a significant role in maintaining the health of New Mexico's ecosystems and living organisms and create or enhance recreational opportunities and experiences for all New Mexicans. I support the designation and urge the New Mexico Environment Department to move forward with the full petition.

Michael Mick Brown
I fully support the NMED initiative to designate the waters named in the plan as ONRW. It is imperative that our limited resources are given heightened monitoring and oversight to evaluate water quality.

Art Vollmer
I know I am a little late, but please accept these comments in support of the SWQB's nominations for designation as an Outstanding National Resource Waters (ORNW). New Mexico lags behind other western states in recognizing the economic and environmental values resulting from improving the quality of its coldwater fisheries and restoring native fish to their home waters. Designating these stream reaches as ONRWs will make a statement that New Mexico values high water quality in its streams and is willing to take action to preserve water quality at the highest levels. The protection from water quality degradation that accompanies designation as an ONRW will ensure public opportunity enjoy sparkling mountain streams.

New Mexico's coldwater fisheries, especially those with native fish species, require high water quality too. Protecting these waters through an ONRW designation will help ensure their high water quality is maintained and thus aid native fish, especially the Rio Grande Cutthroat trout, restoration efforts there. Successes of native trout restorations across the West show that restoration of native trout benefits both the trout and anglers while at the same time providing significant contributions to local economies and the environment. I believe that the protection extended by ONRW designation in conjunction with native fish restoration projects conducted under the watchful eye of the New Mexico Game and Fish Department, the New Mexico Environment Department and the Water Quality Control Commission will ensure that the recreational and ecological significance of the nominated waters is maintained and possibly improved.

Submitted via Email (michael.baca1@env.nm.gov)

Carol Joan Patterson
Michael Meade
Raye Myers
Michael Flores
Kathie B
Howard Cohen
Marcia Demento
MJ Gallahan
Mary Foley Foley
Rich Reynolds
Ryan Magee
Glenda Fletcher
Christopher Wentz
Bonnie MacRaith
Casey McFarland
Sherry Beatty
Beth Cohen
Ross Ulibarri
Elizabeth Ziers
Carolyn Gamiao
Scott Geary
Nancy Stockdale
Leslie Wilbur
Elizabeth Rhodes
Ed Kossmann
Patti Packer
Carl Struck
Paula Hartgraves
Kathleen Granillo
Diane Stevenson
Silke Bletzer
E M Geouge
Thomas Talbot
Sandra and Glenn Griffin
Patricia Vineski
Cheryl Landgren
Dale Kappy
Janie Zackin
Donna Jobe
Vanessa Hartman
M Pal
Reece Parker

Maria Dougherty
Michael McMahan
Walter K Barger
Edward DeFrancia
Liz Vance
Tracy Brees
Sean Solowiej
Lane Andress
Tanya Barlow
Sue Small
Rosina Medina
Mark Harrison
Christopher Lish
Heloise Matt
Claudio Henry
Martha Sorensen
Luwana Wanaisie
Mark Walch
Morgan Paige
Stephanie Laman
David Schlessinger
Kim Card
June Elliott
Israel McMullin
Samuel Morningstar
Karla Devine
J Franz
Janet Griego
Steve and Tina Ehrman
Catherine Williams
Glenn Stocki
Peggy Elston
Ms Zentura
Andrew Wadsworth
Tedd Ward Jr.
Gordon Parker III
MaryAnna Foskett
Catharine Stringfellow
Diane Bloom
Craig C
Nikoma Henkels
Stephen Jatho
Monica DuClaud
Mary Harrison
Mary Ann Leitch
Sandra Vieth
Lura Brookins
Sandra Marshall
Signe Stuart
Dave Wheelock
Kenneth Schowengerdt
David Burtis
Forrest Netzel
Ryan Winton
Patricia R Wendell
Marcia Kellam
Steve Sklar
Patricia Michaels
William Orr
John Falvey
Silvia Bertano
Carol Yerden
Chris Townley
A Felix
Joyce Crews
Daniel Berman
Elena Tillman
Gary Wolf Ardito
Kirsten Lear
Brea Viragh
Christine Hill
John Handelin
Elizabeth Burdick-Romero
Margaret Burgess
Faith Harmony
Pamela Hamilton
Thomas Thornburg
Gary Goddard
Denise Saccone
Darren Strain
Joan Eilers
Therese Ryan
Lynn DiFiore
Craig Jolly
Seth Rabke
Julija Merljak
Meryl Pinque
Candy Bowman
Paul Kelly
D Bello
Amanda Graham
Susan Reichel-Halverson
Donald Smith
Liz Murphy
Kathy Glatz
Sandra Hareld
Corey Townsend
Allan Chen
Linda Carroll
Blaine Wimberly
Michele Johnson
George Craciun
Kathi Ridgway
Dorothy Beatty
G. Paxton
Alma Best
Rebecca Reynolds
Sylvia De Baca
Marge D
Jamie Shields
Robin Spiegelman
Scott Harrison
Ralph Bakshi
Heide Coppotelli
Teresa Nylander
Jean Stevens
C. Borello
Patricia Foschi
Doug Krause
Shari Tarbet
Elmer Martinez
Henry Kimbell
Norm Gagne
Mitzi Deitch
Ellen Gutfleisch
Doug Sporn
Camille Gilbert
Gilda Nuss
Bill Tiwald
Carol A Sassaman
Lauri Costello
John Stearns
Pat Jonker
Thomas Bombaci
Michael Lombardi
Ellen Drew
Roger Southward
Barbara Giorgio
Kenneth Lapointe
Leslie Byrnes
Cathy McManus
Sari Stein
Mary Drabbs
Robin Patten

Michael Leo
Karen Kirschling
Bridgett Heinly
Margo Fried
Richard Creswell
Alice Lorenz
William Ridgeway
Catherine A Louisell
Chris Calvert
Cynthia Hull
Benjamin George
Jackie Ericksen
Jasper Hardesty
Anna Grondin
Monica Steensma
Larry Gioannini
Eric Pash
Mary Bissell
C. H.
Susan Sims
Janice Richmond
Abigail Fox
Dereka Rushbrook
Scott Schaffer
Tamara Stewart
Sarah Stewart
Timothy Edward Duda
Jon Hager
Diana Gries
Teresa Seamster
Bill Lundeen
Julie Herman
Daisy Kates
Jerre Stallcup
Daniel Muenzberg
Linda Buckingham
Ann Bicking
James Kawamura
Ann Lowe
John Carroll
Robert Foehring
Paul Hunrichs
David Patenaude
L.L. Wilkinson
John Reid
Richard Han
Charles Long
Nancy Woodward
Joanne De Phillips
Lynne Gaffikin
Yolanda Garcia
John V LaRochelle
Steven Standard
Max Vollmer
Erin Baiano
David Stout
Louis Dribjwater
Brad Miller
I. Engle
Howard Bradley
Randy Hutchins
Sandra Couch
Annette Tynan
Rita Glasscock
Andrew Hellinger
Yazmin Gonzalez
W. Andrew Stover
Robert Fischoff
Linda Prostko
Nancy Austin
Mary Dudley
Gudrun Dennis
Jesse Williams
JL Angell
Donna Poisson
Scott Workinger
Alexia Hall
Jeff Freels
Dawn Albanese
Jerry Sue Bassalleck
Valerie Nesteruk
Rob Nash
Carol Martin
Lorraine Martinez
Ronald Parry
David Olson
Matt Young
Jane Butler
Ingrid Lincoln
Kathy Bradley
Roberta Sans
Valarie Snell
Catherine Beauchamp
Lisa Chase
James Mulcare
Taryn Braband
Donna Smith
Maresa Pryor-Luzier
Jackie Hall
Susan Lefler
Anita Kasbarian
John Dunn
Carolyn Chapin
Marie Driscoll
Robert Mark
Ada Rippberger
Heather Sinclair-Furr
Virgene Link-New
Kathryn Lemoine
Cynthia King
Laurie Rugenstein
Sandra Serafin
Karen Syzdek
Marcia Stout
Margaret Hadderman
Linda Ray
Michelle Simon
Debra Heath
Alyson Bigney
Terry Ihnat
Matthew Monjaras
Ralph Vigil
Barbara Harnack
Michael Mullins
Linda Zat
Chloe Brennan
Tyler Glidden
Reba N
Jenny Lapetina
Jim Loveland
Adrienne Seltz
John Reese
Cheryl L. Williams
Jack Borninski
Grace Padelford
Kelly Cranston
Irvin Strange
Richard Ward
Maria Johnson
Susan and Peter Risser
Linda Hall
Sarah Councell
Tim Blose
Paul Karas

Marilynn Szydlowski
John Mazur
Nelson Murphy
Gloria Hacker
Yvonne Fisher
Caroline Sévilla
Janice Hoffman
Elaine Becker
Gayla Cremin
Dorothea McLeod
Allegra Huston
Eliza Gilkyson
Rebecca Justus
Robin Reindle
Jeff Reynolds
Cecilia Seabrook
Elisabeth Bakshi
Láné Sa'an
Kyeann Sayer
Phillip MacDonald
William Gilbert
Katherine Trotter
Karina Menali
Mary Davis
Anna Tangi
Norman Wendell
Richard Barish
Steve Liebhart
Terry Jurrens
Michael Madden
Scott Messick
Richard Steele
Marjorie Xavier
DeWitt Henderson
Michael Potvin-Frost
Jeffrey Thomas
Kenneth J Legaux
Roger Kulp
Julie Parcells
Meredith Taylor
Jennifer Brandon
Roy Fuller
Jon Spar
S Selbin
Lydia Hailu
Peter Riva
Phyllis Chavez
Arjan McNamara
Cristina Amarillas
Joseph Bayley
Anita Warren
Marilyn Staff
Cheryl Foote
Laura Gery
Ariana Jarvis
Mimi Hurd
Doc Campbell
Dana Hees
Douglas Kaufman
Peter Callen
Wreatha Carner
Mary Beth Hulsey
Cheryl Watters
Ed Fiedler
Ruth Sabiers
Sherry Barrett
Robert Cobb
Whitney Watters
Ingrid Bucher
Lorraine Olson
Ellen Y. Swain
Anna Doten
Kerry Heck
John Bretting
Michael Sauber
Carolyn Nieland
Thomas Nieland
Heather Tachna
Ann Lucas
Anne Dios
Todd Monson
Andrew Gildersleeve
Ji Montgomery
Henry Schelton
Mark Wiechmann
Cynthia Loucks
Leia Barnett
Laurie Bower
Denise Evans
Karen Boehler
Marge Dupler
Margaret Hermann
Janie Chodosh
Barbara Lindsey
Debra Cameron
Lissa Callirhoe
Nicholas Mouzourakis
Diane Jouppi
Carol Kuykendall
Andrew Quarles
Michael Butterfield
Dianna Wynn
Michelle Hegmon
Anna Gieselman
Juan Handelin
Susan Morgan
Nikole Black
Tom Kruzik
Bonnie Vendig
Shawn Boyette
Evan Weger
Angie True
Miranda Garcia
Rhonda Rhodes
Leroy Lints
Noel Wagner
Steve Lucas
Paula Narbutovskih
Margo Wyse
Nicolas Zapata
Elizabeth Rayl-Sweitzer
Javier Lujan
Michael Miller
Jason Scullion
Sandra Jackson
Heidi Ahlstrand
Stephanie E.
Karen DeBraal
Lorraine Derhammer
Ron Faich
Katherine Hinson
Leon Clingman
Maria Kjaerulff
Warwick Hansell
Philip Ratcliff
Emily Holcomb
Angel McCarter
Richard Meyer
Drew Ericson
Martha Spencer
Alex Jagger
Timothy Stinson
Magalli Gómez
Robert Handelsman

Todd Snyder
Alan Barrow
Michael Harvey
Robert Wofford
Kris Olson
L. Watchempino
Christina Anderson
Terry Vollmer
Alyce Santoro
Ann Roylance
Jeanne Green
Sarah Weekley
Greg Hughes
Alia Pinedo
Kathy Jackson
Jeffrey Maxcy
Peter Gradoni
Vera Liljestrand
John Teevan
Nancy Poe
Karen Reck
Lillian Connelly
Joan Bacon
Marion Cook
Lauri Costello MD
Richard Wilhelm
Bo Baggs
Diane Beck
Carol Marion
Jesse Counterman
Donna Lentz
Stephen Schmidt
A Sanchez
Leah Hallow
David Donohue
Carol Collins
Douglas Gruenau
Vikram Sikand
Gary Loos
Ruth Agius
Annie McCann
Gary Brooker
Bonnie Farmer
Richard Rotert
Sharon Selvaggio
Randy Crutcher
Tanya Gerard
Susan Ambler
Dennis Davideit
Richard Kuehn
Daniel Webb
Alexus Reyes
Audrey Urbano, MD FACEP
Joan Martinez
Gerald Atkinson
Dee Sands
Judith Stevens
Jamie Gagan
Pat Jones
Ann Ellen Tuomey
Kenneth Nahigian
Dawn Tirschel
Penelope Fisher
Robinson Kurth
Maria Nasif
Jody Gibson
Akashia Allen
Chris Ottemiller
Kate OShea
Merilynn Hidalgo
Tom Harris
Frances Penvenne
Robert Ferrara
Dwight Sanders
Eileen Benner
Mary Jane Gallahan
John Hogan
Stacia Raymond
Krista Joslin-Gay
Gary Clauss
Nancy King
Charles Rarick
Frankie Chamberlain
Edyne Gordon
Irini Dieringer
Sandra Weber
William Wiley
Ryan Bermel
Ashton Nichols
Jan Ankerson
Donna Koechner
Y Lee
Patricia Duncan
A.L. Steiner
James T O'Donnell
Derek Gendvil
Cynthia McNamara
Pat O'Brien
Kathy Wright
Karen Peterson
Amy Mower
JC Corcoran
Jon Klingel
Allan Sindelar
Diane LaFrance
Edmund McWilliams
Donna Sims
John Cochran
Les Roberts
Quentin Fischer
Sandra Dal Cais
Matthew Midgett
Chris Baker
Anthony Donnici
Nancy Telese
Alexandra Dube
Tony Estrada
Jeremy Thomas
Michael DeLongchamp
Brenda Polacca
Deborah Jackson
Richard Brown
S S
Diane Schmidt
William Williams
Margaret McGee
Ashley Lewin
Walter Barger
Joanne Smogor
Deborah Shaw
Lisa Mazzola
Daniel Gibson
Mary Cline
Ralph Bauer
Deborah Williamson
Linda Granato
Diana Zelnio
Chantell Murphy
Wayne van Voorhies
Alicia Edwards
Angela Raines
Robert Scott
Chad Fuqua
Margaret Bell

Katie Bruell
Jeff Sussmann
Lasita Shalev
Maria Gabrielle
Dieter Engelke
Thomas Jervis
Lori Young
Howard Gross
Tommy Adams
Mary McIntyre
Kelly Wright
Lee Sides
Patricia Huband
Mai Doan
Victoria Bell
Michael Lee
Justin Crellin
Molly Kraft
Phyllis Price
Oliver Smith
Anne Petrokubi
Catherine Burton
Virginia Molin
Chemen Ochoa
Steven and Susan Mayes
Kristine Johnson
Barbara Harper
Pat Nunez
Iain Middleton
Michael Bordenave
Laird Lorenz
Terrye Bullers
Marie Wakefield
Budd Berkman
Geoff Regalado
Adrienne Ross
Tisha Broska
Sara Bergthold

Dear Michael Baca,

I am writing to express my strong support for the designation of 245 miles of nominated streams as Outstanding National Resource Waters (ONRWs). This includes streams in the Rio Chama, Upper Rio Grande, Cimarron, Pecos headwaters, Jemez, and Rio Grande-Santa Fe watersheds, and many more.

These nominated streams are invaluable to our state. They provide some of the best trout habitat and fishing opportunities in New Mexico, and protecting them is crucial for safeguarding water quality in these special waters. Moreover, these streams play a significant role in maintaining the health of New Mexico's ecosystems and living organisms. They also create and enhance recreational opportunities and experiences for all New Mexicans, contributing to our state's natural heritage and outdoor economy.

I urge the New Mexico Environment Department to move forward with the full petition to nominate these 245 miles of streams as ONRWs. This designation will ensure these critical water resources receive the highest level of protection, benefiting both current and future generations of New Mexicans.

Thank you for your consideration of this important matter.

Appendix E4 – Comment Letters

GOVERNOR
Michelle Lujan Grisham

DIRECTOR AND SECRETARY
TO THE COMMISSION
Michael B. Sloane

STATE OF NEW MEXICO
DEPARTMENT OF GAME & FISH

One Wildlife Way, Santa Fe, NM 87507

Tel: (505) 476-8000 | Fax: (505) 476-8180

For information call: (888) 248-6866

www.wildlife.dgf.nm.gov

15 August 2024

Michael Baca
Water Quality Standards Coordinator
New Mexico Environment Department (NMED)
Surface Water Quality Bureau (SWQB)
P.O. Box 5469
Santa Fe, NM, 87502

RE: Outstanding National Resource Waters Designation Nominations; NMERT Project No. NMERT-3697

Dear Mr. Baca:

The Department has reviewed the NMED SWQB's draft of the 2024 nominations for Outstanding National Resource Water (ONRW) Designation (Document). Please consider this letter as the Department's response to the Document.

The Department supports the designation of ONRWs as a means of protecting streams, lakes, and wetlands from future degradation, and thus providing increased water quality protection. However, the Department has reservations regarding the use of Special Trout Water (STW) designation as the sole criteria for nominating ONRWs. Special Trout Waters are a regulatory framework for managing trout angling, largely through limiting harvest via reduced bag limits and tackle restrictions. Special Trout Waters are established in rule by the New Mexico State Game Commission (SGC) for a variety of reasons. Some STWs hold significant ecological value (e.g., a stronghold for native fish, unique biodiversity, pristine aquatic or riparian habitat, etc.) while others exist to moderate harvest of trout in high-use fisheries like reservoir tailwaters and urban ponds. Thus, STW designation may sometimes compliment the spirit of ONRW nomination but in other cases do not. Further, we are concerned about creating an administrative and regulatory link between ONRW and STWs that may create a public perception of de facto surface water regulation via SGC rule making. Such a perception could negatively influence fisheries management by creating challenges to the addition or removal of waters from the STW list. We recognize that 20.6.4.9(B)(1) NMAC provides for use of STWs as a nominating criteria that "may" be used in designation of ONRWs but

NMED Exhibit 4

respectfully request reconsideration of the use of STW status as a sole nominating criteria.

The Department is also concerned with the inclusion of the four ONRW nominations that have hydrologic connections to State Fish Hatcheries (SFH). These waters and hatcheries are the Rio Chama near Heron reservoir (Los Ojos SFH), the most downstream Red River reach (Red River SFH), Rio Cebolla (Seven Spring SFH), and the Pecos River (Lisboa Springs SFH). State Fish Hatcheries produce native and sportfish to support conservation efforts and recreational angling across the state. Each hatchery's effluent is tightly regulated by a U.S. Environmental Protection Agency National Pollution Discharge Elimination Permit. These permits require that stringent water quality standards be met and place strict limitations on the discharge of nutrients and other potential pollutants. These permit requirements are the limiting factor in the production of fish from SFHs. Any further tightening of these requirements would impede the Department's ability to provide outdoor recreation opportunities, conduct native trout conservation activities, and meet our legislatively mandated performance metrics for fish production and angler satisfaction. We request that SWQB be explicit in the ONRW process that designation will not lead to further restrictions on hatchery effluent permits.

The Department and our partners have an extensive history of and active programs for native fish restoration, particularly Rio Grande Cutthroat Trout. The process of native fish restoration typically includes construction of a barrier to upstream fish movement and removal of non-native fish, often with pesticide per 20.6.4.16 NMAC. The list of nominated ONRWs includes four streams with existing fish barriers (Tanques Creek, Canada Tio Grande, Palociento Creek, and West Fork Luna Creek), most of which require maintenance or improvement. Additionally, barrier construction is being considered as a conservation tool in six waters on the nomination list (Cabresto Creek, Columbine Creek, Gavilan Canyon, Italianos Creek, Manzanita Creek, and Yerba Creek) We request that the ONRW designation process explicitly state that maintenance, improvement, and construction of fish barriers, as well as treatments to remove non-native fish, are compatible with ONRW designation.

In keeping with spirit of the other nominating criteria for ONRWs outlined in 20.6.4.9(B) NMAC (i.e., streams with exceptional water and habitat quality being the most suitable for ONRW designation), the Department disagrees with the nomination of two stream reaches in the Document based on their regulated state: the Rio Chama below El Vado dam, and the Rio Chama below Abiquiu Reservoir. These reservoir tailwater reaches have highly altered flow regimes, temperatures, sediment loads, and nutrient levels, and therefore do not meet the ONRW eligibility criteria which states, "the water has not been significantly modified by human activities in a manner that substantially detracts from its value as a natural resource" (20.6.4.9(B)(3) NMAC). Further, these waters are examples of STW use as a fisheries management tool to equitably distribute harvest of stocked trout. As a result, the Department recommends these two reaches be removed from consideration for ONRW status.

Thank you for the opportunity to provide comments regarding the Document. Please contact Jack Marchetti, Aquatic/Riparian Habitat Specialist, at jack.marchetti@dgf.nm.gov or 505-479-1269 if you have any questions.

Sincerely,

Michael B. Sloane

Digitally signed by Michael B. Sloane
Date: 2024.08.16 12:02:53 -06'00'

Michael B. Sloane
Director

Audubon
Paul Tashjian
Director of Freshwater Conservation
Audubon Southwest
400 Gold Ave SW; Suite 660
Albuquerque, NM 87102
Phone: 505-217-4531

August 2, 2024

New Mexico Environment Department
Surface Water Quality Bureau
Harold Runnels Building, RM 2063
1190 Saint Francis Drive
Santa Fe, New Mexico 87505

Re: NMED's Criteria One 2024 ONRW Petition

Dear Michael Baca,

On behalf of Audubon Southwest, I am writing in support of the New Mexico Environment Department's 2024 effort to designate 245 miles of stream that meet New Mexico's criteria at 20.6.4.9.B(1) NMAC ("Criteria One Waters") as Outstanding National Resource Waters ("ONRWs"). Criteria One Waters are waterbodies that have already been identified as important to New Mexico or the nation, such as special trout waters or waters in state or federal or national parks. ONRW protections would provide much needed water quality protections to these important water resources. As an organization focused on birds and bird habitat, these areas provide critical corridors for a myriad of nesting and migratory birds.

In the light of the recent Supreme Court's *Sackett* Decision, it is imperative that New Mexico protect the water quality of our streams. ONRW protections prohibit increased pollution to our waters while ensuring traditional and historic uses. These waters are the lifeblood for New Mexicans, serving as water sources for downstream domestic use, acequias and irrigation needs, and recreational activities that draw visitors from all over the world to New Mexico. In addition, these waters ensure the integrity of critical habitat for plants and wildlife that make New Mexico the Land of Enchantment. Our culture, economy, and ecosystems all rely on clean water and this designation will protect these streams for today's residents as well as for future generations.

Therefore, I join the large coalition of community organizations, state and local government officials, farmers and ranchers, and recreationists in asking the New Mexico Environment Department to safeguard the water quality of these waters by nominating them as Outstanding National Resource Waters under the federal Clean Water Act. Please let me know if I can be of further assistance in your decision-making upon this issue.

Thank you for your consideration.

Sincerely,

Audubon

Healthy Rivers Mean a Healthy New Mexico

Acting Now Can Save the State's Economy, Homes, and Birds

In New Mexico, rivers are the ribbons of life for our land, culture, economy, and our way of life. Healthy river ecosystems safeguard water quality, protect the groundwater supply that 90% of New Mexican's use as their primary source of drinking water, reduce fire risk, and provide critical habitat. Healthy river ecosystems are also part of our state's cultural heritage, agricultural economy and a billion dollar per year recreation industry.

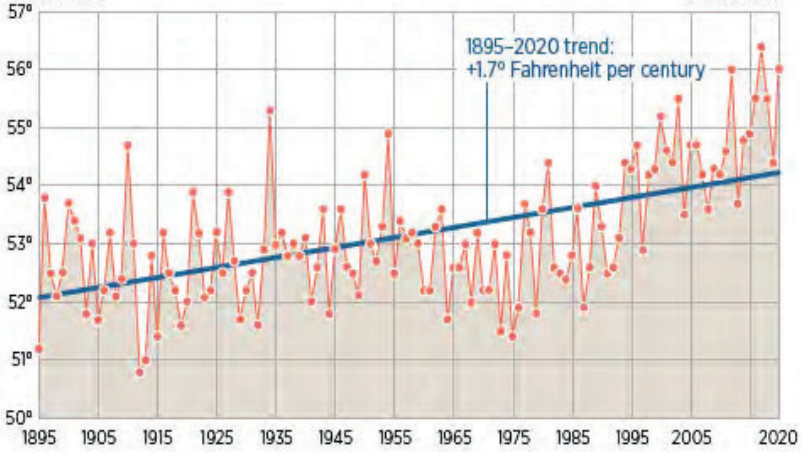
Rio Grande near Belen, New Mexico. Photo: Quantina Martine/Audubon New Mexico

The Climate Crisis and New Mexico's Rivers

Communities, economies, and natural systems function more efficiently when rivers are clean and ecologically robust. From flood control to groundwater storage to downstream water delivery, healthy rivers keep water resources in balance. In turn, healthy rivers are beautiful rivers and are crucial to New Mexico's ecotourism economy. But climate change, drought, increasing demand for water, failing infrastructure, and outdated water rights laws are pushing water supplies to their limits. Assuring that rivers can be resilient in the face of these stressors requires prioritizing healthy rivers through programs and activities that provide water to rivers during drought while providing assurances and incentives to property owners.

New Mexico Average Temperature
in Fahrenheit

SOURCE: NOAA



4,500
different species of plants and animals live in New Mexico

6,500
miles of perennial streams making healthy rivers a key component to the state's strategy for conserving biodiversity

80%
of New Mexico's at-risk species depend upon the riparian or aquatic habitat on these stream systems at some time in their life cycle

NMED Exhibit 4

Nearly 400 Bird Species Rely on New Mexico Waterways

Yellow-billed Cuckoo

Photo: Kevin Jordan/Great Backyard Bird Count

Yellow-breasted Chat

Photo: Megumi Aita/ Audubon Photography Awards

Yellow-throated Warbler

Photo: Judy Lyle/Great Backyard Bird Count

Willow Flycatcher

Photo: John Morrison/ Audubon

Bell's Vireo

Photo: Sherman Barr/ Audubon Photography Award

Environmental Flow Programs Can Be a Benefit to Landowners

Environmental flow programs **are not** a threat to existing water rights and water users. Environmental flow programs work within State water law to find solutions that work for both rivers and people, and typically include temporary water leasing arrangements, on-farm efficiency projects and habitat restoration. Water leasing programs provide drought year funding options to irrigators for temporarily leaving their water in a river while maintaining their water rights.

Protection of Stream Flows in NM

Already, New Mexico found some ways to address the flow needs of endangered species along the Rio Grande and Pecos Rivers. These solutions include the New Mexico Strategic Water Reserve and the leasing of San Juan Chama water on the Middle Rio Grande. Recently (2019) the New Mexico Office of the State Engineer recognized the environmental "beneficial use" of leaving a water right in a river. Because of these programs, New Mexico is well positioned to develop a more comprehensive stream flow enhancement program that works within the existing framework.

Call to Action

By prioritizing healthy rivers, New Mexico can better combat the changes associated with climate change. To accomplish this, New Mexico must understand where and when flow is most needed, have legal and administrative mechanisms for conducting flow protection, and procure staff and financial resources to activate such a program. In the coming years, we believe New Mexico should pursue the following goals:

Emphasize instream flows as a beneficial use by including environmental flows in the state's upcoming 50-year water plan and encourage the State Engineer's Office to issue more instream flow permits.

Identify and implement adaptive water management strategies such as environmental water leasing agreements, conservation and efficiency projects, habitat restoration projects and water shortage sharing agreements.

Adequately fund water infrastructure and conservation projects through New Mexico programs like the Strategic Water Reserve, the Water Trust Board and the River Stewardship Program.

Create a state-wide river protection program that addresses environmental flow needs.

Major NM Rivers

Map: Carol Zuber-Mallison/ZM Graphics

Audubon Southwest is working with diverse partners on the ground and in coalitions to work towards healthy rivers and modernized water policy

Audubon

NMED Exhibit 4

www.defenders.org

August 8, 2024

Re: 2024 ONRW Designation Nominations

Dear New Mexico Environment Department,

I am writing on behalf Defenders of Wildlife's nearly 20,000 members and supporters in the state of New Mexico. Defenders of Wildlife is a national, nonprofit membership organization dedicated to the protection of all native animals and plants in their natural communities. Defenders is committed to protecting wild lands and wildlife in New Mexico.

I write today to express my strong support for the designation of 245 miles of nominated streams as Outstanding National Resource Waters (ONRWs). This includes streams in the Rio Chama, Upper Rio Grande, Cimarron, Pecos headwaters, Jemez, and Rio Grande-Santa Fe watersheds, and many more.

These nominated streams are invaluable to our state. They provide some of the best trout habitat and fishing opportunities in New Mexico and protecting them is crucial for safeguarding water quality in these special waters. Moreover, these streams play a significant role in maintaining the health of New Mexico's ecosystems and living organisms. They also create and enhance recreational opportunities and experiences for all New Mexicans, contributing to our state's natural heritage and outdoor economy.

New Mexico ranks 4th among the states for biological diversity and has already lost as many as 24 species of plans or wildlife to extinction. Globally, we face a biodiversity crisis and designating ONRWs is one way to create a backstop against further extinctions and create a chance for recovery of imperiled species.

I urge the New Mexico Environment Department to move forward with the full petition to nominate these 245 miles of streams as ONRWs. This designation will ensure these critical water resources receive the highest level of protection, benefiting both current and future generations of New Mexicans.

Thank you for your consideration of this important matter.

Sincerely,

Bryan Bird
Southwest Director

National Headquarters | 1130 17th Street, N.W. | Washington, D.C. 20036-4604 | tel 202.682.9400 | fax 202.682.1331 | www.defenders.org

The Nature Conservancy
1613 Paseo de Peralta, Suite 200
Santa Fe, NM 87501
Tel (505) 988-3867
Fax (505) 988-4095
nature.org/newmexico

August 8, 2024

New Mexico Environment Department
Surface Water Quality Bureau
Harold Runnels Building, RM 2063
1190 Saint Francis Drive
Santa Fe, New Mexico 87505

Re: NMED's Criteria One 2024 ONRW Petition

Dear Michael Baca,

On behalf of The Nature Conservancy in New Mexico, I am writing in support of the New Mexico Environment Department's 2024 effort to designate 245 miles of stream that meet New Mexico's criteria at 20.6.4.9.B(1) NMAC ("Criteria One Waters") as Outstanding National Resource Waters ("ONRWs"). Criteria One Waters are waterbodies that have already been identified as important to New Mexico or the nation, such as special trout waters or waters in state or federal or national parks. ONRW protections would provide much needed water quality protections to these important water resources.

In the light of the recent Supreme Court's *Sackett* Decision, it is imperative that New Mexico protect the water quality of our streams. ONRW protections prohibit increased pollution to our waters while ensuring traditional and historic uses. These waters are the lifeblood for New Mexicans, serving as water sources for downstream domestic use, acequias and irrigation needs, and recreational activities that draw visitors from all over the world to New Mexico and support our economy. In addition, these waters ensure the integrity of critical habitat for plants and wildlife that make New Mexico the Land of Enchantment. Our culture, economy, and ecosystems rely on clean water; this designation will protect these streams for today's residents as well as for future generations.

Therefore, I join the large coalition of community organizations, state and local government officials, farmers and ranchers, and recreationists in asking the New Mexico Environment Department to safeguard the water quality of these waters by nominating them as Outstanding National Resource Waters under the federal Clean Water Act. Please let me know if I can be of further assistance in your decision-making upon this issue.

Thank you for your consideration.

Respectfully,

Martha S. Cooper

Martha S. Cooper
Freshwater Program Director

Pew

August 19, 2024

Michael Baca
Supervisor of Standards, Planning, and Reporting

Surface Water Quality Bureau
New Mexico Environment Department
Harold Runnels Building, RM 2063
1190 Saint Francis Drive
Santa Fe, New Mexico 87505

RE: Support for NMED's Criteria One 2024 ONRW Petition

Dear Mr. Baca:

On behalf of The Pew Charitable Trusts (Pew), I am writing to express our support of the New Mexico Environment Department's 2024 petition to designate 245 miles of streams that meet New Mexico's criteria at 20.6.4.9.B(1) NMAC ("Criteria One Waters") as Outstanding National Resource Waters ("ONRWs").

Pew's U.S. Conservation Project advances plans and policies that account for the impacts of ongoing climate change while building a stronger and more adaptable environment for people and nature. The protection and preservation of our nation's freshwater rivers, streams, and wetlands is integral to our efforts to foster a more resilient environment. We believe ONRWs are important and durable designations in that effort.

New Mexico's rivers and streams sustain farms and ranches, provide places to enjoy the outdoors, and support a growing outdoor recreation economy. Despite their importance, New Mexico waters are threatened by a changing climate, increased development, and the loss of federal protections due to recent Supreme Court decisions.

Under the Federal Water Pollution Control Act (Clean Water Act) of 1972, states and Tribes can designate rivers as Outstanding National Resource Waters for a variety of reasons, including high water quality, exceptional recreational or ecological significance, or the existence of cold-water thermal refuges. The

Pew

nominated Criteria One Waters are waterbodies that have already been identified as important to New Mexico or the nation, such as special trout waters or waters in state or national parks. ONRW designations would provide much needed water quality protections to these important water resources.

In addition, ONRW designations respect traditional community water uses such as acequia maintenance and livestock grazing. The designations protect existing ongoing activities and are designed to prohibit new or increased pollution from mining, development, pollution, and the impacts of climate change.

Again, Pew supports the petition by the New Mexico Environment Department to safeguard the quality of these waters by nominating them as Outstanding National Resource Waters under the federal Clean Water Act.

Sincerely,

Patrick Lane
Senior Officer, U.S. Conservation
The Pew Charitable Trusts

August 19, 2024

New Mexico Environment Department
1190 St. Francis Drive, Suite N4050
Santa Fe, New Mexico 87505

Submitted via Online Public Comment Form:
https://nmed.commentinput.com/?id=CBNFsRjDM

Re: New Mexico Wild Comments Supporting NMED's 2024 ONRW Designation Nominations

Dear New Mexico Environment Department:

New Mexico Wilderness Alliance (New Mexico Wild) strongly supports the New Mexico Environment Department's 2024 ONRW Designation Nomination for "Surface Waters Designated as Special Trout Waters, or Wild and Scenic Rivers, or Located within a Wilderness, Park, Monument, or Refuge." New Mexico Wild is a nonprofit 501(c)(3) grassroots organization dedicated to the protection, restoration, and continued enjoyment of New Mexico's waters, wildlands, and wilderness areas. We represent thousands of individual members from all corners of New Mexico and across the nation. New Mexico Wild has engaged in a variety of avenues working to protect and restore New Mexico's waterways, ensure equitable access and management over our water resources, and engage in advocacy to ensure species and habitat protection and water availability for all uses, including recreation. New Mexico Wild also advocates for responsible wildlife policies and the protection and long-term stewardship of Wilderness Areas and Wild and Scenic Rivers.

By nominating these streams, the New Mexico Environment Department has shown strong leadership in pursuing a commonsense solution that will help maintain the health of New Mexico's ecosystems and the communities who rely on them. ONRWs are a critical tool for protecting the water quality of New Mexico's streams, especially in response to the recent Supreme Court *Sackett* decision, which removed federal Clean Water Act protections for up to 95% of our state's waters. Additionally, ONRWs protect traditional community water uses, such as acequia-based agriculture, while safeguarding against degradation and negative impacts from mining, development, transportation, pollution, and climate change. Finally, this action will directly support our growing outdoor recreational economy by protecting the water quality in streams

that provide some of the best trout fishing opportunities in the state, as well as other recreational opportunities.

Designating these streams as ONRWs will benefit all New Mexicans and the wildlife that calls our state home. New Mexico Wild strongly supports this designation and urges the New Mexico Environment Department to move forward with the full petition. Thank you for this opportunity to comment, we look forward to future opportunities to continue engaging in this critical rulemaking.

Sincerely,

[s] Sally Paez

New Mexico Wild
Sally Paez
Staff Attorney
sally@nmwild.org
(505) 843-8696

AMERICAN RIVERS

August 19, 2024

Dear New Mexico Environment Department (NMED):

American Rivers supports NMED's 2024 Outstanding National Resource Waters (ONRWs) nomination. In the petition, NMED's nominated streams are already recognized as some of New Mexico's most exceptional rivers and streams in that their:

> *"water is a significant attribute of a state special trout water, national or state park, national or state monument, national or state wildlife refuge or designated wilderness area, or is part of a designated wild river under the federal Wild and Scenic Rivers Act."*

We wholeheartedly support ONRW designation for rivers and streams that meet the above criteria as listed under 20.6.4.9(B)(1) NMAC. ONRW status will provide the highest water quality protections to these outstanding streams and rivers. State water quality protection is particularly important in New Mexico considering the recent removal of federal water quality protections from the vast majority of the states' rivers, streams, and wetlands—especially with simultaneously increasing demands on the state's decreasing water supply. Importantly, ONRW designation provides this protection while also allowing for continued existing uses, acequia operations, and watershed restoration.

We agree that ONRW designation complements and strengthens water quality protections within designated Wild and Scenic Rivers. Of note, we do want to clarify language in the petition that states that federal Wild and Scenic Rivers do "not provide any water quality-based protections" (p. 7). Under the Wild and Scenic Rivers Act, a designated river's water quality must be maintained and, where possible, enhanced as described in Section 10(a) of the Act. Water quality protection is a core pillar of the Act. We direct NMED to the "Evaluation of State Water Quality Assessments and the National Wild and Scenic Rivers System" (IWSRCC, 2018) for further information and would be happy to engage in further discussion if helpful.

In conclusion, American Rivers agrees with NMED's assessment that protecting water quality in New Mexico is a vital priority and that this ONRW petition will benefit the people of New Mexico and the ecosystems on which we all rely. We encourage NMED to move forward with the full petition.

Please let me know if you have any questions about our support of the nomination.

Sincerely,

Rachel Ellis

Rachel Ellis
Associate Director, Southwest River Protection Program

1101 14th Street NW, Suite 1400, Washington, DC 20005 | 202.347.7550 | AmericanRivers.org

TITLE 20 ENVIRONMENTAL PROTECTION
CHAPTER 6 WATER QUALITY
PART 4 STANDARDS FOR INTERSTATE AND INTRASTATE SURFACE WATERS

20.6.4.1 ISSUING AGENCY: Water Quality Control commission.
[20.6.4.1 NMAC - Rp 20 NMAC 6.1.1001, 10/12/2000]

20.6.4.2 SCOPE: Except as otherwise provided by statute or regulation of the water quality control commission, this part governs all surface waters of the state of New Mexico, which are subject to the New Mexico Water Quality Act, Sections 74-6-1 through 74-6-17 NMSA 1978.
[20.6.4.2 NMAC - Rp 20 NMAC 6.1.1002, 10/12/2000; A, 5/23/2005]

20.6.4.3 STATUTORY AUTHORITY: This part is adopted by the water quality control commission pursuant to Subsection C of Section 74-6-4 NMSA 1978.
[20.6.4.3 NMAC - Rp 20 NMAC 6.1.1003, 10/12/2000]

20.6.4.4 DURATION: Permanent.
[20.6.4.4 NMAC - Rp 20 NMAC 6.1.1004, 10/12/2000]

20.6.4.5 EFFECTIVE DATE: October 12, 2000, unless a later date is indicated in the history note at the end of a section.
[20.6.4.5 NMAC - Rp 20 NMAC 6.1.1005, 10/12/2000]

20.6.4.6 OBJECTIVE:

A. The purpose of this part is to establish water quality standards that consist of the designated use or uses of surface waters of the state, the water quality criteria necessary to protect the use or uses and an antidegradation policy.

B. The state of New Mexico is required under the New Mexico Water Quality Act (Subsection C of Section 74-6-4 NMSA 1978) and the federal Clean Water Act, as amended (33 U.S.C. Section 1251 *et seq*.) to adopt water quality standards that protect the public health or welfare, enhance the quality of water and are consistent with and serve the purposes of the New Mexico Water Quality Act and the federal Clean Water Act. It is the objective of the federal Clean Water Act to restore and maintain the chemical, physical and biological integrity of the nation's waters, including those in New Mexico. This part is consistent with Section 101(a)(2) of the federal Clean Water Act, which declares that it is the national goal that wherever attainable, an interim goal of water quality that provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water be achieved by July 1, 1983. Agricultural, municipal, domestic and industrial water supply are other essential uses of New Mexico's surface water; however, water contaminants resulting from these activities will not be permitted to lower the quality of surface waters of the state below that required for protection and propagation of fish, shellfish and wildlife and recreation in and on the water, where practicable.

C. Pursuant to Subsection A of Section 74-6-12 NMSA 1978, this part does not grant to the water quality control commission or to any other entity the power to take away or modify property rights in water.

D. These surface water quality standards serve to respond to the inherent threats of climate change and provide resiliency for the continued protection and enhancement of water quality.
[20.6.4.6 NMAC - Rp 20 NMAC 6.1.1006, 10/12/2000; A, 5/23/2005; A, 4/23/2022]

20.6.4.7 DEFINITIONS: Terms defined in the New Mexico Water Quality Act, but not defined in this part will have the meaning given in the Water Quality Act.

A. Terms beginning with numerals or the letter "A," and abbreviations for units.

(1) "4Q3" means the critical low flow as determined by the minimum average flow over four consecutive days that occurs with a frequency of once in three years.

(2) "4T3 temperature" means the temperature not to be exceeded for four or more consecutive hours in a 24-hour period on more than three consecutive days.

(3) "6T3 temperature" means the temperature not to be exceeded for six or more consecutive hours in a 24-hour period on more than three consecutive days.

(4) Abbreviations used to indicate units are defined as follows:

(a) **"cfu/100 mL"** means colony-forming units per 100 milliliters; the results for *E. coli* may be reported as either colony forming units (CFU) or the most probable number (MPN), depending on the analytical method used;

(b) **"cfs"** means cubic feet per second;

(c) **"µg/L"** means micrograms per liter, equivalent to parts per billion when the specific gravity of the solution equals 1.0;

(d) **"µS/cm"** means microsiemens per centimeter; one µS/cm is equal to one µmho/cm;

(e) **"mg/kg"** means milligrams per kilogram, equivalent to parts per million;

(f) **"mg/L"** means milligrams per liter, equivalent to parts per million when the specific gravity of the solution equals 1.0;

(g) **"MPN/100 mL"** means most probable number per 100 milliliters; the results for *E. coli* may be reported as either CFU or MPN, depending on the analytical method used;

(h) **"NTU"** means nephelometric turbidity unit;

(i) **"pCi/L"** means picocuries per liter;

(j) **"pH"** means the measure of the acidity or alkalinity and is expressed in standard units (su).

(5) **"Acute toxicity"** means toxicity involving a stimulus severe enough to induce a response in 96 hours of exposure or less. Acute toxicity is not always measured in terms of lethality, but may include other toxic effects that occur within a short time period.

(6) **"Adjusted gross alpha"** means the total radioactivity due to alpha particle emission as inferred from measurements on a dry sample, including radium-226, but excluding radon-222 and uranium. Also excluded are source, special nuclear and by-product material as defined by the Atomic Energy Act of 1954.

(7) **"Aquatic life"** means any plant or animal life that uses surface water as primary habitat for at least a portion of its life cycle, but does not include avian or mammalian species.

(8) **"Attainable Use"** means a use that is achievable by the imposition of effluent limits required under sections 301(b) and 306 of the federal Clean Water Act and implementation of cost-effective and reasonable best management practices for nonpoint source control. An attainable use may or may not have criteria as stringent as the criteria for the designated use.

B. Terms beginning with the letter "B".

(1) **"Best management practices" or "BMPs":**

(a) for national pollutant discharge elimination system (NPDES) permitting purposes means schedules of activities, prohibitions of practices, maintenance procedures and other management practices to prevent or reduce the pollution of "waters of the United States;" BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal or drainage from raw material storage; or

(b) for nonpoint source pollution control purposes means methods, measures or practices selected by an agency to meet its nonpoint source control needs; BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures; BMPS can be applied before, during and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters; BMPs for nonpoint source pollution control purposes shall not be mandatory except as required by state or federal law.

(2) **"Bioaccumulation"** refers to the uptake and retention of a substance by an organism from its surrounding medium and food.

(3) **"Bioaccumulation factor"** is the ratio of a substance's concentration in tissue versus its concentration in ambient water, in situations where the organism and the food chain are exposed.

(4) **"Biomonitoring"** means the use of living organisms to test the suitability of effluents for discharge into receiving waters or to test the quality of surface waters of the state.

C. Terms beginning with the letter "C".

(1) **"CAS number"** means an assigned number by chemical abstract service (CAS) to identify a substance. CAS numbers index information published in chemical abstracts by the American chemical society.

(2) **"Chronic toxicity"** means toxicity involving a stimulus that lingers or continues for a relatively long period relative to the life span of an organism. Chronic effects include, but are not limited to, lethality, growth impairment, behavioral modifications, disease and reduced reproduction.

(3) "Classified water of the state" means a surface water of the state, or reach of a surface water of the state, for which the commission has adopted a segment description and has designated a use or uses and applicable water quality criteria in 20.6.4.101 through 20.6.4.899 NMAC.

(4) "Climate change" refers to any significant change in the measures of climate lasting for an extended period of time, typically decades or longer, and includes major changes in temperature, precipitation, wind patterns or other weather-related effects.

(5) "Closed basin" is a basin where topography prevents the surface outflow of water and water escapes by evapotranspiration or percolation.

(6) "Coldwater" in reference to an aquatic life use means a surface water of the state where the water temperature and other characteristics are suitable for the support or propagation or both of coldwater aquatic life.

(7) "Coolwater" in reference to an aquatic life use means the water temperature and other characteristics are suitable for the support or propagation of aquatic life whose physiological tolerances are intermediate between and may overlap those of warm and coldwater aquatic life.

(8) "Commission" means the New Mexico water quality control commission.

(9) "Criteria" are elements of state water quality standards, expressed as constituent concentrations, levels or narrative statements, representing a quality of water that supports a use. When criteria are met, water quality will protect the designated use.

D. Terms beginning with the letter "D".

(1) "DDT and derivatives" means 4,4'-DDT (CAS number 50293), 4,4'-DDE (CAS number 72559) and 4,4'-DDD (CAS number 72548).

(2) "Department" means the New Mexico environment department.

(3) "Designated use" means a use specified in 20.6.4.97 through 20.6.4.899 NMAC for a surface water of the state whether or not it is being attained.

(4) "Dissolved" refers to the fraction of a constituent of a water sample that passes through a 0.45-micrometer pore-size filter. The "dissolved" fraction is also termed "filterable residue."

(5) "Domestic water supply" means a surface water of the state that could be used for drinking or culinary purposes after disinfection.

E. Terms beginning with the letter "E".

(1) "E. coli" means the bacteria Escherichia coli.

(2) "Emerging contaminants" refer to water contaminants that may cause significant ecological or human health effects at low concentrations. Emerging contaminants are generally chemical compounds recognized as having deleterious effects at environmental concentrations whose negative impacts have not been fully quantified and may not have regulatory numeric criteria.

(3) "Ephemeral" when used to describe a surface water of the state means the water body contains water briefly only in direct response to precipitation; its bed is always above the water table of the adjacent region.

(4) "Existing use" means a use actually attained in a surface water of the state on or after November 28, 1975, whether or not it is a designated use.

F. Terms beginning with the letter "F".

(1) "Fish culture" means production of coldwater or warmwater fishes in a hatchery or rearing station.

(2) "Fish early life stages" means the egg and larval stages of development of fish ending when the fish has its full complement of fin rays and loses larval characteristics.

G. Terms beginning with the letter "G" [RESERVED]

H. Terms beginning with the letter "H".

(1) "Hardness" means the measure of dissolved calcium and magnesium salts in water expressed in units of dissolved calcium carbonate (CaCO3) concentration unless otherwise noted.

(2) "Harmonic mean flow" is the number of daily flow measurements divided by the sum of the reciprocals of the flows; that is, it is the reciprocal of the arithmetic mean of reciprocal daily flow measurements consistent with the equations in Paragraph (1) of Subsection B of 20.6.4.11 NMAC.

(3) "High quality coldwater" in reference to an aquatic life use means a perennial surface water of the state in a minimally disturbed condition with considerable aesthetic value and superior coldwater aquatic life habitat. A surface water of the state to be so categorized must have water quality, stream bed characteristics and other attributes of habitat sufficient to protect and maintain a propagating coldwater aquatic life population.

(4) "Human health-organism only" means the health of humans who ingest fish or other aquatic organisms from waters that contain pollutants.

I. Terms beginning with the letter "I".

(1) "Industrial water supply" means the use or storage of water by a facility for process operations unless the water is supplied by a public water system. Industrial water supply does not include irrigation or other agricultural uses.

(2) "Intermittent" when used to describe a surface water of the state means the water body contains water for extended periods only at certain times of the year, such as when it receives seasonal flow from springs or melting snow.

(3) "Interstate waters" means all surface waters of the state that cross or form a part of the border between states.

(4) "Intrastate waters" means all surface waters of the state that are not interstate waters.

(5) "Irrigation" means application of water to land areas to supply the water needs of beneficial plants.

(6) "Irrigation storage" means storage of water to supply the needs of beneficial plants.

J. Terms beginning with the letter "J". [**RESERVED**]

K. Terms beginning with the letter "K". [**RESERVED**]

L. Terms beginning with the letter "L".

(1) "LC-50" means the concentration of a substance that is lethal to fifty percent of the test organisms within a defined time period. The length of the time period, which may vary from 24 hours to one week or more, depends on the test method selected to yield the information desired.

(2) "Limited aquatic life" as a designated use, means the surface water is capable of supporting only a limited community of aquatic life. This subcategory includes surface waters that support aquatic species selectively adapted to take advantage of naturally occurring rapid environmental changes, low-flow, high turbidity, fluctuating temperature, low dissolved oxygen content or unique chemical characteristics.

(3) "Livestock watering" means the use of a surface water of the state as a supply of water for consumption by livestock.

M. Terms beginning with the letter "M".

(1) "Marginal coldwater" in reference to an aquatic life use means that natural habitat conditions severely limit maintenance of a coldwater aquatic life population during at least some portion of the year or historical data indicate that the temperature of the surface water of the state may exceed that which could continually support aquatic life adapted to coldwater.

(2) "Marginal warmwater" in reference to an aquatic life use means natural intermittent or low flow or other natural habitat conditions severely limit the ability of the surface water of the state to sustain a natural aquatic life population on a continuous annual basis; or historical data indicate that natural water temperature routinely exceeds 32.2°C (90°F).

(3) "Maximum temperature" means the instantaneous temperature not to be exceeded at any time.

(4) "Minimum quantification level" means the minimum quantification level for a constituent determined by official published documents of the United States environmental protection agency.

N. Terms beginning with the letter "N".

(1) "Natural background" means that portion of a pollutant load in a surface water resulting only from non-anthropogenic sources. Natural background does not include impacts resulting from historic or existing human activities.

(2) "Natural causes" means those causal agents that would affect water quality and the effect is not caused by human activity but is due to naturally occurring conditions.

(3) "Nonpoint source" means any source of pollutants not regulated as a point source that degrades the quality or adversely affects the biological, chemical or physical integrity of surface waters of the state.

O. Terms beginning with the letter "O".

(1) "Organoleptic" means the capability to produce a detectable sensory stimulus such as odor or taste.

(2) "Oversight agency" means a state or federal agency, such as the United States department of agriculture forest service, that is responsible for land use or water quality management decisions affecting nonpoint source discharges where an outstanding national resource water is located.

P. Terms beginning with the letter "P".

(1) "Playa" means a shallow closed basin lake typically found in the high plains and deserts.

(2) "Perennial" when used to describe a surface water of the state means the water body typically contains water throughout the year and rarely experiences dry periods.

(3) "Persistent toxic pollutants" means pollutants, generally organic, that are resistant to environmental degradation through chemical, biological and photolytic processes and can bioaccumulate in organisms, causing adverse impacts on human health and aquatic life.

(4) "Point source" means any discernible, confined and discrete conveyance from which pollutants are or may be discharged into a surface water of the state, but does not include return flows from irrigated agriculture.

(5) "Practicable" means that which may be done, practiced or accomplished; that which is performable, feasible, possible.

(6) "Primary contact" means any recreational or other water use in which there is prolonged and intimate human contact with the water, such as swimming and water skiing, involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard. Primary contact also means any use of surface waters of the state for cultural, religious or ceremonial purposes in which there is intimate human contact with the water, including but not limited to ingestion or immersion, that could pose a significant health hazard.

(7) "Public water supply" means the use or storage of water to supply a public water system as defined by New Mexico's Drinking Water Regulations, 20.7.10 NMAC. Water provided by a public water system may need to undergo treatment to achieve drinking water quality.

Q. Terms beginning with the letter "Q". [RESERVED]

R. Terms beginning with the letter "R". [RESERVED]

S. Terms beginning with the letter "S".

(1) "Secondary contact" means any recreational or other water use in which human contact with the water may occur and in which the probability of ingesting appreciable quantities of water is minimal, such as fishing, wading, commercial and recreational boating and any limited seasonal contact.

(2) "Segment" means a classified water of the state described in 20.6.4.101 through 20.6.4.899 NMAC. The water within a segment should have the same uses, similar hydrologic characteristics or flow regimes, and natural physical, chemical and biological characteristics and exhibit similar reactions to external stresses, such as the discharge of pollutants.

(3) "Specific conductance" is a measure of the ability of a water solution to conduct an electrical current.

(4) "State" means the state of New Mexico.

(5) "Surface water(s) of the state"

(a) means all surface waters situated wholly or partly within or bordering upon the state, including the following:

- **(i)** lakes;
- **(ii)** rivers;
- **(iii)** streams (including intermittent and ephemeral streams);
- **(iv)** mudflats;
- **(v)** sandflats;
- **(vi)** wetlands;
- **(vii)** sloughs;
- **(viii)** prairie potholes;
- **(ix)** wet meadows;
- **(x)** playa lakes;
- **(xi)** reservoirs; and
- **(xii)** natural ponds.

(b) also means all tributaries of such waters, including adjacent wetlands, any manmade bodies of water that were originally created in surface waters of the state or resulted in the impoundment of surface waters of the state, and any "waters of the United States" as defined under the Clean Water Act that are not included in the preceding description.

(c) does not include private waters that do not combine with other surface or subsurface water or any water under tribal regulatory jurisdiction pursuant to Section 518 of the Clean Water Act. Waste treatment systems, including treatment ponds or lagoons designed and actively used to meet requirements of the Clean Water Act (other than cooling ponds as defined in 40 CFR Part 423.11(m) that also meet the criteria of

this definition), are not surface waters of the state, unless they were originally created in surface waters of the state or resulted in the impoundment of surface waters of the state.

T. Terms beginning with the letter "T".

(1) "TDS" means total dissolved solids, also termed "total filterable residue."

(2) "Toxic pollutant" means those pollutants, or combination of pollutants, including disease-causing agents, that after discharge and upon exposure, ingestion, inhalation or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will cause death, shortened life spans, disease, adverse behavioral changes, reproductive or physiological impairment or physical deformations in such organisms or their offspring.

(3) "Tributary" means a perennial, intermittent or ephemeral waterbody that flows into a larger waterbody, and includes a tributary of a tributary.

(4) "Turbidity" is an expression of the optical property in water that causes incident light to be scattered or absorbed rather than transmitted in straight lines.

U. Terms beginning with the letter "U".

(1) "Unclassified waters of the state" means those surface waters of the state not identified in 20.6.4.101 through 20.6.4.899 NMAC.

(2) "Use attainability analysis" means a scientific study conducted for the purpose of assessing the factors affecting the attainment of a use.

V. Terms beginning with the letter "V" [**RESERVED**]

W. Terms beginning with the letter "W".

(1) "Warmwater" with reference to an aquatic life use means that water temperature and other characteristics are suitable for the support or propagation or both of warmwater aquatic life.

(2) "Water contaminant" means any substance that could alter if discharged or spilled the physical, chemical, biological or radiological qualities of water. "Water contaminant" does not mean source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, but may include all other radioactive materials, including but not limited to radium and accelerator-produced isotopes.

(3) "Water pollutant" means a water contaminant in such quantity and of such duration as may with reasonable probability injure human health, animal or plant life or property, or to unreasonably interfere with the public welfare or the use of property.

(4) "Wetlands" means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions in New Mexico. Wetlands that are constructed outside of a surface water of the state for the purpose of providing wastewater treatment and that do not impound a surface water of the state are not included in this definition.

(5) "Wildlife habitat" means a surface water of the state used by plants and animals not considered as pathogens, vectors for pathogens or intermediate hosts for pathogens for humans or domesticated livestock and plants.

X. Terms beginning with the letters "X" through "Z". [**RESERVED**]

[20.6.4.7 NMAC - Rp 20 NMAC 6.1.1007, 10/12/2000; A, 7/19/2001; A, 5/23/2005; A, 7/17/2005; A, 8/1/2007; A, 12/1/2010; A, 1/14/2011; A, 3/2/2017; A, 4/23/2022]

20.6.4.8 ANTIDEGRADATION POLICY AND IMPLEMENTATION PLAN:

A. Antidegradation Policy: This antidegradation policy applies to all surface waters of the state.

(1) Existing uses, as defined in Paragraph (4) of Subsection E of 20.6.4.7 NMAC, and the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state.

(2) Where the quality of a surface water of the state exceeds levels necessary to support the propagation of fish, shellfish, and wildlife, and recreation in and on the water, that quality shall be maintained and protected unless the commission finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic and social development in the area in which the water is located. In allowing such degradation or lower water quality, the state shall assure water quality adequate to protect existing uses fully. Further, the state shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable BMPs for nonpoint source control. Additionally, the state shall encourage the use of watershed planning as a further means to protect surface waters of the state.

(3) No degradation shall be allowed in waters designated by the commission as outstanding national resource waters (ONRWs), except as provided in Subparagraphs (a) through (e) of this paragraph and in Paragraph (4) of this Subsection A.

(a) After providing a minimum 30-day public review and comment period, the commission determines that allowing temporary and short-term degradation of water quality is necessary to accommodate public health or safety activities in the area in which the ONRW is located. Examples of public health or safety activities include but are not limited to replacement or repair of a water or sewer pipeline or a roadway bridge. In making its decision, the commission shall consider whether the activity will interfere with activities implemented to restore or maintain the chemical, physical or biological integrity of the water. In approving the activity, the commission shall require that:

(i) the degradation shall be limited to the shortest possible time and shall not exceed six months;

(ii) the degradation shall be minimized and controlled by best management practices or in accordance with permit requirements as appropriate; all practical means of minimizing the duration, magnitude, frequency and cumulative effects of such degradation shall be utilized;

(iii) the degradation shall not result in water quality lower than necessary to protect any existing use in the ONRW; and

(iv) the degradation shall not alter the essential character or special use that makes the water an ONRW.

(b) Prior to the commission making a determination, the department or appropriate oversight agency shall provide a written recommendation to the commission. If the commission approves the activity, the department or appropriate oversight agency shall oversee implementation of the activity.

(c) Where an emergency response action that may result in temporary and short-term degradation to an ONRW is necessary to mitigate an immediate threat to public health or safety, the emergency response action may proceed prior to providing notification required by Subparagraph (a) of this paragraph in accordance with the following:

(i) only actions that mitigate an immediate threat to public health or safety may be undertaken pursuant to this provision; non-emergency portions of the action shall comply with the requirements of Subparagraph (a) of this paragraph;

(ii) the discharger shall make best efforts to comply with requirements (i) through (iv) of Subparagraph (a) of this paragraph;

(iii) the discharger shall notify the department of the emergency response action in writing within seven days of initiation of the action;

(iv) within 30 days of initiation of the emergency response action, the discharger shall provide a summary of the action taken, including all actions taken to comply with requirements (i) through (iv) of Subparagraph (a) of this paragraph.

(d) Preexisting land-use activities, including grazing, allowed by federal or state law prior to designation as an ONRW, and controlled by best management practices (BMPs), shall be allowed to continue so long as there are no new or increased discharges resulting from the activity after designation of the ONRW.

(e) Acequia operation, maintenance, and repairs are not subject to new requirements because of ONRW designation. However, the use of BMPs to minimize or eliminate the introduction of pollutants into receiving waters is strongly encouraged.

(4) This antidegradation policy does not prohibit activities that may result in degradation in surface waters of the state when such activities will result in restoration or maintenance of the chemical, physical or biological integrity of the water.

(a) For ONRWs, the department or appropriate oversight agency shall review on a case-by-case basis discharges that may result in degradation from restoration or maintenance activities, and may approve such activities in accordance with the following:

(i) the degradation shall be limited to the shortest possible time;

(ii) the degradation shall be minimized and controlled by best management practices or in accordance with permit requirements as appropriate, and all practical means of minimizing the duration, magnitude, frequency and cumulative effects of such degradation shall be utilized;

(iii) the degradation shall not result in water quality lower than necessary to protect any existing use of the surface water; and

(iv) the degradation shall not alter the essential character or special use that makes the water an ONRW.

(b) For surface waters of the state other than ONRWs, the department shall review on a case-by-case basis discharges that may result in degradation from restoration or maintenance activities, and may approve such activities in accordance with the following:

(i) the degradation shall be limited to the shortest possible time;

(ii) the degradation shall be minimized and controlled by best management practices or in accordance with permit requirements as appropriate, and all practical means of minimizing the duration, magnitude, frequency and cumulative effects of such degradation shall be utilized; and

(iii) the degradation shall not result in water quality lower than necessary to protect any existing use of the surface water.

(5) In those cases where potential water quality impairment associated with a thermal discharge is involved, this antidegradation policy and implementing method shall be consistent with Section 316 of the federal Clean Water Act.

(6) In implementing this section, the commission through the appropriate regional offices of the United States environmental protection agency will keep the administrator advised and provided with such information concerning the surface waters of the state as he or she will need to discharge his or her responsibilities under the federal Clean Water Act.

B. Implementation Plan: The department, acting under authority delegated by the commission, implements the water quality standards, including the antidegradation policy, by describing specific methods and procedures in the continuing planning process and by establishing and maintaining controls on the discharge of pollutants to surface waters of the state. The steps summarized in the following paragraphs, which may not all be applicable in every water pollution control action, list the implementation activities of the department. These implementation activities are supplemented by detailed antidegradation review procedures developed under the state's continuing planning process. The department:

(1) obtains information pertinent to the impact of the effluent on the receiving water and advises the prospective discharger of requirements for obtaining a permit to discharge;

(2) reviews the adequacy of existing data and conducts a water quality survey of the receiving water in accordance with an annually reviewed, ranked priority list of surface waters of the state requiring total maximum daily loads pursuant to Section 303(d) of the federal Clean Water Act;

(3) assesses the probable impact of the effluent on the receiving water relative to its attainable or designated uses and numeric and narrative criteria;

(4) requires the highest and best degree of wastewater treatment practicable and commensurate with protecting and maintaining the designated uses and existing water quality of surface waters of the state;

(5) develops water quality based effluent limitations and comments on technology based effluent limitations, as appropriate, for inclusion in any federal permit issued to a discharger pursuant to Section 402 of the federal Clean Water Act;

(6) requires that these effluent limitations be included in any such permit as a condition for state certification pursuant to Section 401 of the federal Clean Water Act;

(7) coordinates its water pollution control activities with other constituent agencies of the commission, and with local, state and federal agencies, as appropriate;

(8) develops and pursues inspection and enforcement programs to ensure that dischargers comply with state regulations and standards, and complements EPA's enforcement of federal permits;

(9) ensures that the provisions for public participation required by the New Mexico Water Quality Act and the federal Clean Water Act are followed;

(10) provides continuing technical training for wastewater treatment facility operators through the utility operators training and certification programs;

(11) provides funds to assist the construction of publicly owned wastewater treatment facilities through the wastewater construction program authorized by Section 601 of the federal Clean Water Act, and through funds appropriated by the New Mexico legislature;

(12) conducts water quality surveillance of the surface waters of the state to assess the effectiveness of water pollution controls, determines whether water quality standards are being attained, and proposes amendments to improve water quality standards;

(13) encourages, in conjunction with other state agencies, implementation of the best management practices set forth in the New Mexico statewide water quality management plan and the nonpoint

source management program, such implementation shall not be mandatory except as provided by federal or state law;

(14) evaluates the effectiveness of BMPs selected to prevent, reduce or abate sources of water pollutants;

(15) develops procedures for assessing use attainment as required by 20.6.4.15 NMAC and establishing site-specific standards; and

(16) develops list of surface waters of the state not attaining designated uses, pursuant to Sections 305(b) and 303(d) of the federal Clean Water Act.

[20.6.4.8 NMAC - Rp 20 NMAC 6.1.1101, 10/12/2000; A, 5/23/2005; A, 8/1/2007; A, 1/14/2011; A, 4/23/2022]

20.6.4.9 OUTSTANDING NATIONAL RESOURCE WATERS:

A. Procedures for nominating an ONRW: Any person may nominate a surface water of the state for designation as an ONRW by filing a petition with the commission pursuant to 20.1.6 NMAC, Rulemaking Procedures - Water Quality Control Commission. A petition to designate a surface water of the state as an ONRW shall include:

(1) a map of the surface water of the state, including the location and proposed upstream and downstream boundaries;

(2) a written statement and evidence based on scientific principles in support of the nomination, including specific reference to one or more of the applicable ONRW criteria listed in Subsection B of this section;

(3) water quality data including chemical, physical or biological parameters, if available, to establish a baseline condition for the proposed ONRW;

(4) a discussion of activities that might contribute to the reduction of water quality in the proposed ONRW;

(5) any additional evidence to substantiate such a designation, including a discussion of the economic impact of the designation on the local and regional economy within the state of New Mexico and the benefit to the state; and

(6) affidavit of publication of notice of the petition in a newspaper of general circulation in the affected counties and in a newspaper of general statewide circulation.

B. Criteria for ONRWs: A surface water of the state, or a portion of a surface water of the state, may be designated as an ONRW where the commission determines that the designation is beneficial to the state of New Mexico, and:

(1) the water is a significant attribute of a state special trout water, national or state park, national or state monument, national or state wildlife refuge or designated wilderness area, or is part of a designated wild river under the federal Wild and Scenic Rivers Act; or

(2) the water has exceptional recreational or ecological significance; or

(3) the existing water quality is equal to or better than the numeric criteria for protection of aquatic life and contact uses and the human health-organism only criteria, and the water has not been significantly modified by human activities in a manner that substantially detracts from its value as a natural resource.

C. Pursuant to a petition filed under Subsection A of this section, the commission may classify a surface water of the state or a portion of a surface water of the state as an ONRW if the criteria set out in Subsection B of this section are met.

D. Waters classified as ONRWs: The following waters are classified as ONRWs:

(1) Rio Santa Barbara, including the west, middle and east forks from their headwaters downstream to the boundary of the Pecos Wilderness; and

(2) the waters within the United States forest service Valle Vidal special management unit including:

(a) Rio Costilla, including Comanche, La Cueva, Fernandez, Chuckwagon, Little Costilla, Powderhouse, Holman, Gold, Grassy, LaBelle and Vidal creeks, from their headwaters downstream to the boundary of the United States forest service Valle Vidal special management unit;

(b) Middle Ponil creek, including the waters of Greenwood Canyon, from their headwaters downstream to the boundary of the Elliott S. Barker wildlife management area;

(c) Shuree lakes;

(d) North Ponil creek, including McCrystal and Seally Canyon creeks, from their headwaters downstream to the boundary of the United States forest service Valle Vidal special management unit; and

(e) Leandro creek from its headwaters downstream to the boundary of the United States forest service Valle Vidal special management unit.

(3) the named perennial surface waters of the state, identified in Subparagraph (a) below, located within United States department of agriculture forest service wilderness. Wilderness are those lands designated by the United States congress as wilderness pursuant to the Wilderness Act. Wilderness areas included in this designation are the Aldo Leopold wilderness, Apache Kid wilderness, Blue Range wilderness, Chama River Canyon wilderness, Cruces Basin wilderness, Dome wilderness, Gila wilderness, Latir Peak wilderness, Pecos wilderness, San Pedro Parks wilderness, Wheeler Peak wilderness, and White Mountain wilderness.

(a) The following waters are designated in the Rio Grande basin:

(i) in the Aldo Leopold wilderness: Byers Run, Circle Seven creek, Flower canyon, Holden Prong, Indian canyon, Las Animas creek, Mud Spring canyon, North Fork Palomas creek, North Seco creek, Pretty canyon, Sids Prong, South Animas canyon, Victorio Park canyon, Water canyon;

(ii) in the Apache Kid wilderness Indian creek and Smith canyon;

(iii) in the Chama River Canyon wilderness: Chavez canyon, Ojitos canyon, Rio Chama;

(iv) in the Cruces Basin wilderness: Beaver creek, Cruces creek, Diablo creek, Escondido creek, Lobo creek, Osha creek;

(v) in the Dome wilderness: Capulin creek, Medio creek, Sanchez canyon/creek;

(vi) in the Latir Peak wilderness: Bull creek, Bull Creek lake, Heart lake, Lagunitas Fork, Lake Fork creek, Rito del Medio, Rito Primero, West Latir creek;

(vii) in the Pecos wilderness: Agua Sarca, Hidden lake, Horseshoe lake (Alamitos), Jose Vigil lake, Nambe lake, Nat lake IV, No Fish lake, North Fork Rio Quemado, Rinconada, Rio Capulin, Rio de las Trampas (Trampas creek), Rio de Truchas, Rio Frijoles, Rio Medio, Rio Molino, Rio Nambe, Rio San Leonardo, Rito con Agua, Rito Gallina, Rito Jaroso, Rito Quemado, San Leonardo lake, Santa Fe lake, Santa Fe river, Serpent lake, South Fork Rio Quemado, Trampas lake (East), Trampas lake (West);

(viii) in the San Pedro Parks wilderness: Agua Sarca, Cañon Madera, Cave creek, Cecilia Canyon creek, Clear creek (North SPP), Clear creek (South SPP), Corralitos creek, Dove creek, Jose Miguel creek, La Jara creek, Oso creek, Rio Capulin, Rio de las Vacas, Rio Gallina, Rio Puerco de Chama, Rito Anastacio East, Rito Anastacio West, Rito de las Palomas, Rito de las Perchas, Rito de los Pinos, Rito de los Utes, Rito Leche, Rito Redondo, Rito Resumidero, San Gregorio lake;

(ix) in the Wheeler Peak wilderness: Black Copper canyon, East Fork Red river, Elk lake, Horseshoe lake, Lost lake, Sawmill creek, South Fork lake, South Fork Rio Hondo, Williams lake.

(b) The following waters are designated in the Pecos River basin:

(i) in the Pecos wilderness: Albright creek, Bear creek, Beatty creek, Beaver creek, Carpenter creek, Cascade canyon, Cave creek, El Porvenir creek, Hollinger creek, Holy Ghost creek, Horsethief creek, Jack's creek, Jarosa canyon/creek, Johnson lake, Lake Katherine, Lost Bear lake, Noisy brook, Panchuela creek, Pecos Baldy lake, Pecos river, Rio Mora, Rio Valdez, Rito Azul, Rito de los Chimayosos, Rito de los Esteros, Rito del Oso, Rito del Padre, Rito las Trampas, Rito Maestas, Rito Oscuro, Rito Perro, Rito Sebadilloses, South Fork Bear creek, South Fork Rito Azul, Spirit lake, Stewart lake, Truchas lake (North), Truchas lake (South), Winsor creek;

(ii) in the White Mountain wilderness: Argentina creek, Aspen creek, Bonito creek, Little Bonito creek, Mills canyon/creek, Rodamaker creek, South Fork Rio Bonito, Turkey canyon/creek.

(c) The following waters are designated in the Gila River basin:

(i) in the Aldo Leopold wilderness: Aspen canyon, Black Canyon creek, Bonner canyon, Burnt canyon, Diamond creek, Falls canyon, Fisherman canyon, Running Water canyon, South Diamond creek;

(ii) in the Gila wilderness: Apache creek, Black Canyon creek, Brush canyon, Canyon creek, Chicken Coop canyon, Clear creek, Cooper canyon, Cow creek, Cub creek, Diamond creek, East Fork Gila river, Gila river, Gilita creek, Indian creek, Iron creek, Langstroth canyon, Lilley canyon, Little creek, Little Turkey creek, Lookout canyon, McKenna creek, Middle Fork Gila river, Miller Spring canyon, Mogollon creek, Panther canyon, Prior creek, Rain creek, Raw Meat creek, Rocky canyon, Sacaton creek, Sapillo creek, Sheep Corral canyon, Skeleton canyon, Squaw creek, Sycamore canyon, Trail canyon, Trail creek, Trout creek, Turkey creek, Turkey Feather creek, Turnbo canyon, West Fork Gila river, West Fork Mogollon creek, White creek, Willow creek, Woodrow canyon.

(d) The following waters are designated in the Canadian River basin: in the Pecos wilderness Daily creek, Johns canyon, Middle Fork Lake of Rio de la Casa, Middle Fork Rio de la Casa, North Fork Lake of Rio de la Casa, Rito de Gascon, Rito San Jose, Sapello river, South Fork Rio de la Casa, Sparks creek (Manuelitas creek).

(e) The following waters are designated in the San Francisco River basin:

(i) in the Blue Range wilderness: Pueblo creek;

(ii) in the Gila wilderness: Big Dry creek, Lipsey canyon, Little Dry creek, Little Whitewater creek, South Fork Whitewater creek, Spider creek, Spruce creek, Whitewater creek.

(f) The following waters are designated in the Mimbres Closed basin: in the Aldo Leopold wilderness Corral canyon, Mimbres river, North Fork Mimbres river, South Fork Mimbres river.

(g) The following waters are designated in the Tularosa Closed basin: in the White Mountain wilderness Indian creek, Nogal Arroyo, Three Rivers.

(h) The wetlands designated are identified on the *Maps and List of Wetlands Within United States Forest Service Wilderness Areas Designated as Outstanding National Resource Waters* published at the New Mexico state library and available on the department's website.

(4) The following waters are designated in the headwaters Pecos river watershed:

(a) The Pecos river from Dalton Canyon creek to the Pecos wilderness boundary;

(b) In the Dry Gulch-Pecos river subwatershed, Dalton Canyon creek from the Pecos river upstream to the headwaters, Wild Horse creek from Dalton Canyon creek upstream to the headwaters, Macho Canyon creek from the Pecos river upstream to the headwaters and Sawyer creek from the Pecos river upstream to the headwaters;

(c) In the Indian creek-Pecos river subwatershed, Indian creek from the Pecos river upstream to the headwaters, Holy Ghost creek from the Pecos river upstream to the Pecos wilderness boundary, Doctor creek from Holy Ghost creek upstream to the headwaters, Davis creek from the Pecos river upstream to the headwaters and Willow creek from the Pecos river upstream to the headwaters;

(d) In the Rio Mora subwatershed, Rio Mora from the Pecos river upstream to the Pecos wilderness boundary and Bear creek from the Rio Mora upstream to the Pecos wilderness boundary;

(e) In the Rio Mora-Pecos river subwatershed, Carpenter creek from the Pecos river upstream to the Pecos wilderness boundary, Winsor creek from the Pecos river upstream to the Pecos wilderness boundary and Jack's creek from the Pecos river upstream to the Pecos wilderness boundary; and,

(f) In the Panchuela creek subwatershed, Panchuela creek from the Pecos river upstream to the Pecos wilderness boundary;

(g) Unnamed tributaries to waters in Subparagraphs (a) through (f), Paragraph (4) of this Subsection (D) as identified in the *Maps and Lists for Unnamed Tributaries to Perennial Waters and Wetlands in the Headwaters Pecos River Watershed,* published at the New Mexico state library and available on the department's website.

(h) Unnamed wetlands adjacent to waters in Subparagraphs (a) through (f), Paragraph (4) of this Subsection (D) as identified in the *Maps and Lists for Unnamed Tributaries to Perennial Waters and Wetlands in the Headwaters Pecos River Watershed*, published at the New Mexico state library and available on the department's website.

(5) the Rio Grande from directly above the Rio Pueblo de Taos to the New Mexico-Colorado state border.

(6) the Rio Hondo from the Carson National Forest boundary to its headwaters; and Lake Fork creek from the Rio Hondo to its headwaters.

(7) the East Fork Jemez river from San Antonio creek to its headwaters; San Antonio creek from the East Fork Jemez river to its headwaters; and Redondo creek from Sulphur creek to its headwaters.

(8) the following waters located within a national or state park, national or state monument, or national or state wildlife refuge:

(a) in the Valles Caldera national preserve: La Jara creek, Sulphur creek, San Luis creek, Jaramillo creek, and Rito de los Indios;

(b) in the Bandelier national monument: Rito de los Frijoles, Lummis canyon, Alamo canyon, Capulin creek, and Medio creek;

(c) in the Cimarron canyon state park: Cimarron river;

(d) in the Pecos national historical park: Pecos river;

(e) in the Rio Grande del Norte national monument: Rio San Antonio.

(9) the following waters located within a designated wilderness area: in the Columbine – Hondo wilderness areas: Columbine creek, Deer creek, Placer fork, Willow fork, Goose creek, Bear creek, Long canyon, Gavilan canyon, Italianos creek, Yerba creek, Manzanita creek, Gallina creek, Lobo creek, San Cristobal creek, and Lama canyon.

(10) the following wild rivers as designated by the federal Wild and Scenic Rivers Act:

(a) Rio Chama from the US forest service boundary to confluence with the Rio Nutrias;

(b) Red River from the confluence with the Rio Grande to four miles upstream.

(11) the following state special trout waters not already included in Paragraphs 8 through 10 of this Subsection:

(a) in the Edward Sargent wildlife management area: Rio Chamita, Nabor creek, Sixto creek, and Rio Chama;

(b) Rio Chama from Heron Reservoir outlet to Cottonwood flats;

(c) Rio de los Pinos from United States forest service road 87A to private land 2.5 miles upstream, Tanques creek, Canada Tio Grande;

(d) Cabresto creek from United States forest service boundary to headwaters, Frijoles creek, Palociento creek, and West Fork Luna creek;

(e) Rio Cebolla from Calaveras creek to its headwaters, Rio Gaudalupe from the confluence with Deer creek upstream to confluence with Stable creek;

(f) Capulin creek from the Dome wilderness boundary to headwaters.

[20.6.4.9 NMAC - Rn, Subsections B, C and D of 20.6.4.8 NMAC, 5/23/2005; A, 5/23/2005; A, 7/17/2005; A, 2/16/2006; A, 12/1/2010; A, 1/14/2011; A, 4/23/2022; A, 09/24/2022; A, XX/XX/XXXX]

20.6.4.10 REVIEW OF STANDARDS; NEED FOR ADDITIONAL STUDIES:

A. Section 303(c)(1) of the federal Clean Water Act requires that the state hold public hearings at least once every three years for the purpose of reviewing water quality standards and proposing, as appropriate, necessary revisions to water quality standards.

B. In accordance with 40 CFR 131.10(i), when an existing use, as defined under 20.6.4.7 NMAC, is higher quality water than prescribed by the designated use and supporting evidence demonstrates the presence of that use, the designated use shall be amended accordingly to have criteria no less stringent than the existing use.

C. It is recognized that, in some cases, numeric criteria for a particular designated use may not adequately reflect the local conditions or the aquatic communities adapted to those localized conditions. In these cases, a water quality criterion may be modified to reflect the natural condition of a specific waterbody. The modification of the criterion does not change the designated use; the modification only changes the criterion for that specific waterbody When justified by sufficient data and information, a numeric water quality criterion may be adopted or modified in accordance with Subsection F of 20.6.4.10 and Subsection G of 20.6.4.10 NMAC, to protect the attainable uses of the waterbody.

D. The removal or amendment of a designated use to a designated use with less stringent criteria can only be done through a use attainability analysis in accordance with 20.6.4.15 NMAC.

E. It is also recognized that contributions of water contaminants by diffuse nonpoint sources of water pollution may make attainment of certain criteria difficult. Revision of these criteria may be necessary as new information is obtained on nonpoint sources and other problems unique to semi-arid regions.

F. Site-specific criteria.

(1) The commission may adopt site-specific numeric criteria applicable to all or part of a surface water of the state based on relevant site-specific conditions such as:

(a) actual species at a site are more or less sensitive than those used in the national criteria data set;

(b) physical or chemical characteristics at a site such as pH or hardness alter the biological availability and/or toxicity of the chemical;

(c) physical, biological or chemical factors alter the bioaccumulation potential of a chemical;

(d) the concentration resulting from natural background exceeds numeric criteria for aquatic life, wildlife habitat or other uses if consistent with Subsection G of 20.6.4.10 NMAC; or

(e) other factors or combination of factors that upon review of the commission may warrant modification of the default criteria, subject to EPA review and approval.

(2) Site-specific criteria must fully protect the designated use to which they apply. In the case of human health-organism only criteria, site-specific criteria must fully protect human health when organisms are consumed from waters containing pollutants.

(3) Any person may petition the commission to adopt site-specific criteria. A petition for the adoption of site-specific criteria shall:

(a) identify the specific waters to which the site-specific criteria would apply;

(b) explain the rationale for proposing the site-specific criteria;

(c) describe the methods used to notify and solicit input from potential stakeholders and from the general public in the affected area, and present and respond to the public input received;

(d) present and justify the derivation of the proposed criteria.

(4) A derivation of site-specific criteria shall rely on a scientifically defensible method, such as one of the following:

(a) the recalculation procedure, the water-effect ratio for metals procedure or the resident species procedure as described in the water quality standards handbook (EPA-823-B-94-005a, 2nd edition, August 1994);

(b) the streamlined water-effect ratio procedure for discharges of copper (EPA-822-R-01-005, March 2001);

(c) the biotic ligand model as described in aquatic life ambient freshwater quality criteria - copper (EPA-822-R-07-001, February 2007);

(d) the methodology for deriving ambient water quality criteria for the protection of human health (EPA-822-B-00-004, October 2000) and associated technical support documents; or

(e) a determination of the natural background of the water body as described in Subsection G of 20.6.4.10 NMAC.

G. Site-specific criteria based on natural background. The commission may adopt site-specific criteria equal to the concentration resulting from natural background where that concentration protects the designated use. The concentration resulting from natural background supports the level of aquatic life and wildlife habitat expected to occur naturally at the site absent any interference by humans. Domestic water supply, primary or secondary contact, or human health-organism only criteria shall not be modified based on natural background. A determination of natural background shall:

(1) consider natural spatial and seasonal to interannual variability as appropriate;

(2) document the presence of natural sources of the pollutant;

(3) document the absence of human sources of the pollutant or quantify the human contribution; and

(4) rely on analytical, statistical or modeling methodologies to quantify the natural background.

H. Temporary standards.

(1) Any person may petition the commission to adopt a temporary standard applicable to all or part of a surface water of the state as provided for in this section and applicable sections in 40 CFR Part 131, Water Quality Standards; specifically, Section 131.14. The commission may adopt a proposed temporary standard if the petitioner demonstrates that:

(a) attainment of the associated designated use may not be feasible in the short term due to one or more of the factors listed in 40 CFR 131.10(g), or due to the implementation of actions necessary to facilitate restoration such as through dam removal or other significant wetland or water body reconfiguration activities as demonstrated by the petition and supporting work plan requirements in Paragraphs (4) and (5) of Subsection H of 20.6.4.10 NMAC;

(b) the proposed temporary standard represents the highest degree of protection feasible in the short term, limits the degradation of water quality to the minimum necessary to achieve the original standard by the expiration date of the temporary standard, and adoption will not cause the further impairment or loss of an existing use;

(c) for point sources, existing or proposed discharge control technologies will comply with applicable technology-based limitations and feasible technological controls and other management alternatives, such as a pollution prevention program; and

(d) for restoration activities, nonpoint source or other control technologies shall limit downstream impacts, and if applicable, existing or proposed discharge control technologies shall be in place consistent with Subparagraph (c) of Paragraph (1) of Subsection H of 20.6.4.10 NMAC.

(2) A temporary standard shall apply to specific designated use(s), pollutant(s), or permittee(s), and to specific water body segment(s). The adoption of a temporary standard does not exempt dischargers from complying with all other applicable water quality standards or control technologies.

(3) Designated use attainment as reported in the federal Clean Water Act, Section 305(b)/303(d) Integrated Report shall be based on the original standard and not on a temporary standard.

(4) A petition for a temporary standard shall:

(a) identify the currently applicable standard(s), the proposed temporary standard for the specific pollutant(s), the permittee(s), and the specific surface water body segment(s) of the state to which the temporary standard would apply;

(b) include the basis for any factor(s) specific to the applicability of the temporary standard (for example critical flow under Subsection B of 20.6.4.11 NMAC);

(c) demonstrate that the proposed temporary standard meets the requirements in this subsection;

(d) present a work plan with timetable of proposed actions for achieving compliance with the original standard in accordance with Paragraph (5) of Subsection H of 20.6.4.10 NMAC;

(e) include any other information necessary to support the petition.

(5) As a condition of a petition for a temporary standard, in addition to meeting the requirements in this Subsection, the petitioner shall prepare a work plan in accordance with Paragraph (4) of Subsection H of 20.6.4.10 NMAC and submit the work plan to the department for review and comment. The work plan shall identify the factor(s) listed in 40 CFR 131.10(g) or Subparagraph (a) of Paragraph (1) of Subsection H of 20.6.4.10 NMAC affecting attainment of the standard that will be analyzed and the timeline for proposed actions to be taken to achieve the uses attainable over the term of the temporary standard, including baseline water quality, and any investigations, projects, facility modifications, monitoring, or other measures necessary to achieve compliance with the original standard. The work plan shall include provisions for review of progress in accordance with Paragraph (8) of Subsection H of 20.6.4.10 NMAC, public notice and consultation with appropriate state, tribal, local and federal agencies.

(6) The commission may condition the approval of a temporary standard by requiring additional monitoring, relevant analyses, the completion of specified projects, submittal of information, or any other actions.

(7) Temporary standards may be implemented only after a public hearing before the commission, commission approval and adoption pursuant to Subsection H of 20.6.4.10 NMAC for all state purposes, and the federal Clean Water Act Section 303 (c) approval for any federal action.

(8) All temporary standards are subject to a required review during each succeeding review of water quality standards conducted in accordance with Subsection A of 20.6.4.10 NMAC. The petitioner shall provide a written report to the commission documenting the progress of proposed actions, pursuant to a reporting schedule stipulated in the approved temporary standard. The purpose of the review is to determine progress consistent with the original conditions of the petition for the duration of the temporary standard. If the petitioner cannot demonstrate that sufficient progress has been made the commission may revoke approval of the temporary standard or provide additional conditions to the approval of the temporary standard.

(9) The commission may consider a petition to extend a temporary standard. The effective period of a temporary standard shall be extended only if demonstrated to the commission that the factors precluding attainment of the underlying standard still apply, that the petitioner is meeting the conditions required for approval of the temporary standard, and that reasonable progress towards meeting the underlying standard is being achieved.

(10) A temporary standard shall expire no later than the date specified in the approval of the temporary standard. Upon expiration of a temporary standard, the original standard becomes applicable.

(11) Temporary standards shall be identified in 20.6.4.97-899 NMAC as appropriate for the surface water affected.

(12) "Temporary standard" means a time-limited designated use and criterion for a specific pollutant(s) or water quality parameter(s) that reflect the highest attainable condition during the term of the temporary standard.

[20.6.4.10 NMAC - Rp 20 NMAC 6.1.1102, 10/12/2000; Rn, 20.6.4.9 NMAC, 5/23/2005; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017; A, 4/23/2022]

20.6.4.11 APPLICABILITY OF WATER QUALITY STANDARDS:

A. [**RESERVED**]

B. Critical low flow: The critical low flow of a stream at a particular site shall be used in developing point source discharge permit requirements to meet numeric criteria set in 20.6.4.97 through 20.6.4.900 NMAC and Subsection F of 20.6.4.13 NMAC.

(1) For human health-organism only criteria, the critical low flow is the harmonic mean flow. For ephemeral waters the calculation shall be based upon the nonzero flow intervals and modified by including a factor to adjust for the proportion of intervals with zero flow. The equations are as follows:

$$\text{Harmonic Mean} = \frac{n}{\sum 1/Q}$$

where n = number of flow values
and Q = flow value

$$\text{Modified Harmonic Mean} = \left[\frac{\sum_{i=1}^{Nt-N0} \frac{1}{Qi}}{Nt - N0} \right]^{-1} x \left[\frac{Nt - N0}{Nt} \right]$$

where Qi = nonzero flow
Nt = total number of flow values
and N_0 = number of zero flow values

(2) For all other narrative and numeric criteria, the critical low flow is the minimum average four consecutive day flow that occurs with a frequency of once in three years (4Q3). The critical low flow may be determined on an annual, a seasonal or a monthly basis, as appropriate, after due consideration of site-specific conditions.

C. Guaranteed minimum flow: The commission may allow the use of a contractually guaranteed minimum streamflow in lieu of a critical low flow determined under Subsection B of this section on a case-by-case basis and upon consultation with the interstate stream commission. Should drought, litigation or any other reason interrupt or interfere with minimum flows under a guaranteed minimum flow contract for a period of at least 30 consecutive days, such permission, at the sole discretion of the commission, may then be revoked. Any minimum flow specified under such revoked permission shall be superseded by a critical low flow determined under Subsection B of this section. A public notice of the request for a guaranteed minimum flow shall be published in a newspaper of general circulation by the department at least 30 days prior to scheduled action by the commission. These water quality standards do not grant to the commission or any other entity the power to create, take away or modify property rights in water.

D. Mixing zones: A limited mixing zone, contiguous to a point source wastewater discharge, may be allowed in any stream receiving such a discharge. Mixing zones serve as regions of initial dilution that allow the application of a dilution factor in calculations of effluent limitations. Effluent limitations shall be developed that will protect the most sensitive existing, designated or attainable use of the receiving water.

E. Mixing zone limitations: Wastewater mixing zones, in which the numeric criteria set under Subsection F of 20.6.4.13 NMAC, 20.6.4.97 through 20.6.4.899 NMAC or 20.6.4.900 NMAC may be exceeded, shall be subject to the following limitations:

(1) Mixing zones are not allowed for discharges to lakes, reservoirs, or playas; these effluents shall meet all applicable criteria set under Subsection F of 20.6.4.13 NMAC, 20.6.4.97 through 20.6.4.899 NMAC and 20.6.4.900 NMAC at the point of discharge.

(2) The acute aquatic life criteria, as set out in Subsection I, Subsection J, and Subsection K of 20.6.4.900 NMAC, shall be attained at the point of discharge for any discharge to a surface water of the state with a designated aquatic life use.

(3) The general criteria set out in Subsections A, B, C, D, E, G, H and J of 20.6.4.13 NMAC, and the provision set out in Subsection D of 20.6.4.14 NMAC are applicable within mixing zones.

(4) The areal extent and concentration isopleths of a particular mixing zone will depend on site-specific conditions including, but not limited to, wastewater flow, receiving water critical low flow, outfall design, channel characteristics and climatic conditions and, if needed, shall be determined on a case-by-case basis.

When the physical boundaries or other characteristics of a particular mixing zone must be known, the methods presented in Section 4.4.5, "Ambient-induced mixing," in "Technical support document for water quality-based toxics control" (March 1991, EPA/505/2-90-001) shall be used.

(5) All applicable water quality criteria set under Subsection F of 20.6.4.13 NMAC, 20.6.4.97 through 20.6.4.899 NMAC and 20.6.4.900 NMAC shall be attained at the boundaries of mixing zones. A continuous zone of passage through or around the mixing zone shall be maintained in which the water quality meets all applicable criteria and allows the migration of aquatic life presently common in surface waters of the state with no effect on their populations.

F. Multiple uses: When a surface water of the state has more than a single designated use, the applicable numeric criteria shall be the most stringent of those established for such water.

G. Human health-organism only criteria in Subsection J of 20.6.4.900 NMAC apply to those waters with a designated, existing or attainable aquatic life use. When limited aquatic life is a designated use, the human health-organism only criteria apply only if adopted on a segment-specific basis. The human health-organism only criteria for persistent toxic pollutants, as identified in Subsection J of 20.6.4.900 NMAC, also apply to all tributaries of waters with a designated, existing or attainable aquatic life use.

H. Unclassified waters of the state: An unclassified surface water of the state is presumed to support the uses specified in Section 101(a)(2) of the federal Clean Water Act. As such, it is subject to 20.6.4.98 NMAC if nonperennial or subject to 20.6.4.99 NMAC if perennial. The commission may include an ephemeral unclassified surface water of the state under 20.6.4.97 NMAC only if a use attainability analysis demonstrates pursuant to 20.6.4.15 NMAC that attainment of Section 101(a)(2) uses is not feasible.

I. Exceptions: Numeric criteria for temperature, dissolved solids, dissolved oxygen, sediment or turbidity adopted under the Water Quality Act do not apply when changes in temperature, dissolved solids, dissolved oxygen, sediment or turbidity in a surface water of the state are attributable to:

(1) natural causes (discharges from municipal separate storm sewers are not covered by this exception.); or

(2) the reasonable operation of irrigation and flood control facilities that are not subject to federal or state water pollution control permitting; major reconstruction of storage dams or diversion dams except for emergency actions necessary to protect health and safety of the public are not covered by this exception.

[20.6.4.11 NMAC - Rp 20 NMAC 6.1.1103, 10/12/2000; A, 10/11/2002; Rn, 20.6.4.10 NMAC, 5/23/2005; A, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

20.6.4.12 COMPLIANCE WITH WATER QUALITY STANDARDS: The following provisions apply to determining compliance for enforcement purposes; they do not apply for purposes of determining attainment of uses. The department has developed assessment protocols for the purpose of determining attainment of uses that are available for review from the department's surface water quality bureau.

A. Compliance with acute water quality criteria shall be determined from the analytical results of a single grab sample. Acute criteria shall not be exceeded.

B. Compliance with chronic water quality criteria shall be determined from the arithmetic mean of the analytical results of samples collected using applicable protocols. Chronic criteria shall not be exceeded more than once every three years.

C. Compliance with water quality standards for total ammonia shall be determined by performing the biomonitoring procedures set out in Subsections D and E of 20.6.4.14 NMAC, or by attainment of applicable ammonia criteria set out in Subsections K, L and M of 20.6.4.900 NMAC.

D. Compliance with the human health-organism only criteria shall be determined from the analytical results of representative grab samples, as defined in the water quality management plan. Human health-organism only criteria shall not be exceeded.

E. The commission may establish a numeric water quality criterion at a concentration that is below the minimum quantification level. In such cases, the water quality standard is enforceable at the minimum quantification level.

F. For compliance with hardness-dependent numeric criteria, hardness (as mg $CaCO_3$/L) shall be determined from a sample taken at the same time that the sample for the contaminant is taken.

G. Compliance schedules: The commission may allow the inclusion of a schedule of compliance in a NPDES permit issued to an existing facility on a case-by-case basis. Such schedule of compliance will be for the purpose of providing a permittee with adequate time to make treatment facility modifications necessary to comply with water quality based permit limitations determined to be necessary to implement new or revised water quality standards or wasteload allocation. Compliance schedules may be included in NPDES permits at the time of

permit renewal or modification and shall be written to require compliance at the earliest practicable time. Compliance schedules shall also specify milestone dates so as to measure progress towards final project completion (e.g., design completion, construction start, construction completion, date of compliance).

H. It is a policy of the commission to allow a temporary standard approved and adopted pursuant to Subsection H of 20.6.4.10 NMAC to be included in the applicable federal Clean Water Act permit as enforceable limits and conditions. The temporary standard and any schedule of actions may be included at the earliest practicable time, and shall specify milestone dates so as to measure progress towards meeting the original standard. [20.6.4.12 NMAC - Rp 20 NMAC 6.1.1104, 10/12/2000; A, 10/11/2002; Rn, 20.6.4.11 NMAC, 5/23/2005; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017; A, 4/23/2022]

20.6.4.13 GENERAL CRITERIA: General criteria are established to sustain and protect existing or attainable uses of surface waters of the state. These general criteria apply to all surface waters of the state at all times, unless a specified criterion is provided elsewhere in this part. Surface waters of the state shall be free of any water contaminant in such quantity and of such duration as may with reasonable probability injure human health, animal or plant life or property, or unreasonably interfere with the public welfare or the use of property.

A. Bottom deposits and suspended or settleable solids:

(1) Surface waters of the state shall be free of water contaminants including fine sediment particles (less than two millimeters in diameter), precipitates or organic or inorganic solids from other than natural causes that have settled to form layers on or fill the interstices of the natural or dominant substrate in quantities that damage or impair the normal growth, function or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom.

(2) Suspended or settleable solids from other than natural causes shall not be present in surface waters of the state in quantities that damage or impair the normal growth, function or reproduction of aquatic life or adversely affect other designated uses.

B. Floating solids, oil and grease: Surface waters of the state shall be free of oils, scum, grease and other floating materials resulting from other than natural causes that would cause the formation of a visible sheen or visible deposits on the bottom or shoreline, or would damage or impair the normal growth, function or reproduction of human, animal, plant or aquatic life.

C. Color: Color-producing materials resulting from other than natural causes shall not create an aesthetically undesirable condition nor shall color impair the use of the water by desirable aquatic life presently common in surface waters of the state.

D. Organoleptic quality:

(1) Flavor of fish: Water contaminants from other than natural causes shall be limited to concentrations that will not impart unpalatable flavor to fish.

(2) Odor and taste of water: Water contaminants from other than natural causes shall be limited to concentrations that will not result in offensive odor or taste arising in a surface water of the state or otherwise interfere with the reasonable use of the water.

E. Plant nutrients: Plant nutrients from other than natural causes shall not be present in concentrations that will produce undesirable aquatic life or result in a dominance of nuisance species in surface waters of the state.

F. Toxic pollutants:

(1) Except as provided in 20.6.4.16 NMAC, surface waters of the state shall be free of toxic pollutants from other than natural causes in amounts, duration, concentrations, or combinations that affect the propagation of fish or that are toxic to humans, livestock or other animals, fish or other aquatic organisms, wildlife using aquatic environments for habitation or aquatic organisms for food, or that will or can reasonably be expected to bioaccumulate in tissues of fish, shellfish and other aquatic organisms to levels that will impair the health of aquatic organisms or wildlife or result in unacceptable tastes, odors or health risks to human consumers of aquatic organisms.

(2) Pursuant to this section, the human health-organism only criteria shall be as set out in 20.6.4.900 NMAC. When a human health-organism only criterion is not listed in 20.6.4.900 NMAC, the following provisions shall be applied in accordance with 20.6.4.11, 20.6.4.12 and 20.6.4.14 NMAC.

(a) The human health-organism only criterion shall be the recommended human health criterion for "consumption of organisms only" published by the U.S. environmental protection agency pursuant to Section 304(a) of the federal Clean Water Act. In determining such criterion for a cancer-causing toxic pollutant, a cancer risk of 10^{-5} (one cancer per 100,000 exposed persons) shall be used.

(b) When a numeric criterion for the protection of human health for the consumption of organism only has not been published by the U.S. environmental protection agency, a quantifiable criterion may be derived from data available in the U.S. environmental protection agency's Integrated Risk Information System (IRIS) using the appropriate formula specified in *Methodology for Deriving Ambient Water Quality Criteria for The Protection Of Human Health (2000)*, EPA-822-B-00-004.

(3) Pursuant to this section, the chronic aquatic life criteria shall be as set out in 20.6.4.900 NMAC. When a chronic aquatic life criterion is not listed in 20.6.4.900 NMAC, the following provisions shall be applied in sequential order in accordance with 20.6.4.11, 20.6.4.12 and 20.6.4.14 NMAC.

(a) The chronic aquatic life criterion shall be the "freshwater criterion continuous concentration" published by the U.S. environmental protection agency pursuant to Section 304(a) of the federal Clean Water Act;

(b) If the U.S. environmental protection agency has not published a chronic aquatic life criterion, a geometric mean LC-50 value shall be calculated for the particular species, genus or group that is representative of the form of life to be preserved, using the results of toxicological studies published in scientific journals.

(i) The chronic aquatic life criterion for a toxic pollutant that does not bioaccumulate shall be ten percent of the calculated geometric mean LC-50 value; and

(ii) The chronic aquatic life criterion for a toxic pollutant that does bioaccumulate shall be: the calculated geometric mean LC-50 adjusted by a bioaccumulation factor for the particular species, genus or group representative of the form of life to be preserved, but when such bioaccumulation factor has not been published, the criterion shall be one percent of the calculated geometric mean LC-50 value.

(4) Pursuant to this section, the acute aquatic life criteria shall be as set out in 20.6.4.900 NMAC. When an acute aquatic life criterion is not listed in 20.6.4.900 NMAC, the acute aquatic life criterion shall be the "freshwater criterion maximum concentration" published by the U.S. environmental protection agency pursuant to Section 304(a) of the federal Clean Water Act.

(5) Within 90 days of the issuance of a final NPDES permit containing a numeric criterion selected or calculated pursuant to Paragraph (2), Paragraph (3) or Paragraph (4) of Subsection F of this section, the department shall petition the commission to adopt such criterion into these standards.

G. Radioactivity: The radioactivity of surface waters of the state shall be maintained at the lowest practical level and shall in no case exceed the criteria set forth in the New Mexico Radiation Protection Regulations, 20.3.1 and 20.3.4 NMAC.

H. Pathogens: Surface waters of the state shall be free of pathogens from other than natural causes in sufficient quantity to impair public health or the designated, existing or attainable uses of a surface water of the state.

I. Temperature: Maximum temperatures for surface waters of the state have been specified in 20.6.4.97 through 20.6.4.900 NMAC. However, the introduction of heat by other than natural causes shall not increase the temperature, as measured from above the point of introduction, by more than 2.7°C (5°F) in a stream, or more than 1.7°C (3°F) in a lake or reservoir. In no case will the introduction of heat be permitted when the maximum temperature specified for the reach would thereby be exceeded. These temperature criteria shall not apply to impoundments constructed offstream for the purpose of heat disposal. High water temperatures caused by unusually high ambient air temperatures are not violations of these criteria.

J. Turbidity: Turbidity attributable to other than natural causes shall not reduce light transmission to the point that the normal growth, function or reproduction of aquatic life is impaired or that will cause substantial visible contrast with the natural appearance of the water. Activities or discharges shall not cause turbidity to increase more than 10 NTU over background turbidity when the background turbidity, measured at a point immediately upstream of the activity, is 50 NTU or less, nor to increase more than twenty percent when the background turbidity is more than 50 NTU. However, limited-duration turbidity increases caused by dredging, construction or other similar activities may be allowed provided all practicable turbidity control techniques have been applied and all appropriate permits, certifications and approvals have been obtained.

K. Total dissolved solids (TDS): TDS attributable to other than natural causes shall not damage or impair the normal growth, function or reproduction of animal, plant or aquatic life. TDS shall be measured by either the "calculation method" (sum of constituents) or the filterable residue method. Approved test procedures for these determinations are set forth in 20.6.4.14 NMAC.

L. Dissolved gases: Surface waters of the state shall be free of nitrogen and other dissolved gases at levels above one hundred ten percent saturation when this supersaturation is attributable to municipal, industrial or other discharges.

M. Biological integrity: Surface waters of the state shall support and maintain a balanced and integrated community of aquatic organisms with species composition, diversity and functional organization comparable to those of natural or minimally impacted water bodies of a similar type and region.
[20.6.4.13 NMAC - Rp 20 NMAC 6.1.1105, 10/12/2000; A, 10/11/2002; Rn, 20.6.4.12 NMAC, 5/23/2005; A, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

20.6.4.14 SAMPLING AND ANALYSIS:

A. Sampling and analytical techniques shall conform with methods described in the following references unless otherwise specified by the commission pursuant to a petition to amend these standards:

(1) "*Guidelines Establishing Test Procedures For The Analysis Of Pollutants Under The Clean Water Act*," 40 CFR Part 136 or any test procedure approved or accepted by EPA using procedures provided in 40 CFR Parts 136.3(d), 136.4, and 136.5;

(2) *Standard Methods For The Examination Of Water And Wastewater*, latest edition, American public health association;

(3) *Methods For Chemical Analysis Of Water And Waste*, and other methods published by EPA office of research and development or office of water;

(4) *Techniques Of Water Resource Investigations Of The U.S. Geological Survey*;

(5) *Annual Book Of ASTM Standards*: volumes 11.01 and 11.02, water (I) and (II), latest edition, ASTM international;

(6) *Federal Register*, latest methods published for monitoring pursuant to Resource Conservation and Recovery Act regulations;

(7) *National Handbook Of Recommended Methods For Water-Data Acquisition*, latest edition, prepared cooperatively by agencies of the United States government under the sponsorship of the U.S. geological survey; or

(8) *Federal Register*, latest methods published for monitoring pursuant to the Safe Drinking Water Act regulations.

B. Bacteriological Surveys: The monthly geometric mean shall be used in assessing attainment of criteria when a minimum of five samples is collected in a 30-day period.

C. Sampling Procedures:

(1) Streams: Stream monitoring stations below discharges shall be located a sufficient distance downstream to ensure adequate vertical and lateral mixing.

(2) Lakes: Sampling stations in lakes shall be located at least 250 feet from a discharge.

(3) Lakes: Except for the restriction specified in Paragraph (2) of this subsection, lake sampling stations shall be located at any site where the attainment of a water quality criterion is to be assessed. Water quality measurements taken at intervals in the entire water column at a sampling station shall be averaged for the epilimnion, or in the absence of an epilimnion, for the upper one-third of the water column of the lake to determine attainment of criteria, except that attainment of criteria for toxic pollutants shall be assessed during periods of complete vertical mixing, e.g., during spring or fall turnover, or by taking depth-integrated composite samples of the water column.

D. Acute toxicity of effluent to aquatic life shall be determined using the procedures specified in U.S. environmental protection agency "*Methods for Measuring The Acute Toxicity of Effluents and Receiving Waters To Freshwater and Marine Organisms*" (5th Ed., 2002, EPA 821-R-02-012), or latest edition thereof if adopted by EPA at 40 CFR Part 136, which is incorporated herein by reference. Acute toxicities of substances shall be determined using at least two species tested in whole effluent and a series of effluent dilutions. Acute toxicity due to discharges shall not occur within the wastewater mixing zone in any surface water of the state with an existing or designated aquatic life use.

E. Chronic toxicity of effluent or ambient surface waters of the state to aquatic life shall be determined using the procedures specified in U.S. environmental protection agency "*Short-Term Methods For Estimating The Chronic Toxicity Of Effluents And Receiving Waters To Freshwater Organisms*" (4th Ed., 2002, EPA 821-R-02-013), or latest edition thereof if adopted by EPA at 40 CFR Part 136, which is incorporated herein by reference. Chronic toxicities of substances shall be determined using at least two species tested in ambient surface water or whole effluent and a series of effluent dilutions. Chronic toxicity due to discharges shall not occur at the critical low flow, or any flow greater than the critical low flow, in any surface water of the state with an existing or designated aquatic life use more than once every three years.

F. Emerging Contaminants Monitoring: The department may require monitoring, analysis and reporting of emerging contaminants as a condition of a federal permit under Section 401 of the federal Clean Water Act.

[20.6.4.14 NMAC - Rp 20 NMAC 6.1.1106, 10/12/2000; Rn, 20.6.4.13 NMAC, 5/23/2005 & A, 5/23/2005; A, 12/1/2010; A 4/23/2022]

20.6.4.15 USE ATTAINABILITY ANALYSIS:

A. Regulatory requirements for a use attainability analysis. Whenever a use attainability analysis is conducted, it shall be subject to the requirements and limitations set forth in 40 CFR Part 131, Water Quality Standards; specifically, Subsections 131.3(g), 131.10(g), 131.10(h) and 131.10(j) shall be applicable. In accordance with 40 CFR 131.10(i), and 20.6.4.10 NMAC, the amendment of a designated use, based on an existing use with more stringent criteria, does not require a use attainability analysis.

(1) The commission may remove a designated use, that is not an existing use, specified in Section 101(a)(2) of the federal Clean Water Act or adopt subcategories of a use in Section 101(a)(2) of the federal Clean Water Act requiring less stringent criteria only if a use attainability analysis demonstrates that attaining the use is not feasible because of a factor listed in 40 CFR 131.10(g). Uses in Section 101(a)(2) of the federal Clean Water Act, which refer to the protection and propagation of fish, shellfish and wildlife and recreation in and on the water, are also specified in Subsection B of 20.6.4.6 NMAC.

(2) A designated use cannot be removed if it is an existing use unless a use requiring more stringent criteria is designated.

B. Methods for developing a use attainability analysis. A use attainability analysis shall assess the physical, chemical, biological, economic or other factors affecting the attainment of a use. The analysis shall rely on scientifically defensible methods such as the methods described in the following documents:

(1) *Technical Support Manual: Waterbody Surveys And Assessments For Conducting Use Attainability Analyses*, volume I (November 1983) and volume III (November 1984) or latest editions, United States environmental protection agency, office of water, regulations and standards, Washington, D.C., for the evaluation of aquatic life or wildlife uses;

(2) the department's *Hydrology Protocol*, latest edition, approved by the commission, for identifying ephemeral, intermittent, and perennial waters; or

(3) *Interim Economic Guidance For Water Quality Standards - Workbook*, March 1995, United States environmental protection agency, office of water, Washington, D.C. for evaluating economic impacts.

C. Determining the highest attainable use. If the use attainability analysis determines that the designated use is not attainable based on one of the factors in 40 CFR 131.10(g), the use attainability analysis shall demonstrate the support for removing the designated use and then determine the highest attainable use, as defined in 40 CFR 131.3(m), for the protection and propagation of fish, shellfish and wildlife and recreation in and on the water based on methods described in Subsection B of this section.

D. Process to amend a designated use through a use attainability analysis.

(1) The process for developing a use attainability analysis and petitioning the commission for removing a designated use and establishing the highest attainable use shall be done in accordance with the State's current *Water Quality Management Plan/Continuing Planning Process*.

(2) If the findings of a use attainability analysis, conducted by the department, in accordance with the department's *Hydrology Protocol* (latest edition) demonstrates that federal Clean Water Act Section 101(a)(2) uses, that are not existing uses, are not feasible in an ephemeral water body due to the factor in 40 CFR 131.10(g)(2), the department may consider proceeding with the expedited use attainability analysis process in accordance with the State's current *Water Quality Management Plan/Continuing Planning Process*. The following elements must be met for the expedited use attainability analysis process to be authorized and implemented:

(a) The department is the primary investigator of the use attainability analysis;

(b) The use attainability analysis determined, through the application of the *Hydrology Protocol*, that the water being investigated is ephemeral and has no effluent discharges of sufficient volume that could compensate for the low-flow;

(c) The use attainability analysis determined that the criteria associated with the existing uses of the water being investigated are not more stringent than those in 20.6.4.97 NMAC;

(d) The designated uses in 20.6.4.97 NMAC have been determined to be the highest attainable uses for the water being analyzed;

(e) The department posted the use attainability analysis on its water quality standards website and notified its interested parties list of a 30-day public comment period;

(f) The department reviewed and responded to any comments received during the 30-day public comment period ; and

(g) The department submitted the use attainability analysis and response to comments to region 6 EPA for technical approval.

If EPA approves the revision under section 303(c) of the Clean Water Act, the water shall be subject to 20.6.4.97 NMAC for federal Clean Water Act purposes. The use attainability analysis, the technical support document, and the applicability of 20.6.4.97 NMAC to the water shall be posted on the department's water quality standards website. The department shall periodically petition the commission to list ephemeral waters under Subsection C of 20.6.4.97 NMAC and to incorporate changes to classified segments as appropriate.

E. Use attainability analysis conducted by an entity other than the department. Any person may submit notice to the department stating their intent to conduct a use attainability analysis.

(1) The proponent shall provide such notice along with a work plan supporting the development of a use attainability analysis to the department and region 6 EPA for review and comment.

(2) Upon approval of the work plan by the department, the proponent shall conduct the use attainability analysis in accordance with the applicable portions of Subsections A through D of this Section and implement public noticing in accordance with the approved work plan.

(3) Work plan elements. The work plan shall identify, at a minimum:

(a) the waterbody of concern and the reasoning for conducting a use attainability analysis;

(b) the source and validity of data to be used to demonstrate whether the current designated use is not attainable;

(c) the factors in 40 CFR 131.10(g) affecting the attainment of that use;

(d) a description of the data being proposed to be used to demonstrate the highest attainable use;

(e) the provisions for consultation with appropriate state and federal agencies;

(f) a description of how stakeholders and potentially affected tribes will be identified and engaged;

(g) a description of the public notice mechanisms to be employed; and

(h) the expected timelines outlining the administrative actions to be taken for a rulemaking petition, pending the outcome of the use attainability analysis.

(4) Upon completion of the use attainability analysis, the proponent shall submit the data, findings and conclusions to the department, and provide public notice of the use attainability analysis in accordance with the approved work plan.

(5) Pending the conclusions of the use attainability analysis and as described in the approved work plan, the department or the proponent may petition the commission to modify the designated use. The cost of such use attainability analysis shall be the responsibility of the proponent. Subsequent costs associated with the administrative rulemaking process shall be the responsibility of the petitioner.

[20.6.4.15 NMAC - Rp 20 NMAC 6.1.1107, 10/12/2000; Rn, 20.6.4.14 NMAC, 5/23/2005; A, 5/23/2005; A, 7/17/2005; A, 12/1/2010; A, 4/23/2022]

20.6.4.16 PLANNED USE OF A PISCICIDE: The use of a piscicide registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 7 U.S.C. Section 136 *et seq*., and under the New Mexico Pesticide Control Act (NMPCA), Section 76-4-1 *et seq*. NMSA 1978 (1973) in a surface water of the state, shall not be a violation of Subsection F of 20.6.4.13 NMAC when such use is covered by a federal national pollutant discharge elimination system (NPDES) permit or has been approved by the commission under procedures provided in this section. The use of a piscicide which is covered by a NPDES permit shall require no further review by the commission and the person whose application is covered by the NPDES permit shall meet the additional notification and monitoring requirements outlined in Subsection G of 20.6.4.16 NMAC. The commission may approve the reasonable use of a piscicide under this section if the proposed use is not covered by a NPDES permit to further a Clean Water Act objective to restore and maintain the physical or biological integrity of surface waters of the state, including restoration of native species.

A. Any person seeking commission approval of the use of a piscicide not covered by a NPDES permit shall file a written petition concurrently with the commission and the surface water bureau of the department. The petition shall contain, at a minimum, the following information:

(1) petitioner's name and address;

(2) identity of the piscicide and the period of time (not to exceed five years) or number of applications for which approval is requested;

(3) documentation of registration under FIFRA and NMPCA and certification that the petitioner intends to use the piscicide according to the label directions, for its intended function;

(4) target and potential non-target species in the treated waters and adjacent riparian area, including threatened or endangered species;

(5) potential environmental consequences to the treated waters and the adjacent riparian area, and protocols for limiting such impacts;

(6) surface water of the state proposed for treatment;

(7) results of pre-treatment survey;

(8) evaluation of available alternatives and justification for selecting piscicide use;

(9) documentation of notice requesting public comment on the proposed use within a 30-day period, including information as described in Paragraphs (1), (2) and (6) of Subsection A of 20.6.4.16 NMAC, provided to:

(a) local political subdivisions;

(b) local water planning entities;

(c) local conservancy and irrigation districts; and

(d) local media outlets, except that the petitioner shall only be required to publish notice in a newspaper of circulation in the locality affected by the proposed use.

(10) copies of public comments received in response to the publication of notice and the petitioner's responses to public comments received;

(11) post-treatment assessment monitoring protocol; and

(12) any other information required by the commission.

B. Within 30 days of receipt of the petition, the department shall review the petition and file a recommendation with the commission to grant, grant with conditions or deny the petition. The recommendation shall include reasons, and a copy shall be sent to the petitioner by certified mail.

C. The commission shall review the petition, the public comments received under Paragraphs (9) and (10) of Subsection A of 20.6.4.16 NMAC, the petitioner's responses to public comments and the department's technical recommendations for the petition. A public hearing shall be held if the commission determines there is substantial public interest. The commission shall notify the petitioner and those commenting on the petition of the decision whether to hold a hearing and the reasons therefore in writing.

D. If the commission determines there is substantial public interest a public hearing shall be held within 90 days of receipt of the department's recommendation in the locality affected by the proposed use in accordance with 20.1.3 NMAC, Adjudicatory Procedures - Water Quality Control Commission. Notice of the hearing shall be given in writing by the petitioner to individuals listed under Subsection A of 20.6.4.16 NMAC as well as to individuals who provided public comment under that subsection at least 30 days prior to the hearing.

E. In a hearing provided for in this section or, if no hearing is held, in a commission meeting, the registration of a piscicide under FIFRA and NMPCA shall provide a rebuttable presumption that the determinations of the EPA Administrator in registering the piscicide, as outlined in 7 U.S.C. Section 136a(c)(5), are valid. For purposes of this Section the rebuttable presumptions regarding the piscicide include:

(1) Its composition is such as to warrant the proposed claims for it;

(2) Its labeling and other material submitted for registration comply with the requirements of FIFRA and NMPCA;

(3) It will perform its intended function without unreasonable adverse effects on the environment; and

(4) When used in accordance with all FIFRA label requirements it will not generally cause unreasonable adverse effects on the environment.

(5) "Unreasonable adverse effects on the environment" has the meaning provided in FIFRA, 7 U.S.C. Section 136(bb): "any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide."

F. After a public hearing, or commission meeting if no hearing is held, the commission may grant the petition in whole or in part, may grant the petition subject to conditions, or may deny the petition. In granting any petition in whole or part or subject to conditions, the commission shall require the petitioner to implement post-treatment assessment monitoring and provide notice to the public in the immediate and near downstream vicinity of the application prior to and during the application.

G. Any person whose application is covered by a NPDES permit shall provide written notice to local entities as described in Subsection A of 20.6.4.16 NMAC and implement post-treatment assessment monitoring within the application area as described in Subsection F of 20.6.4.16 NMAC.

[20.6.4.16 NMAC - Rn, Paragraph (6) of Subsection F of 20.6.4.12 NMAC, 5/23/2005; A, 5/23/2005; A, 3/2/2017]

20.6.4.17 - 20.6.4.49 [**RESERVED**]

20.6.4.50 BASINWIDE PROVISIONS - Special provisions arising from interstate compacts, international treaties or court decrees or that otherwise apply to a basin are contained in 20.6.4.51 through 20.6.4.59 NMAC.

[20.6.4.50 NMAC - N, 5/23/2005]

20.6.4.51 [**RESERVED**]

20.6.4.52 PECOS RIVER BASIN - In order to protect existing and designated uses, it is a goal of the state of New Mexico to prevent increases in TDS in the Pecos river above the following benchmark values, which are expressed as flow-weighted, annual average concentrations, at three USGS gaging stations: at Santa Rosa 500 mg/L; near Artesia 2,700 mg/L; and near Malaga 3,600 mg/L. The benchmark values serve to guide state action. They are adopted pursuant to the New Mexico Water Quality Act, not the Clean Water Act.

[20.6.4.52 NMAC - N, 12/1/2010]

20.6.4.53 [**RESERVED**]

20.6.4.54 COLORADO RIVER BASIN - For the tributaries of the Colorado river system, the state of New Mexico will cooperate with the Colorado river basin states and the federal government to support and implement the salinity policy and program outlined in the most current "review, water quality standards for salinity, Colorado river system" or equivalent report by the Colorado river salinity control forum.

A. Numeric criteria expressed as the flow-weighted annual average concentration for salinity are established at three points in the Colorado river basin as follows: below Hoover dam, 723 mg/L; below Parker dam, 747 mg/L; and at Imperial dam, 879 mg/L.

B. As a part of the program, objectives for New Mexico shall include the elimination of discharges of water containing solids in solution as a result of the use of water to control or convey fly ash from coal-fired electric generators, wherever practicable.

[20.6.4.54 NMAC - Rn, Paragraphs (1) through (3) of Subsection K of 20.6.4.12 NMAC, 5/23/2005; A, 5/23/2005]

20.6.4.55 - 20.6.4.96 [**RESERVED**]

20.6.4.97 EPHEMERAL WATERS: Ephemeral surface waters of the state as identified below and additional ephemeral waters as identified on the department's water quality standards website pursuant to Paragraph (2) of Subsection D of 20.6.4.15 NMAC are subject to the designated uses and criteria as specified in this section. Ephemeral waters classified in 20.6.4.101-899 NMAC are subject to the designated uses and criteria as specified in those sections.

A. Designated uses: livestock watering, wildlife habitat, limited aquatic life and secondary contact.

B. Criteria: the use-specific criteria in 20.6.4.900 NMAC are applicable to the designated uses.

C. Waters:

(1) the following waters are designated in the Rio Grande basin:

(a) Cunningham gulch from Santa Fe county road 55 upstream 1.4 miles to a point upstream of the Lac minerals mine, identified as Ortiz mine on U.S. geological survey topographic maps;

(b) an unnamed tributary from Arroyo Hondo upstream 0.4 miles to the Village of Oshara water reclamation facility outfall;

(c) an unnamed tributary from San Pedro creek upstream 0.8 miles to the PAA-KO community sewer outfall;

(d) Inditos draw from the crossing of an unnamed road along a power line one-quarter mile west of McKinley county road 19 upstream to New Mexico highway 509;

(e) an unnamed tributary from the diversion channel connecting Blue canyon and Socorro canyon upstream 0.6 miles to the New Mexico firefighters academy treatment facility outfall;

(f) an unnamed tributary from the Albuquerque metropolitan arroyo flood control authority (AMAFCA) Rio Grande south channel upstream of the crossing of New Mexico highway 47 upstream to I-25;

(g) the south fork of Cañon del Piojo from Cañon del Piojo upstream 1.2 miles to an unnamed tributary;

(h) an unnamed tributary from the south fork of Cañon del Piojo upstream 1 mile to the Resurrection mine outfall;

(i) Arroyo del Puerto from San Mateo creek upstream 6.8 miles to the Ambrosia Lake mine entrance road;

(j) an unnamed tributary from San Mateo creek upstream 1.5 miles to the Roca Honda mine facility outfall;

(k) San Isidro arroyo, including unnamed tributaries to San Isidro arroyo, from Arroyo Chico upstream to its headwaters;

(l) Arroyo Tinaja, including unnamed tributaries to Arroyo Tinaja, from San Isidro arroyo upstream to 2 miles northeast of the Cibola national forest boundary;

(m) Mulatto canyon from Arroyo Tinaja upstream to 1 mile northeast of the Cibola national forest boundary; and

(n) Doctor arroyo, including unnamed tributaries to Doctor arroyo, from San Isidro arroyo upstream to its headwaters, and excluding Doctor Spring and Doctor arroyo from the spring to its confluence with the unnamed tributary approximately one-half mile downstream of the spring.

(2) the following waters are designated in the Pecos river basin:

(a) an unnamed tributary from Hart canyon upstream 1 mile to South Union road;

(b) Aqua Chiquita from Rio Peñasco upstream to McEwan canyon; and

(c) Grindstone canyon upstream of Grindstone reservoir.

(3) the following waters are designated in the Canadian river basin:

(a) Bracket canyon upstream of the Vermejo river;

(b) an unnamed tributary from Bracket canyon upstream 2 miles to the Ancho mine; and

(c) Gachupin canyon from the Vermejo river upstream 2.9 miles to an unnamed west tributary near the Ancho mine outfall.

(4) in the San Juan river basin an unnamed tributary of Kim-me-ni-oli wash upstream of the mine outfall.

(5) the following waters are designated in the Little Colorado river basin:

(a) Defiance draw from County Road 1 to upstream of West Defiance Road; and

(b) an unnamed tributary of Defiance draw from McKinley county road 1 upstream to New Mexico highway 264.

(6) the following waters are designated in the closed basins:

(a) in the Tularosa river closed basin San Andres canyon downstream of South San Andres canyon; and

(b) in the Mimbres river closed basin San Vicente arroyo from the Mimbres river upstream to Maudes canyon.

[20.6.4.97 NMAC - N, 5/23/2005; A, 12/1/2010; A, 3/2/2017; A, 12/17/2019; A, 4/23/2022]

20.6.4.98 INTERMITTENT WATERS: All non-perennial surface waters of the state, except those ephemeral waters included under section 20.6.4.97 NMAC or classified in 20.6.4.101-899 NMAC.

A. Designated uses: livestock watering, wildlife habitat, marginal warmwater aquatic life and primary contact.

B. Criteria: the use-specific criteria in 20.6.4.900 NMAC are applicable to the designated uses, except that the following site-specific criteria apply: the monthly geometric mean of E. coli bacteria 206 cfu/100 mL or less, single sample 940 cfu/100 mL or less.

[20.6.4.98 NMAC - N, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.99 PERENNIAL WATERS: All perennial surface waters of the state except those classified in 20.6.4.101-899 NMAC.

A. Designated uses: Warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: The use-specific criteria in 20.6.4.900 NMAC are applicable to the designated uses, except that the following site-specific criteria apply: the monthly geometric mean of E. coli bacteria 206 cfu/100 mL or less, single sample 940 cfu/100 mL or less.

[20.6.4.99 NMAC - N, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.100 [RESERVED]

20.6.4.101 RIO GRANDE BASIN: The main stem of the Rio Grande from the international boundary with Mexico upstream to one mile downstream of Percha dam.

A. Designated uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses except that the following segment-specific criterion applies: temperature 34°C (93.2°F) or less.

(2) At mean monthly flows above 350 cfs, the monthly average concentration for: TDS 2,000 mg/L or less, sulfate 500 mg/L or less and chloride 400 mg/L or less.

C. Remarks: sustained flow in the Rio Grande below Caballo reservoir is dependent on release from Caballo reservoir during the irrigation season; at other times of the year, there may be little or no flow.

[20.6.4.101 NMAC - Rp 20 NMAC 6.1.2101, 10/12/2010; A, 12/15/2001; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.102 RIO GRANDE BASIN: The main stem of the Rio Grande from one mile downstream of Percha dam upstream to Caballo dam.

A. Designated uses: irrigation, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

C. Remarks: sustained flow in the Rio Grande downstream of Caballo reservoir is dependent on release from Caballo reservoir during the irrigation season; at other times of the year, there may be little or no flow.

[20.6.4.102 NMAC - Rp 20 NMAC 6.1.2102, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.103 RIO GRANDE BASIN: Perennial reaches of tributaries to the Rio Grande in Sierra and Socorro counties not specifically identified under other sections of 20.6.4 NMAC, excluding waters on tribal lands.

A. Designated uses: irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, secondary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.103 NMAC - Rp 20 NMAC 6.1.2103, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

[**NOTE:** This segment was divided effective 4/23/2022. The standards for the main stem of the Rio Grande from the headwaters of Caballo reservoir upstream to Elephant Butte dam, perennial reaches of Palomas creek, perennial reaches of Rio Salado, perennial reaches of Percha creek, perennial reaches of Alamosa creek, Las Animas creek, and perennial reaches of Abo arroyo are under 20.6.4.112 NMAC.]

20.6.4.104 RIO GRANDE BASIN: Caballo and Elephant Butte reservoir.

A. Designated uses: irrigation storage, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.104 NMAC - Rp 20 NMAC 6.1.2104, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.105 RIO GRANDE BASIN: The main stem of the Rio Grande from the headwaters of Elephant Butte reservoir upstream to Alameda bridge (Corrales bridge), excluding waters on Isleta pueblo.

A. Designated uses: irrigation, marginal warmwater aquatic life, livestock watering, public water supply, wildlife habitat and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS l,500 mg/L or less, sulfate 500 mg/L or less and chloride 250 mg/L or less.

[20.6.4.105 NMAC - Rp 20 NMAC 6.1.2105, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.106 RIO GRANDE BASIN: The main stem of the Rio Grande from Alameda bridge (Corrales bridge) upstream to the Angostura diversion works, excluding waters on Santa Ana pueblo, and intermittent water in the Jemez river below the Jemez pueblo boundary, excluding waters on Santa Ana and Zia pueblos, that enters the main stem of the Rio Grande. Portions of the Rio Grande in this segment are under the joint jurisdiction of the state and Sandia pueblo.

A. Designated uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and primary contact; and public water supply on the Rio Grande.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS 1,500 mg/L or less, sulfate 500 mg/L or less and chloride 250 mg/L or less.

[20.6.4.106 NMAC - Rp 20 NMAC 6.1.2105.1, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.107 RIO GRANDE BASIN: The Jemez river from the Jemez pueblo boundary upstream to Soda dam near the town of Jemez Springs and perennial reaches of Vallecito creek.

A. Designated uses: coldwater aquatic life, primary contact, irrigation, livestock watering and wildlife habitat; and public water supply on Vallecito creek.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 25°C (77°F).

[20.6.4.107 NMAC - Rp 20 NMAC 6.1.2105.5, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.108 RIO GRANDE BASIN: Perennial reaches of the Jemez river upstream of Soda dam near the town of Jemez Springs and perennial reaches of tributaries to the Jemez river except those not specifically identified under other sections of 20.6.4 NMAC, and perennial reaches of the Guadalupe river and perennial reaches of tributaries to the Guadalupe river, and Calaveras canyon.

A. Designated uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 400 µS/cm or less (800 µS/cm or less on Sulphur creek); the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less; and pH within the range of 2.0 to 8.8 on Sulphur creek.

[20.6.4.108 NMAC - Rp 20 NMAC 6.1.2106, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 7/10/2012; A, 4/23/2022]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segment are under 20.6.4.124 NMAC. The standards for San Gregorio lake are in 20.6.4.134 NMAC, effective 7/10/2012]

20.6.4.109 RIO GRANDE BASIN: Perennial reaches of Bluewater creek excluding Bluewater lake and waters on tribal lands, Rio Moquino upstream of Laguna pueblo, Seboyeta creek, Rio Paguate upstream of Laguna pueblo, the Rio Puerco upstream of the northern boundary of Cuba, and all other perennial reaches of tributaries to the Rio Puerco, including the Rio San Jose in Cibola county from the USGS gaging station at Correo upstream to Horace springs excluding waters on tribal lands.

A. Designated uses: coldwater aquatic life, domestic water supply, fish culture, irrigation, livestock watering, wildlife habitat and primary contact; and public water supply on La Jara creek.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: phosphorus (unfiltered sample) 0.1 mg/L or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.109 NMAC - Rp 20 NMAC 6.1.2107, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 7/10/2012]

[**NOTE:** The standards for Bluewater lake are in 20.6.4.135 NMAC, effective 7/10/2012]

20.6.4.110 RIO GRANDE BASIN: The main stem of the Rio Grande from Angostura diversion works upstream to Cochiti dam, excluding the reaches on San Felipe, Kewa and Cochiti pueblos.

A. Designated uses: irrigation, livestock watering, wildlife habitat, primary contact, coldwater aquatic life and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: pH within the range of 6.6 to 9.0 and temperature 25°C (77°F) or less.

[20.6.4.110 NMAC - Rp 20 NMAC 6.1.2108, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.111 RIO GRANDE BASIN: Perennial reaches of Las Huertas creek from the San Felipe pueblo boundary to the headwaters.

A. Designated uses: high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 25°C (77°F) or less.

[20.6.4.111 NMAC - Rp 20 NMAC 6.1.2108.5, 10/12/2000; A, 7/25/2001; A, 5/23/2005; A-12/1/2010]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segment are under 20.6.4.125 NMAC.]

20.6.4.112 RIO GRANDE BASIN: The main stem of the Rio Grande from the headwaters of Caballo reservoir upstream to Elephant Butte dam, perennial reaches of Palomas creek, perennial reaches of Rio Salado, perennial reaches of Percha creek, perennial reaches of Alamosa creek, Las Animas creek, and perennial reaches of Abo arroyo.

A. Designated uses: irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

C. Remarks: flow in this reach of the Rio Grande main stem is dependent upon release from Elephant Butte dam.

[20.6.4.112 NMAC - Rp 20 NMAC 6.1.2109, 10/12/2000; A, 5/23/2005; Repealed, 12/1/2010; A, 4/23/2022]

20.6.4.113 RIO GRANDE BASIN: The Santa Fe river and perennial reaches of its tributaries from the Cochiti pueblo boundary upstream to the outfall of the Santa Fe wastewater treatment facility.

A. Designated uses: irrigation, livestock watering, wildlife habitat, primary contact and coolwater aquatic life.

B. Criteria: The use-specific criteria in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 30°C (86°F) or less.

[20.6.4.113 NMAC - Rp 20 NMAC 6.1.2110, 10/12/2000; A, 10/11/2002; A, 5/23/2005; A, 12/1/2010; A, 2/14/2013]

20.6.4.114 RIO GRANDE BASIN: The main stem of the Rio Grande from the Cochiti pueblo boundary upstream to Rio Pueblo de Taos excluding waters on San Ildefonso, Santa Clara and Ohkay Owingeh pueblos, Embudo creek from its mouth on the Rio Grande upstream to the Picuris Pueblo boundary, the Santa Cruz river from the Santa Clara pueblo boundary upstream to the Santa Cruz dam, the Rio Tesuque except waters on the Tesuque and Pojoaque pueblos, and the Pojoaque river from the San Ildefonso pueblo boundary upstream to the Pojoaque pueblo boundary. Some Rio Grande waters in this segment are under the joint jurisdiction of the state and San Ildefonso pueblo.

A. Designated uses: irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, primary contact and warmwater aquatic life; and public water supply on the main stem Rio Grande.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: 6T3 temperature 22°C (71.6°F) and maximum temperature 25°C (78.8°F). In addition, the following criteria based on a 12-month rolling average are applicable to the public water supply use for monitoring and public disclosure purposes only:

Radionuclide	pCi/L
Americium-241	1.9
Cesium-137	6.4
Plutonium-238	1.5
Plutonium-239/240	1.5
Strontium-90	3.5
Tritium	4,000

(2) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS 500 mg/L or less, sulfate 150 mg/L or less and chloride 25 mg/L or less.

[20.6.4.114 NMAC - Rp 20 NMAC 6.1.2111, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.115 RIO GRANDE BASIN: The perennial reaches of Rio Vallecitos, perennial reaches of tributaries to Rio Vallecitos except Hopewell lake, and perennial reaches of Rio del Oso and perennial reaches of El Rito creek above the town of El Rito.

A. Designated uses: domestic water supply, irrigation, high quality coldwater aquatic life, livestock watering, wildlife habitat and primary contact; public water supply on the Rio Vallecitos and El Rito creek.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.115 NMAC - Rp 20 NMAC 6.1.2112, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 7/10/2012; A, 4/23/2022]

[**NOTE:** The standards for Hopewell lake are in 20.6.4.134 NMAC, effective 7/10/2012]

20.6.4.116 RIO GRANDE BASIN: The Rio Chama from its mouth on the Rio Grande upstream to Abiquiu reservoir, perennial reaches of the Rio Tusas, perennial reaches of the Rio Ojo Caliente, perennial reaches of Abiquiu creek and perennial reaches of El Rito creek downstream of the town of El Rito.

A. Designated uses: irrigation, livestock watering, wildlife habitat, coldwater aquatic life, warmwater aquatic life and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 31°C (87.8°F) or less.

[20.6.4.116 NMAC - Rp 20 NMAC 6.1.2113, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017; A, 4/23/2022]

20.6.4.117 RIO GRANDE BASIN: Abiquiu reservoir.

A. Designated uses: irrigation storage, livestock watering, wildlife habitat, primary contact, coldwater aquatic life and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 25°C (77°F) or less.

[20.6.4.117 NMAC - Rp 20 NMAC 6.1.2114, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.118 RIO GRANDE BASIN: The Rio Chama from the headwaters of Abiquiu reservoir upstream to El Vado reservoir and perennial reaches of the Rio Gallina and Rio Puerco de Chama north of state highway 96. Some Rio Chama waters in this segment are under the joint jurisdiction of the state and the Jicarilla Apache tribe.

A. Designated uses: irrigation, livestock watering, wildlife habitat, coldwater aquatic life, warmwater aquatic life and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 26°C (78.8°F) or less.

[20.6.4.118 NMAC - Rp 20 NMAC 6.1.2115, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.119 RIO GRANDE BASIN: All perennial reaches of tributaries to the Rio Chama above Abiquiu dam, except Canjilon lakes a, c, e and f and the Rio Gallina and Rio Puerco de Chama north of state highway 96 and excluding waters on Jicarilla Apache reservation, and the main stem of the Rio Chama from the headwaters of El Vado reservoir upstream to the New Mexico-Colorado line. Some Cañones creek and Rio Chama waters in this segment are under the joint jurisdiction of the state and the Jicarilla Apache tribe.

A. Designated uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact; and public water supply on the Rio Brazos and Rio Chama.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 500 µS/cm or less (1,000 µS or less for Coyote creek); the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.119 NMAC - Rp 20 NMAC 6.1.2116, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 7/10/2012]

[**NOTE:** The standards for Canjilon lakes a, c, e and f are in 20.6.4.134 NMAC, effective 7/10/2012]

20.6.4.120 RIO GRANDE BASIN: El Vado and Heron reservoirs.

A. Designated uses: irrigation storage, livestock watering, wildlife habitat, public water supply, primary contact and coldwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.120 NMAC - Rp 20 NMAC 6.1.2117, 10/12/2000; A. 5/23/2005; A, 12/1/2010]

20.6.4.121 RIO GRANDE BASIN: Perennial tributaries to the Rio Grande in Bandelier national monument and their headwaters in Sandoval county and all perennial reaches of tributaries to the Rio Grande in Santa Fe county unless included in other segments and excluding waters on tribal lands.

A. Designated uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact; and public water supply on Little Tesuque creek, the Rio en Medio, and the Santa Fe river.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.121 NMAC - Rp 20 NMAC 6.1.2118, 10/12/2000; A. 5/23/2005; A, 12/1/2010; A, 2/14/2013]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segments are under 20.6.4.126, 20.6.4.127 and 20.6.4.128 NMAC.]

20.6.4.122 RIO GRANDE BASIN: The main stem of the Rio Grande from Rio Pueblo de Taos upstream to the New Mexico-Colorado line, the Red river from its mouth on the Rio Grande upstream to the mouth of Placer creek, and the Rio Pueblo de Taos from its mouth on the Rio Grande upstream to the mouth of the Rio Grande del Rancho. Some Rio Grande and Rio Pueblo de Taos waters in this segment are under the joint jurisdiction of the state and Taos pueblo.

A. Designated uses: coldwater aquatic life, fish culture, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.122 NMAC - Rp 20 NMAC 6.1.2119, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.123 RIO GRANDE BASIN: Perennial reaches of the Red river upstream of the mouth of Placer creek, all perennial reaches of tributaries to the Red river, and all other perennial reaches of tributaries to the Rio Grande in Taos and Rio Arriba counties unless included in other segments and excluding waters on Santa Clara, Ohkay Owingeh, Picuris and Taos pueblos.

A. Designated uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact; and public water supply on the Rio Pueblo and Rio Fernando de Taos.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 400 µS/cm or less (500 µS/cm or less for the Rio Fernando de Taos); the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less; and phosphorus (unfiltered sample) less than 0.1 mg/L for the Red river.

[20.6.4.123 NMAC - Rp 20 NMAC 6.1.2120, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segment are under 20.6.4.129 NMAC.]

20.6.4.124 RIO GRANDE BASIN: Perennial reaches of Sulphur creek from its confluence with Redondo creek upstream to its headwaters.

A. Designated uses: limited aquatic life, wildlife habitat, livestock watering and secondary contact.

B. Criteria: the use-specific criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: pH within the range of 2.0 to 9.0, maximum temperature 30ºC (86ºF), and the chronic aquatic life criteria of Subsections I and J of 20.6.4.900 NMAC.

[20.6.4.124 NMAC - N, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.125 RIO GRANDE BASIN: Perennial reaches of San Pedro creek from the San Felipe pueblo boundary to the headwaters.

A. Designated uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 25°C (77°F) or less.

[20.6.4.125 NMAC - N, 5/23/2005; A, 12/1/2010]

20.6.4.126 RIO GRANDE BASIN: Perennial waters within lands managed by the U.S. department of energy (DOE) within Los Alamos National Laboratory (LANL), including but not limited to: Cañon de Valle from LANL stream gage E256 upstream to Burning Ground spring, Sandia canyon from Sigma canyon upstream to LANL NPDES outfall 001, Pajarito canyon from 0.5 miles below Arroyo de La Delfe upstream to Homestead spring, Arroyo de la Delfe from Pajarito canyon to Kieling spring, Starmers gulch and Starmers spring and Water canyon from Area-A canyon upstream to State Route 501.

A. Designated uses: coldwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.126 NMAC - N, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

20.6.4.127 RIO GRANDE BASIN: Perennial portions of Los Alamos canyon upstream from Los Alamos reservoir and Los Alamos reservoir.

A. Designated uses: coldwater aquatic life, livestock watering, wildlife habitat, irrigation and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.127 NMAC - N, 5/23/2005; A, 12/1/2010]

20.6.4.128 RIO GRANDE BASIN: Ephemeral and intermittent waters within lands managed by U.S. department of energy (DOE) within LANL, including but not limited to: Mortandad canyon, Cañada del Buey, Ancho canyon, Chaquehui canyon, Indio canyon, Fence canyon, Potrillo canyon, and portions of Cañon de Valle, Los Alamos canyon, Sandia canyon, Pajarito canyon and Water canyon not identified in 20.6.4.126 NMAC or 20.6.4.140 NMAC. (Surface waters within lands scheduled for transfer from DOE to tribal, state or local authorities are specifically excluded.)

A. Designated uses: livestock watering, wildlife habitat, limited aquatic life and secondary contact.

B. Criteria: the use-specific criteria in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the acute total ammonia criteria set forth in Subsection L of 20.6.4.900 NMAC (*Oncorhynchus* spp. absent).

[20.6.4.128 NMAC - N, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

[**NOTE:** This section was divided effective 4/23/2022. The standards for some intermittent waters within LANL are in 20.6.4.140 NMAC.]

20.6.4.129 RIO GRANDE BASIN: Perennial reaches of the Rio Hondo.

A. Designated uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 400 µS/cm or less and phosphorus (unfiltered sample) less than 0.1 mg/L.

[20.6.4.129 NMAC - N, 5/23/2005; A, 12/1/2010]

20.6.4.130 RIO GRANDE BASIN: The Rio Puerco from the Rio Grande upstream to Arroyo Chijuilla, excluding the reaches on Isleta, Laguna and Cañoncito Navajo pueblos. Some waters in this segment are under the joint jurisdiction of the state and Isleta, Laguna or Cañoncito Navajo pueblos.

A. Designated uses: irrigation, warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) At mean monthly flows above 100 cfs, the monthly average concentration for: TDS l,500 mg/L or less, sulfate 500 mg/L or less and chloride 250 mg/L or less.

[20.6.4.130 NMAC - N, 12/1/2010]

20.6.4.131 RIO GRANDE BASIN: The Rio Puerco from the confluence of Arroyo Chijuilla upstream to the northern boundary of Cuba.

A. Designated uses: warmwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.131 NMAC - N, 12/1/2010]

20.6.4.132 RIO GRANDE BASIN: Rio Grande (Klauer) spring

A. Designated uses: domestic water supply, wildlife habitat, livestock watering, coldwater aquatic life use and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.132 NMAC - N, 12/1/2010]

20.6.4.133 RIO GRANDE BASIN: Bull Creek lake, Cow lake, Elk lake, Goose lake, Heart lake, Hidden lake (Lake Hazel), Horseshoe lake, Horseshoe (Alamitos) lake, Jose Vigil lake, Lost lake, Middle Fork lake, Nambe lake, Nat II lake, Nat IV lake, No Fish lake, Pioneer lake, San Leonardo lake, Santa Fe lake, Serpent lake, South Fork lake, Trampas lakes (east and west) and Williams lake.

A. Designated uses: high quality coldwater aquatic life, irrigation, domestic water supply, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.133 NMAC - N, 7/10/2012]

20.6.4.134 RIO GRANDE BASIN: Cabresto lake, Canjilon lakes a, c, e and f, Fawn lakes (east and west), Hopewell lake and San Gregorio lake.

A. Designated uses: high quality coldwater aquatic life, irrigation, domestic water supply, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.134 NMAC - N, 7/10/2012]

20.6.4.135 RIO GRANDE BASIN: Bluewater lake.

A. Designated uses: coldwater aquatic life, irrigation, domestic water supply, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses except that the following segment-specific criteria apply: phosphorus (unfiltered sample) 0.1 mg/L or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.135 NMAC - N, 7/10/2012]

20.6.4.136 RIO GRANDE BASIN: The Santa Fe river from the outfall of the Santa Fe wastewater treatment facility to Guadalupe street.

A. Designated uses: limited aquatic life, wildlife habitat, primary contact, livestock watering, and irrigation.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.136 NMAC - N, 2/14/2013]

20.6.4.137 RIO GRANDE BASIN: The Santa Fe river from Guadalupe street to Nichols reservoir.

A. Designated uses: coolwater aquatic life, wildlife habitat, primary contact, livestock watering, and irrigation.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.137 NMAC - N, 2/14/2013]

20.6.4.138 RIO GRANDE BASIN: Nichols and McClure reservoirs.

A. Designated uses: high quality coldwater aquatic life, wildlife habitat, primary contact, public water supply and irrigation.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.138 NMAC - N, 2/14/2013]

20.6.4.139 RIO GRANDE BASIN: Perennial reaches of Galisteo creek and perennial reaches of its tributaries from Kewa pueblo upstream to 2.2 miles upstream of Lamy.

A. Designated uses: coolwater aquatic life, primary contact, irrigation, livestock watering, domestic water supply and wildlife habitat; and public water supply on Cerrillos reservoir.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.139 NMAC - N, 2/14/2013]

20.6.4.140 RIO GRANDE BASIN: Effluent canyon from Mortandad canyon to its headwaters, intermittent portions of S-Site canyon from monitoring well MSC 16-06293 to Martin spring, and intermittent portions of Twomile canyon from its confluence with Pajarito canyon to Upper Twomile canyon. (Surface waters within lands scheduled for transfer from DOE to tribal, state or local authorities are specifically excluded.)

A. Designated uses: livestock watering, wildlife habitat, marginal warmwater aquatic life and secondary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.140 NMAC - N, 4/23/2022]

20.6.4.141 - 20.6.4.200 [**RESERVED**]

20.6.4.201 PECOS RIVER BASIN: The main stem of the Pecos river from the New Mexico-Texas line upstream to the mouth of the Black river (near Loving).

A. Designated uses: irrigation, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(l) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: dissolved boron for irrigation use 2,000 µg/L or less.

(2) At all flows above 50 cfs: TDS 20,000 mg/L or less, sulfate 3,000 mg/L or less and chloride 10,000 mg/L or less.

[20.6.4.201 NMAC - Rp 20 NMAC 6.1.2201, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.202 PECOS RIVER BASIN: The main stem of the Pecos river from the mouth of the Black river upstream to lower Tansil dam, including perennial reaches of the Black river, the Delaware river and Blue spring.

A. Designated uses: industrial water supply, irrigation, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(l) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 34°C (93.2°F) or less.

(2) At all flows above 50 cfs: TDS 8,500 mg/L or less, sulfate 2,500 mg/L or less and chloride 3,500 mg/L or less.

C. Remarks: diversion for irrigation frequently limits summer flow in this reach of the main stem Pecos river to that contributed by springs along the watercourse.

[20.6.4.202 NMAC - Rp 20 NMAC 6.1.2202, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for Lower Tansil Lake and Lake Carlsbad are under 20.6.4.218 NMAC.]

20.6.4.203 PECOS RIVER BASIN: The main stem of the Pecos river from the headwaters of Lake Carlsbad upstream to Avalon dam.

A. Designated uses: industrial water supply, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: temperature 34°C (93.2°F) or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.203 NMAC - Rp 20 NMAC 6.1.2203, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for Lower Tansil Lake and Lake Carlsbad are under 20.6.4.218 and for Avalon Reservoir are under 20.6.4.219 NMAC.]

20.6.4.204 PECOS RIVER BASIN: The main stem of the Pecos river from the headwaters of Avalon reservoir upstream to Brantley dam.

A. Designated uses: irrigation, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.204 NMAC - Rp 20 NMAC 6.1.2204, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for Avalon Reservoir are under 20.6.4.219 NMAC.]

20.6.4.205 PECOS RIVER BASIN: Brantley reservoir.

A. Designated uses: irrigation storage, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.205 NMAC - Rp 20 NMAC 6.1.2205, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.206 PECOS RIVER BASIN: Perennial reaches of the Rio Felix and perennial reaches of tributaries to the Rio Hondo downstream of Bonney canyon, excluding North Spring river.

A. Designated uses: irrigation, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) At all flows above 50 cfs: TDS 14,000 mg/L or less, sulfate 3,000 mg/L or less and chloride 6,000 mg/L or less.

[20.6.4.206 NMAC - Rp 20 NMAC 6.1.2206, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017; A, 4/23/2022]

[**NOTE:** This segment was divided effective 4/23/2022. The standards for the main stem of the Pecos river from the headwaters of Brantley reservoir upstream to Salt creek (near Acme), perennial reaches of the Rio Peñasco downstream from state highway 24 near Dunken, and perennial reaches of the Rio Hondo are under 20.6.4.231 NMAC.]

20.6.4.207 PECOS RIVER BASIN: The main stem of the Pecos river from Salt creek (near Acme) upstream to Sumner dam.

A. Designated uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) At all flows above 50 cfs: TDS 8,000 mg/L or less, sulfate 2,500 mg/L or less and chloride 4,000 mg/L or less.

[20.6.4.207 NMAC - Rp 20 NMAC 6.1.2207, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

20.6.4.208 PECOS RIVER BASIN: Perennial reaches of the Rio Peñasco above state highway 24 near Dunken, perennial reaches of tributaries to the Rio Peñasco above state highway 24 near Dunken, perennial reaches of Cox canyon, perennial reaches of the Rio Bonito downstream from state highway 48 (near Angus), the Rio Ruidoso downstream of the U.S. highway 70 bridge near Seeping Springs lakes, perennial reaches of the Rio Hondo upstream from Bonney canyon and perennial reaches of Agua Chiquita.

A. Designated uses: fish culture, irrigation, livestock watering, wildlife habitat, coldwater aquatic life and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: temperature 30°C (86°F) or less, and phosphorus (unfiltered sample) less than 0.1 mg/L.

[20.6.4.208 NMAC - Rp 20 NMAC 6.1.2208, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

20.6.4.209 PECOS RIVER BASIN: Perennial reaches of Eagle creek upstream of Alto dam to the Mescalero Apache boundary, perennial reaches of the Rio Bonito upstream of state highway 48 (near Angus) excluding Bonito lake, perennial reaches of tributaries to the Rio Bonito upstream of state highway 48 (near Angus), perennial reaches of the Rio Ruidoso upstream of the U.S. highway 70 bridge near Seeping Springs lakes above and below the Mescalero Apache boundary and perennial reaches of tributaries to the Rio Ruidoso upstream of the U.S. highway 70 bridge near Seeping Springs lakes above and below the Mescalero Apache boundary.

A. Designated uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat, public water supply and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 600 µS/cm or less in Eagle creek, 1,100 µS/cm or less in Bonito creek and 1,500 µS/cm or less in the Rio Ruidoso; phosphorus (unfiltered sample) less than 0.1 mg/L; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.209 NMAC - Rp 20 NMAC 6.1.2209, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 7/10/2012; A, 4/23/2022]

[**NOTE:** The standards for Bonito lake are in 20.6.4.223 NMAC, effective 7/10/2012]

20.6.4.210 PECOS RIVER BASIN: Sumner reservoir.

A. Designated uses: irrigation storage, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.210 NMAC - Rp 20 NMAC 6.1.2210, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.211 PECOS RIVER BASIN: The main stem of the Pecos river from the headwaters of Sumner reservoir upstream to Tecolote creek excluding Santa Rosa reservoir.

A. Designated uses: fish culture, irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) At all flows above 50 cfs: TDS 3,000 mg/L or less, sulfate 2,000 mg/L or less and chloride 400 mg/L or less.

[20.6.4.211 NMAC - Rp 20 NMAC 6.1.2211, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 7/10/2012]

[**NOTE:** The standards for Santa Rosa reservoir are in 20.6.4.225 NMAC, effective 7/10/2012]

20.6.4.212 PECOS RIVER BASIN: Perennial tributaries to the main stem of the Pecos river from the headwaters of Sumner reservoir upstream to Santa Rosa dam.

A. Designated uses: irrigation, coldwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 25°C (77°F) or less.

[20.6.4.212 NMAC - Rp 20 NMAC 6.1.2211.1, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.213 PECOS RIVER BASIN: McAllister lake.

A. Designated uses: coldwater aquatic life, secondary contact, livestock watering and wildlife habitat.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 25°C (77°F) or less.

[20.6.4.213 NMAC - Rp 20 NMAC 6.1.2211.3, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.214 PECOS RIVER BASIN: Storrie lake.

A. Designated uses: coldwater aquatic life, warmwater aquatic life, primary contact, livestock watering, wildlife habitat, public water supply and irrigation storage.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.214 NMAC - Rp 20 NMAC 6.1.2211.5, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.215 PECOS RIVER BASIN: Perennial reaches of the Gallinas river upstream of the diversion for the Las Vegas municipal reservoir, perennial reaches of tributaries to the Gallinas river upstream of the diversion for the Las Vegas municipal reservoir, perennial reaches of Tecolote creek upstream of Blue creek and all perennial reaches of tributaries to Tecolote creek upstream of Blue creek.

A. Designated uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat, industrial water supply and primary contact; and public water supply on the Gallinas river.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less (450 µS/cm or less in Wright Canyon creek); the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.215 NMAC - Rp 20 NMAC 6.1.2212, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 2/13/2018; A, 4/23/2022]

[**NOTE:** This segment was divided effective 2/13/2018. The standards for Tecolote creek from I-25 to Blue creek are under 20.6.4.230 NMAC.]

20.6.4.216 PECOS RIVER BASIN: The main stem of the Pecos river from Tecolote creek upstream to Cañon de Manzanita.

A. Designated uses: irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 30°C (86°F) or less.

(2) At all flows above 10 cfs: TDS 250 mg/L or less, sulfate 25 mg/L or less and chloride 5 mg/L or less.

[20.6.4.216 NMAC - Rp 20 NMAC 6.1.2213, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.217 PECOS RIVER BASIN: Perennial reaches of Cow creek and all perennial reaches of its tributaries and the main stem of the Pecos river from Cañon de Manzanita upstream to its headwaters, including perennial reaches of all tributaries thereto except lakes identified in 20.6.4.222 NMAC.

A. Designated uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact; and public water supply on the main stem of the Pecos river.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.217 NMAC - Rp 20 NMAC 6.1.2214, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 7/10/2012]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segments are under 20.6.4.220 and 20.6.4.221 NMAC.]

20.6.4.218 PECOS RIVER BASIN: Lower Tansil lake and Lake Carlsbad.

A. Designated uses: industrial water supply, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 34°C (93.2°F) or less.

[20.6.4.218 NMAC - N, 5/23/2005; A, 12/1/2010]

20.6.4.219 PECOS RIVER BASIN: Avalon reservoir.

A. Designated uses: irrigation storage, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.219 NMAC - N, 5/23/2005; A, 12/1/2010]

20.6.4.220 PECOS RIVER BASIN: Perennial reaches of the Gallinas river and perennial reaches of tributaries to the Gallinas river from its mouth upstream to the diversion for the Las Vegas municipal reservoir, except Pecos Arroyo.

A. Designated uses: irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 30°C (86°F) or less.

[20.6.4.220 NMAC - N, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

20.6.4.221 PECOS RIVER BASIN: Pecos Arroyo.

A. Designated uses: livestock watering, wildlife habitat, warmwater aquatic life and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 206 cfu/100 mL, single sample 940 cfu/100 mL.

[20.6.4.221 NMAC - N, 5/23/2005; A, 12/1/2010]

20.6.4.222 PECOS RIVER BASIN: Johnson lake, Katherine lake, Lost Bear lake, Pecos Baldy lake, Spirit lake, Stewart lake and Truchas lakes (north and south).

A. Designated uses: high quality coldwater aquatic life, irrigation, domestic water supply, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.
[20.6.4.222 NMAC - N, 7/10/2012]

20.6.4.223 PECOS RIVER BASIN: Bonito lake.

A. Designated uses: high quality coldwater aquatic life, irrigation, domestic water supply, primary contact, livestock watering, wildlife habitat and public water supply.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses except that the following segment-specific criteria apply: specific conductance 1100 µS/cm or less; phosphorus (unfiltered sample) less than 0.1 mg/L; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.
[20.6.4.223 NMAC - N, 7/10/2012]

20.6.4.224 PECOS RIVER BASIN: Monastery lake.

A. Designated uses: coolwater aquatic life, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of *E. coli* bacteria 206 cfu/100 mL or less, single sample 940 cfu/100 mL or less.
[20.6.4.224 NMAC - N, 7/10/2012]

20.6.4.225 PECOS RIVER BASIN: Santa Rosa reservoir.

A. Designated uses: coolwater aquatic life, irrigation, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.
[20.6.4.225 NMAC - N, 7/10/2012]

20.6.4.226 PECOS RIVER BASIN: Perch lake.

A. Designated uses: coolwater aquatic life, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses except that the following segment-specific criteria apply: the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.
[20.6.4.226 NMAC - N, 7/10/2012]

20.6.4.227 PECOS RIVER BASIN: Lea lake.

A. Designated uses: warmwater aquatic life, primary contact and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses except that the following segment-specific criteria apply: the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.
[20.6.4.227 NMAC - N, 7/10/2012]

20.6.4.228 PECOS RIVER BASIN: Cottonwood lake and Devil's Inkwell.

A. Designated uses: coolwater aquatic life, primary contact and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of *E. coli* bacteria 206 cfu/100 mL or less, single sample 940 cfu/100 mL or less.
[20.6.4.228 NMAC - N, 7/10/2012]

20.6.4.229 PECOS RIVER BASIN: Mirror lake.

A. Designated uses: warmwater aquatic life, primary contact and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of *E. coli* bacteria 206 cfu/100 mL or less, single sample 940 cfu/100 mL or less.
[20.6.4.229 NMAC - N, 7/10/2012]

20.6.4.230 PECOS RIVER BASIN: Perennial reaches of Tecolote creek from I-25 to Blue creek.

A. Designated uses: domestic water supply, coolwater aquatic life, irrigation, livestock watering, wildlife habitat, and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.230 NMAC - N, 2/13/2018]

20.6.4.231 PECOS RIVER BASIN: The main stem of the Pecos river from the headwaters of Brantley reservoir upstream to Salt creek (near Acme), perennial reaches of the Rio Peñasco downstream from state highway 24 near Dunken, perennial reaches of North Spring river and perennial reaches of the Rio Hondo downstream of Bonney canyon.

A. Designated uses: irrigation, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) At all flows above 50 cfs: TDS 14,000 mg/L or less, sulfate 3,000 mg/L or less and chloride 6,000 mg/L or less.

[20.6.4.231 NMAC - N, 4/23/2022]

20.6.4.232 - 20.6.4.300 [**RESERVED**]

20.6.4.301 CANADIAN RIVER BASIN: The main stem of the Canadian river from the New Mexico-Texas line upstream to Ute dam, and any flow that enters the main stem from Revuelto creek.

A. Designated uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) TDS 6,500 mg/L or less at flows above 25 cfs.

[20.6.4.301 NMAC - Rp 20 NMAC 6.1.2301, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.302 CANADIAN RIVER BASIN: Ute reservoir.

A. Designated uses: livestock watering, wildlife habitat, public water supply, industrial water supply, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.302 NMAC - Rp 20 NMAC 6.1.2302, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.303 CANADIAN RIVER BASIN: The main stem of the Canadian river from the headwaters of Ute reservoir upstream to Conchas dam, the perennial reaches of Pajarito and Ute creeks and their perennial tributaries.

A. Designated uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.303 NMAC - Rp 20 NMAC 6.1.2303, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.304 CANADIAN RIVER BASIN: Conchas reservoir.

A. Designated uses: irrigation storage, livestock watering, wildlife habitat, public water supply, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.304 NMAC - Rp 20 NMAC 6.1.2304, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.305 CANADIAN RIVER BASIN: The main stem of the Canadian river from the headwaters of Conchas reservoir upstream to the New Mexico-Colorado line, perennial reaches of the Conchas river, the Mora river downstream from the USGS gaging station near Shoemaker, the Vermejo river downstream from Rail canyon and perennial reaches of Raton, Chicorica (except Lake Maloya and Lake Alice) and Uña de Gato creeks.

A. Designated uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) TDS 3,500 mg/L or less at flows above 10 cfs.

[20.6.4.305 NMAC - Rp 20 NMAC 6.1.2305, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

[**NOTE:** This segment was divided effective 12/1/2010. The standards for Lake Alice and Lake Maloya are under 20.6.4.311 and 20.6.4.312 NMAC, respectively.]

20.6.4.306 CANADIAN RIVER BASIN: The Cimarron river downstream from state highway 21 in Cimarron to the Canadian river and all perennial reaches of tributaries to the Cimarron river downstream from state highway 21 in Cimarron.

A. Designated uses: irrigation, warmwater aquatic life, livestock watering, wildlife habitat and primary contact; and public water supply on Cimarroncito creek.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

(2) TDS 3,500 mg/L or less at flows above 10 cfs.

[20.6.4.306 NMAC - Rp 20 NMAC 6.1.2305.1, 10/12/2000; A, 7/19/2001; A, 5/23/2005; A, 12/1/2010]

20.6.4.307 CANADIAN RIVER BASIN: Perennial reaches of the Mora river from the USGS gaging station near Shoemaker upstream to the state highway 434 bridge in Mora, all perennial reaches of tributaries to the Mora river downstream from the USGS gaging station at La Cueva in San Miguel and Mora counties except lakes identified in 20.6.4.313 NMAC, perennial reaches of Ocate creek downstream of Ocate, perennial reaches of tributaries to Ocate creek downstream of Ocate, and perennial reaches of Rayado creek downstream of Miami lake diversion in Colfax county.

A. Designated uses: marginal coldwater aquatic life, warmwater aquatic life, primary contact, irrigation, livestock watering and wildlife habitat.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.307 NMAC - Rp 20 NMAC 6.1.2305.3, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 7/10/2012; A, 4/23/2022]

20.6.4.308 CANADIAN RIVER BASIN: Charette lakes.

A. Designated uses: coldwater aquatic life, warmwater aquatic life, secondary contact, livestock watering and wildlife habitat.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.308 NMAC - Rp 20 NMAC 6.1.2305.5, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.309 CANADIAN RIVER BASIN: The Mora river and perennial reaches of its tributaries upstream from the state highway 434 bridge in Mora except lakes identified in 20.6.4.313 NMAC, all perennial reaches of tributaries to the Mora river upstream from the USGS gaging station at La Cueva, perennial reaches of Coyote creek, perennial reaches of tributaries to Coyote creek, the Cimarron river above state highway 21 in Cimarron, perennial reaches of tributaries to the Cimarron river above state highway 21 in Cimarron except Eagle Nest lake, all perennial reaches of tributaries to the Cimarron river north and northwest of highway 64 except north and south Shuree ponds, perennial reaches of Rayado creek above Miami lake diversion, perennial reaches of tributaries to Rayado creek above Miami lake diversion, Ocate

creek and perennial reaches of its tributaries upstream of Ocate, perennial reaches of the Vermejo river upstream from Rail canyon and all other perennial reaches of tributaries to the Canadian river northwest and north of U.S. highway 64 in Colfax county unless included in other segments.

A. Designated uses: domestic water supply, irrigation, high quality coldwater aquatic life, livestock watering, wildlife habitat, and primary contact; and public water supply on the Cimarron river upstream from Cimarron, on perennial reaches of Rayado creek and on perennial reaches of tributaries to Rayado creek.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 500 µS/cm or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.309 NMAC - Rp 20 NMAC 6.1.2306, 10/12/2000; A, 7/19/2001; A, 5/23/2005; A, 12/1/2010; A, 7/10/2012; A, 4/23/2022]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segment are under 20.6.4.310 NMAC. The standards for Shuree ponds are in 20.6.4.314 NMAC and the standards for Eagle Nest lake are in 20.6.4.315 NMAC, effective 7/10/2012]

20.6.4.310 CANADIAN RIVER BASIN: Perennial reaches of Corrumpa creek.

A. Designated uses: livestock watering, wildlife habitat, irrigation, primary contact and coldwater aquatic life.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: temperature 25°C (77°F) or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

(2) TDS 1,200 mg/L or less, sulfate 600 mg/L or less, chloride 40 mg/L or less.

[20.6.4.310 NMAC - N, 5/23/2005; A, 12/1/2010]

20.6.4.311 CANADIAN RIVER BASIN: Lake Alice.

A. Designated uses: marginal coldwater aquatic life, irrigation, livestock watering, wildlife habitat, primary contact and public water supply.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.311 NMAC - N, 12/1/2010; A, 4/23/2022]

20.6.4.312 CANADIAN RIVER BASIN: Lake Maloya.

A. Designated uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat, primary contact and public water supply.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.312 NMAC - N, 12/1/2010; A, 4/23/2022]

20.6.4.313 CANADIAN RIVER BASIN: Encantada lake, Maestas lake, Middle Fork lake of Rio de la Casa, North Fork lake of Rio de la Casa and Pacheco lake.

A. Designated uses: high quality coldwater aquatic life, irrigation, domestic water supply, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.313 NMAC - N, 7/10/2012]

20.6.4.314 CANADIAN RIVER BASIN: Shuree ponds (north and south).

A. Designated uses: high quality coldwater aquatic life, irrigation, domestic water supply, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses except that the following segment-specific criteria apply: specific conductance 500 µS/cm or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.314 NMAC - N, 7/10/2012]

20.6.4.315 CANADIAN RIVER BASIN: Eagle Nest lake.

A. Designated uses: high quality coldwater aquatic life, irrigation, domestic water supply, primary contact, livestock watering, wildlife habitat and public water supply.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses except that the following segment-specific criteria apply: specific conductance 500 µS/cm or less; the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.315 NMAC - N, 7/10/2012]

20.6.4.316 CANADIAN RIVER BASIN: Clayton lake.

A. Designated uses: coolwater aquatic life, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of *E. coli* bacteria 206 cfu/100 mL or less, single sample 940 cfu/100 mL or less.

[20.6.4.316 NMAC - N, 7/10/2012]

20.6.4.317 CANADIAN RIVER BASIN: Springer lake.

A. Designated uses: coolwater aquatic life, irrigation, primary contact, livestock watering, wildlife habitat, and public water supply.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.317 NMAC - N, 7/10/2012; A, 3/2/2017]

20.6.4.318 CANADIAN RIVER BASIN: Doggett creek.

A. Designated uses: Warm water aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: The use-specific criteria in 20.6.4.900 NMAC are applicable to the designated uses, except that the following site-specific criteria apply: the monthly geometric mean of E. coli bacteria 206 cfu/100 mL or less, single sample 940 cfu/100 mL or less.

C. Discharger-specific temporary standard:

(1) Discharger: City of Raton wastewater treatment plant

(2) NPDES permit number: NM0020273, Outfall 001

(3) Receiving waterbody: Doggett creek, 20.6.4.318 NMAC

(4) Discharge latitude/longitude: 36° 52' 13.91" N / 104° 25' 39.18" W

(5) Pollutant(s): nutrients; total nitrogen and total phosphorus

(6) Factor of issuance: substantial and widespread economic and social impacts (40 CFR 131.10(g)(6))

(7) Highest attainable condition: interim effluent condition of 8.0 mg/L total nitrogen and 1.6 mg/L total phosphorus as 30-day averages. The highest attainable condition shall be either the highest attainable condition identified at the time of the adoption, or any higher attainable condition later identified during any reevaluation, whichever is more stringent (40 CFR 131.14(b)(1)(iii)).

(8) Effective date of temporary standard: This temporary standard becomes effective for Clean Water Act purposes on the date of EPA approval.

(9) Expiration date of temporary standard: no later than 20 years from the effective date.

(10) Reevaluation period: at each succeeding review of water quality standards and at least once every five years from the effective date of the temporary standard (Paragraph (8) of Subsection H of 20.6.4.10 NMAC, 40 CFR 131.14(b)(1)(v)). If the discharger cannot demonstrate that sufficient progress has been made the commission may revoke approval of the temporary standard or provide additional conditions to the approval of the temporary standard. If the reevaluation is not completed at the frequency specified or the Department does not submit the reevaluation to EPA within 30 days of completion, the underlying designated use and criterion will be the applicable water quality standard for Clean Water Act purposes until the Department completes and submits the reevaluation to EPA. Public input on the reevaluation will be invited during NPDES permit renewals or triennial reviews, as applicable, in accordance with the State's most current approved water quality management plan and continuing planning process.

(11) Timeline for proposed actions. Tasks and target completion dates are listed in the most recent, WQCC-approved version of the New Mexico Environment Department, Surface Water Quality Bureau's

"Nutrient Temporary Standards for City of Raton Wastewater Treatment Plant, NPDES No. NM0020273 to Doggett Creek."
[20.6.4.318 NMAC - N, 05/22/2020; A, 4/23/2022]

20.6.4.319 - 20.6.4.400 [RESERVED]

20.6.4.401 SAN JUAN RIVER BASIN: The main stem of the San Juan river from the Navajo Nation boundary at the Hogback upstream to its confluence with the Animas river. Some waters in this segment are under the joint jurisdiction of the state and the Navajo Nation.

A. Designated uses: public water supply, industrial water supply, irrigation, livestock watering, wildlife habitat, primary contact, marginal coldwater aquatic life and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 32.2°C (90°F) or less.
[20.6.4.401 NMAC - Rp 20 NMAC 6.1.2401, 10/12/2000; A, 5/23/2005; A, 12/1/2010]
[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segment are under 20.6.4.408 NMAC.]

20.6.4.402 SAN JUAN RIVER BASIN: La Plata river from its confluence with the San Juan river upstream to the New Mexico-Colorado line.

A. Designated uses: irrigation, marginal warmwater aquatic life, marginal coldwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 32.2°C (90°F) or less.
[20.6.4.402 NMAC - Rp 20 NMAC 6.1.2402, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.403 SAN JUAN RIVER BASIN: The Animas river from its confluence with the San Juan river upstream to Estes arroyo.

A. Designated uses: Public water supply, industrial water supply, irrigation, livestock watering, wildlife habitat, coolwater aquatic life, and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 29°C (84.2°F) or less.
[20.6.4.403 NMAC - Rp 20 NMAC 6.1.2403, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.404 SAN JUAN RIVER BASIN: The Animas river from Estes arroyo upstream to the Southern Ute Indian tribal boundary.

A. Designated uses: Coolwater aquatic life, irrigation, livestock watering, wildlife habitat, public water supply, industrial water supply and primary contact.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: phosphorus (unfiltered sample) 0.l mg/L or less.
[20.6.4.404 NMAC - Rp 20 NMAC 6.1.2404, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.405 SAN JUAN RIVER BASIN: The main stem of the San Juan river from Cañon Largo upstream to the Navajo dam.

A. Designated uses: high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat, public water supply, industrial water supply and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 400 µS/cm or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.
[20.6.4.405 NMAC - Rp 20 NMAC 6.1.2405, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

20.6.4.406 SAN JUAN RIVER BASIN: Navajo reservoir in New Mexico.

A. Designated uses: coldwater aquatic life, warmwater aquatic life, irrigation storage, livestock watering, wildlife habitat, public water supply, industrial water supply and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: phosphorus (unfiltered sample) 0.1 mg/L

or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.
[20.6.4.406 NMAC - Rp 20 NMAC 6.1.2406, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.407 SAN JUAN RIVER BASIN: Perennial reaches of the Navajo river from the Jicarilla Apache reservation boundary to the Colorado border and perennial reaches of Los Pinos river in New Mexico.

A. Designated uses: coldwater aquatic life, irrigation, livestock watering, public water supply, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: phosphorus (unfiltered sample) 0.1 mg/L or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.
[20.6.4.407 NMAC - Rp 20 NMAC 6.1.2407, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.408 SAN JUAN RIVER BASIN: The main stem of the San Juan river from its confluence with the Animas river upstream to its confluence with Cañon Largo.

A. Designated uses: public water supply, industrial water supply, irrigation, livestock watering, wildlife habitat, primary contact, marginal coldwater aquatic life and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 32.2°C (90°F) or less.
[20.6.4.408 NMAC - N, 5/23/2005; A, 12/1/2010; A, 4/23/2022]

20.6.4.409 SAN JUAN RIVER BASIN: Lake Farmington.

A. Designated uses: public water supply, wildlife habitat, livestock watering, primary contact, coldwater aquatic life and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 25°C (77°F) or less.
[20.6.4.409 NMAC - N, 12/1/2010]

20.6.4.410 SAN JUAN RIVER BASIN: Jackson lake.

A. Designated uses: coolwater aquatic life, irrigation, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of *E. coli* bacteria 206 cfu/100 mL or less, single sample 940 cfu/100 mL or less.
[20.6.4.410 NMAC - N, 7/10/2012]

20.6.4.411 - 20.6.4.450: [**RESERVED**]

20.6.4.451 LITTLE COLORADO RIVER BASIN: The Rio Nutria upstream of the Zuni pueblo boundary, Tampico draw, Agua Remora, Tampico springs.

A. Designated uses: coolwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.
[20.6.4.451 NMAC - N, 12/1/2010]

20.6.4.452 LITTLE COLORADO RIVER BASIN: Ramah lake.

A. Designated uses: coldwater aquatic life, warmwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 25°C (77°F) or less.
[20.6.4.452 NMAC - N, 12/1/2010]

20.6.4.453 LITTLE COLORADO RIVER BASIN: Quemado lake.

A. Designated uses: coolwater aquatic life, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.453 NMAC - N, 7/10/2012]

20.6.4.454 - 20.6.4.500 [RESERVED]

20.6.4.501 GILA RIVER BASIN: The main stem of the Gila river from the New Mexico-Arizona line upstream to Redrock canyon and perennial reaches of streams in Hidalgo county.

A. Designated uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.501 NMAC - Rp 20 NMAC 6.1.2501, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.502 GILA RIVER BASIN: The main stem of the Gila river from Redrock canyon upstream to the confluence of the West Fork Gila river and East Fork Gila river and perennial reaches of tributaries to the Gila river downstream of Mogollon creek.

A. Designated uses: industrial water supply, irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, primary contact and warmwater aquatic life.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: 28°C (82.4°F) or less.

[20.6.4.502 NMAC - Rp 20 NMAC 6.1.2502, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.503 GILA RIVER BASIN: All perennial tributaries to the Gila river upstream of and including Mogollon creek.

A. Designated uses: domestic water supply, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance of 400 µS/cm or less for all perennial tributaries except West Fork Gila and tributaries thereto, specific conductance of 300 µS/cm or less; 32.2°C (90°F) or less in the east fork of the Gila river and Sapillo creek downstream of Lake Roberts; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.503 NMAC - Rp 20 NMAC 6.1.2503, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.504 GILA RIVER BASIN: Wall lake, Lake Roberts and Snow lake.

A. Designated uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: specific conductance 300 µS/cm or less.

[20.6.4.504 NMAC - Rp 20 NMAC 6.1.2504, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segment are under 20.6.4.806 NMAC.]

20.6.4.505 GILA RIVER BASIN: Bill Evans lake.

A. Designated uses: coolwater aquatic life, primary contact, livestock watering and wildlife habitat.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.505 NMAC - N, 7/10/2012]

20.6.4.506 - 20.6.4.600 [RESERVED]

20.6.4.601 SAN FRANCISCO RIVER BASIN: The main stem of the San Francisco river from the New Mexico-Arizona line upstream to state highway 12 at Reserve and perennial reaches of Mule creek.

A. Designated uses: irrigation, marginal warmwater and marginal coldwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.601 NMAC - Rp 20 NMAC 6.1.2601, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.602 SAN FRANCISCO RIVER BASIN: The main stem of the San Francisco river from state highway 12 at Reserve upstream to the New Mexico-Arizona line.

A. Designated uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: temperature 25°C (77°F) or less.

[20.6.4.602 NMAC - Rp 20 NMAC 6.1.2602, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.603 SAN FRANCISCO RIVER BASIN: All perennial reaches of tributaries to the San Francisco river above the confluence of Whitewater creek and including Whitewater creek.

A. Designated uses: domestic water supply, fish culture, high quality coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 400 µS/cm or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less; and temperature 25°C (77°F) or less in Tularosa creek.

[20.6.4.603 NMAC - Rp 20 NMAC 6.1.2603, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.604 - 20.6.4.700 [**RESERVED**]

20.6.4.701 DRY CIMARRON RIVER: Perennial portions of the Dry Cimarron river above Oak creek and perennial reaches of Oak creek.

A. Designated uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: temperature 25°C (77°F) or less, the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

(2) TDS 1,200 mg/L or less, sulfate 600 mg/L or less and chloride 40 mg/L or less.

[20.6.4.701 NMAC - Rp 20 NMAC 6.1.2701, 10/12/2000; A, 5/23/2005 A, 12/1/2010]

[**NOTE:** The segment covered by this section was divided effective 5/23/2005. The standards for the additional segment are under 20.6.4.702 NMAC.]

20.6.4.702 DRY CIMARRON RIVER: Perennial portions of the Dry Cimarron river below Oak creek, and perennial portions of Long canyon and Carrizozo creeks.

A. Designated uses: coolwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria:

(1) The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of *E. coli* bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

(2) TDS 1,200 mg/L or less, sulfate 600 mg/L or less and chloride 40 mg/L or less.

[20.6.4.702 NMAC - N, 5/23/2005; A, 12/1/2010; A, 7/10/2012]

20.6.4.703 - 20.6.4.800 [**RESERVED**]

20.6.4.801 CLOSED BASINS: Rio Tularosa upstream of the old U.S. highway 70 bridge crossing east of Tularosa and all perennial tributaries to the Tularosa basin except Three Rivers and Dog Canyon creek, and excluding waters on the Mescalero tribal lands.

A. Designated uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat, public water supply and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.801 NMAC - Rp 20 NMAC 6.1.2801, 10/12/2000; A, 5/23/2005; A, 12/1/2010; A, 2/13/2018]

[**NOTE:** This segment was divided effective 2/13/2018. The standards for Dog Canyon creek are under 20.6.4.810 NMAC.]

20.6.4.802 CLOSED BASINS: Perennial reaches of Three Rivers.

A. Designated uses: irrigation, domestic water supply, high quality coldwater aquatic life, primary contact, livestock watering and wildlife habitat.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 500 µS/cm or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.802 NMAC - Rp 20 NMAC 6.1.2802, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.803 CLOSED BASINS: Perennial reaches of the Mimbres river downstream of the confluence with Allie canyon and all perennial reaches of tributaries thereto.

A. Designated uses: Coolwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less and temperature of 30°C (86°F) or less.

[20.6.4.803 NMAC - Rp 20 NMAC 6.1.2803, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017]

20.6.4.804 CLOSED BASINS: Perennial reaches of the Mimbres river upstream of the confluence with Allie canyon to Cooney canyon, and all perennial reaches of East Fork Mimbres (McKnight canyon) downstream of the fish barrier, and all perennial reaches thereto.

A. Designated uses: Irrigation, domestic water supply, coldwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.804 NMAC - Rp 20 NMAC 6.1.2804, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 2/28/2018; A, 3/2/2017]

[**NOTE:** The segment covered by this section was divided effective 3/2/2017. The standards for the additional segment are covered under 20.6.4.807 NMAC.]

20.6.4.805 CLOSED BASINS: Perennial reaches of the Sacramento river (Sacramento-Salt Flat closed basin) and all perennial tributaries thereto.

A. Designated uses: domestic water supply, livestock watering, wildlife habitat, marginal coldwater aquatic life and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

[20.6.4.805 NMAC - Rp 20 NMAC 6.1.2805, 10/12/2000; A, 5/23/2005; A, 12/1/2010]

20.6.4.806 CLOSED BASINS: Bear canyon reservoir.

A. Designated uses: coldwater aquatic life, irrigation, livestock watering, wildlife habitat and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: specific conductance 300 µS/cm or less.

[20.6.4.806 NMAC - N, 5/23/2005; A, 12/1/2010]

20.6.4.807 CLOSED BASINS: Perennial reaches of the Mimbres river upstream of Cooney canyon and all perennial reaches thereto, including perennial reaches of East Fork Mimbres river (McKnight canyon) upstream of the fish barrier.

A. Designated uses: Irrigation, domestic water supply, high quality coldwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: specific conductance 300 µS/cm or less; the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.807 NMAC - N, 3/2/2017]

20.6.4.808 CLOSED BASINS: Perennial and intermittent watercourses within Smelter Tailing Soils Investigation Unit lands at the Chino mines company, excluding those ephemeral waters listed in 20.6.4.809 NMAC and including, but not limited to the mainstem of Lampbright draw, beginning at the confluence of Lampbright Draw with Rustler canyon, all tributaries that originate west of Lampbright draw to the intersection of Lampbright draw with U.S. 180, and all tributaries of Whitewater creek that originate east of Whitewater creek from the confluence of Whitewater creek with Bayard canyon downstream to the intersection of Whitewater creek with U.S. 180.

A. Designated uses: Warmwater aquatic life, livestock watering, wildlife habitat and primary contact.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the acute and chronic aquatic life criteria for copper set forth in Subsection I of 20.6.4.900 NMAC shall be determined by multiplying that criteria by the water effect ratio ("WER") adjustment expressed by the following equation:

$$WER = \frac{[10^{0.588+(0.703 \times \log DOC)+(0.395 \times \log Alkalinity)}] \times (\frac{100}{Hardness})^{0.9422}}{19.31}$$

For purposes of this section, dissolved organic carbon (DOC) is expressed in units of milligrams carbon per liter or mg C/L; alkalinity is expressed in units of mg/L as $CaCO_3$, and hardness is expressed in units of mg/L as $CaCO_3$. In waters that contain alkalinity concentrations greater than 250 mg/L, a value of 250 mg/L shall be used in the equation. In waters that contain DOC concentrations greater than 16 mg C/L, a value of 16 mg C/L shall be used in the equation. In waters that contain hardness concentrations greater than 400 mg/L, a value of 400 mg/L shall be used in the equation. The alkalinity, hardness and DOC concentrations used to calculate the WER value are those measured in the subject water sample.

[20.6.4.808 NMAC - N, 3/2/2017]

20.6.4.809 CLOSED BASINS: Ephemeral watercourses within smelter tailing soils investigation unit lands at the Chino mines company, limited to Chino mines property subwatershed drainage A and tributaries thereof, Chino mines property subwatershed drainage B and tributaries thereof (excluding the northwest tributary containing Ash spring and the Chiricahua leopard frog critical habitat transect); Chino mines property subwatershed drainage C and tributaries thereof (excluding reaches containing Bolton spring, the Chiricahua leopard frog critical habitat transect and all reaches in subwatershed C that are upstream of the Chiricahua leopard frog critical habitat); subwatershed drainage D and tributaries thereof (drainages D-1, D-2 and D-3, excluding the southeast tributary in drainage D1 that contains Brown spring) and subwatershed drainage E and all tributaries thereof (drainages E-1, E-2 and E-3).

A. Designated uses: Limited aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria: The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the acute aquatic life criteria for copper set forth in Subsection I of 20.6.4.900 NMAC shall be determined by multiplying that criteria by the water effect ratio ("WER") adjustment expressed by the following equation:

$$WER = \frac{[10^{0.588+(0.703 \times \log DOC)+(0.395 \times \log Alkalinity)}] \times (\frac{100}{Hardness})^{0.9422}}{19.31}$$

For purposes of this section, dissolved organic carbon (DOC) is expressed in units of milligrams carbon per liter or mg C/L; alkalinity is expressed in units of mg/L as $CaCO_3$, and hardness is expressed in units of mg/L as $CaCO_3$. In waters that contain alkalinity concentrations greater than 250 mg/L, a value of 250 mg/L shall be used in the equation. In waters that contain DOC concentrations greater than 16 mg C/L, a value of 16 mg C/L shall be used in the equation. In waters that contain hardness concentrations greater than 400 mg/L, a value of 400 mg/L shall be used in the equation. The alkalinity, hardness and DOC concentrations used to calculate the WER value are those measured in the subject water sample.

[20.6.4.809 NMAC - N, 3/2/2017]

20.6.4.810 CLOSED BASINS: Perennial reaches of Dog Canyon creek.

A. Designated uses: coolwater aquatic life, irrigation, livestock watering, wildlife habitat, public water supply, and primary contact.

B. Criteria: the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criteria apply: the monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less, single sample 235 cfu/100 mL or less.

[20.6.4.810 NMAC - N, 2/13/2018]

20.6.4.811 - 20.6.4.899 [RESERVED]

20.6.4.900 CRITERIA APPLICABLE TO EXISTING, DESIGNATED OR ATTAINABLE USES UNLESS OTHERWISE SPECIFIED IN 20.6.4.97 THROUGH 20.6.4.899 NMAC:

A. Fish culture and water supply: Fish culture, public water supply and industrial water supply are designated uses in particular classified waters of the state where these uses are actually being realized. However, no numeric criteria apply uniquely to these uses. Water quality adequate for these uses is ensured by the general criteria and numeric criteria for bacterial quality, pH and temperature.

B. Domestic water supply: Surface waters of the state designated for use as domestic water supplies shall not contain substances in concentrations that create a lifetime cancer risk of more than one cancer per 100,000 exposed persons. Those criteria listed under domestic water supply in Subsection J of this section apply to this use.

C. Irrigation and irrigation storage: the following numeric criteria and those criteria listed under irrigation in Subsection J of this section apply to this use:

(1)	dissolved selenium	0.13 mg/L
(2)	dissolved selenium in presence of >500 mg/L SO_4	0.25 mg/L.

D. Primary contact: The monthly geometric mean of E. coli bacteria of 126 cfu/100 mL or MPN/100 ml, a single sample of E. coli bacteria of 410 cfu/100 mL or MPN/100 mL, a single sample of total microcystins of 8 µg/L with no more than three exceedances within a 12-month period and a single sample of cylindrospermopsin of 15 µg/L with no more than three exceedances within a 12-month period, and pH within the range of 6.6 to 9.0 apply to this use. The results for *E. coli* may be reported as either colony forming units (CFU) or the most probable number (MPN) depending on the analytical method used.

E. Secondary contact: The monthly geometric mean of E. coli bacteria of 548 cfu/100 mL or MPN/100 mL and single sample of 2507 cfu/100 mL or MPN/100 mL apply to this use. The results for *E. coli* may be reported as either colony forming units (CFU) or the most probable number (MPN), depending on the analytical method used.

F. Livestock watering: the criteria listed in Subsection J of this section for livestock watering apply to this use.

G. Wildlife habitat: Wildlife habitat shall be free from any substances at concentrations that are toxic to or will adversely affect plants and animals that use these environments for feeding, drinking, habitat or propagation; can bioaccumulate; or might impair the community of animals in a watershed or the ecological integrity of surface waters of the state. The numeric criteria listed in Subsection J for wildlife habitat apply to this use.

H. Aquatic life: Surface waters of the state with a designated, existing or attainable use of aquatic life shall be free from any substances at concentrations that can impair the community of plants and animals in or the ecological integrity of surface waters of the state. Except as provided in Paragraph (7) of this subsection, the acute and chronic aquatic life criteria set out in Subsections I, J, K and L of this section and the human health-organism only criteria set out in Subsection J of this section are applicable to all aquatic life use subcategories. In addition, the specific criteria for aquatic life subcategories in the following paragraphs apply to waters classified under the respective designations.

(1) High quality coldwater: dissolved oxygen 6.0 mg/L or more, 4T3 temperature 20°C (68°F), maximum temperature 23°C (73°F), pH within the range of 6.6 to 8.8 and specific conductance a segment-specific limit between 300 µS/cm and 1,500 µS/cm depending on the natural background in the particular surface water of the state (the intent of this criterion is to prevent excessive increases in dissolved solids which would result in changes in community structure). Where a single segment-specific temperature criterion is indicated in 20.6.4.101-899 NMAC, it is the maximum temperature and no 4T3 temperature applies.

(2) Coldwater: dissolved oxygen 6.0 mg/L or more, 6T3 temperature 20°C (68°F), maximum temperature 24°C (75°F) and pH within the range of 6.6 to 8.8. Where a single segment-specific

temperature criterion is indicated in 20.6.4.101-899 NMAC, it is the maximum temperature and no 6T3 temperature applies.

(3) Marginal coldwater: dissolved oxygen 6 mg/L or more, 6T3 temperature 25°C (77°F), maximum temperature 29°C (84°F) and pH within the range from 6.6 to 9.0. Where a single segment-specific temperature criterion is indicated in 20.6.4.101-899 NMAC, it is the maximum temperature and no 6T3 temperature applies.

(4) Coolwater: dissolved oxygen 5.0 mg/L or more, maximum temperature 29°C (84°F) and pH within the range of 6.6 to 9.0.

(5) Warmwater: dissolved oxygen 5 mg/L or more, maximum temperature 32.2°C (90°F) and pH within the range of 6.6 to 9.0. Where a segment-specific temperature criterion is indicated in 20.6.4.101-899 NMAC, it is the maximum temperature.

(6) Marginal warmwater: dissolved oxygen 5 mg/L or more, pH within the range of 6.6 to 9.0 and temperatures that may routinely exceed 32.2°C (90°F). Where a segment-specific temperature criterion is indicated in 20.6.4.101-899 NMAC, it is the maximum temperature.

(7) Limited aquatic life: The acute aquatic life criteria of Subsections I and J of this section apply to this subcategory. Chronic aquatic life criteria do not apply unless adopted on a segment-specific basis. Human health-organism only criteria apply only for persistent toxic pollutants unless adopted on a segment-specific basis.

I. Hardness-dependent acute and chronic aquatic life criteria for metals are calculated using the following equations. The criteria are expressed as a function of hardness (as mg $CaCO_3$/L). With the exception of aluminum, the equations are valid only forhardness concentrations of 0-400 mg/L. For hardness concentrations above 400 mg/L, the criteria for 400 mg/L apply. For aluminum the equations are valid only for hardness concentrations of 0-220 mg/L. For hardness concentrations above 220 mg/L, the aluminum criteria for 220 mg/L apply. Calculated criteria must adhere to the treatment of significant figures and rounding identified in *Standard Methods For The Examination Of Water And Wastewater*, latest edition, American public health association.

(1) Acute aquatic life criteria for metals: The equation to calculate acute criteria in µg/L is $\exp(m_A[\ln(\text{hardness})] + b_A)(CF)$. Except for aluminum, the criteria are based on analysis of dissolved metal. For aluminum, the criteria are based on analysis of total recoverable aluminum in a sample that has a pH between 6.5 and 9.0 and is filtered to minimize mineral phases as specified by the department. The equation parameters are as follows:

Metal	m_A	b_A	Conversion factor (CF)
Aluminum (Al)	1.3695	1.8308	
Cadmium (Cd)	0.9789	-3.866	1.136672-[(ln hardness)(0.041838)]
Chromium (Cr) III	0.8190	3.7256	0.316
Copper (Cu)	0.9422	-1.700	0.960
Lead (Pb)	1.273	-1.460	1.46203-[(ln hardness)(0.145712)]
Manganese (Mn)	0.3331	6.4676	
Nickel (Ni)	0.8460	2.255	0.998
Silver (Ag)	1.72	-6.59	0.85
Zinc (Zn)	0.9094	0.9095	0.978

(2) Chronic aquatic life criteria for metals: The equation to calculate chronic criteria in µg/L is $\exp(m_C[\ln(\text{hardness})] + b_C)(CF)$. Except for aluminum, the criteria are based on analysis of dissolved metal. For aluminum, the criteria are based on analysis of total recoverable aluminum in a sample that has a pH between 6.5 and 9.0 and is filtered to minimize mineral phases as specified by the department. The equation parameters are as follows:

Metal	m_C	b_C	Conversion factor (CF)
Aluminum (Al)	1.3695	0.9161	
Cadmium (Cd)	0.7977	-3.909	1.101672-[(ln hardness)(0.041838)]
Chromium (Cr) III	0.8190	0.6848	0.860
Copper (Cu)	0.8545	-1.702	0.960
Lead (Pb)	1.273	-4.705	1.46203-[(ln hardness)(0.145712)]
Manganese (Mn)	0.3331	5.8743	
Nickel (Ni)	0.8460	0.0584	0.997
Zinc (Zn)	0.9094	0.6235	0.986

(3) Selected values of calculated acute and chronic criteria (µg/L).

Hardness as $CaCO_3$, dissolved (mg/L)		Al	Cd	Cr III	Cu	Pb	Mn	Ni	Ag	Zn
25.0	Acute	512	0.490	183	3.64	13.9	1,880	145	0.30	45.4
	Chronic	205	0.253	23.8	2.74	0.541	1,040	16.1		34.4
30.0	Acute	658	0.581	212	4.32	17.0	2,000	169	0.40	53.5
	Chronic	263	0.290	27.6	3.20	0.664	1,100	18.8		40.5
40.0	Acute	975	0.761	269	5.67	23.5	2,200	216	0.66	69.5
	Chronic	391	0.360	35.0	4.09	0.916	1,220	24.0		52.7
50.0	Acute	1,320	0.938	323	6.99	30.1	2,370	260	0.98	85.2
	Chronic	530	0.426	42.0	4.95	1.17	1,310	28.9		64.5
60.0	Acute	1,700	1.11	375	8.30	36.9	2,520	304	1.3	100
	Chronic	681	0.489	48.8	5.79	1.44	1,390	33.8		76.2
70.0	Acute	2,100	1.28	425	9.60	43.7	2,650	346	1.7	116
	Chronic	841	0.549	55.3	6.60	1.70	1,460	38.5		87.6
80.0	Acute	2,520	1.46	474	10.9	50.6	2,770	388	2.2	131
	Chronic	1,010	0.607	61.7	7.40	1.97	1,530	43.0		98.9
90.0	Acute	2,960	1.62	523	12.2	57.6	2,880	428	2.7	145
	Chronic	1,190	0.664	68.0	8.18	2.24	1,590	47.6		110
100	Acute	3,420	1.79	570	13.4	64.6	2,980	468	3.2	160
	Chronic	1,370	0.718	74.1	8.96	2.52	1,650	52.0		121
200	Acute	8,840	3.43	1,000	25.8	136	3,760	842	10	300
	Chronic	3,540	1.21	131	16.2	5.30	2,080	93.5		228
220	Acute	10,100	3.74	1,090	28.2	151	3,880	912	12	328
	Chronic	4,030	1.30	141	17.6	5.87	2,140	101		248
300	Acute		5.00	1,400	37.8	208	4,300	1,190	21	434
	Chronic		1.64	182	22.9	8.13	2,380	132		329
400 and above	Acute		6.54	1,770	49.6	281	4,740	1,510	35	564
	Chronic		2.03	231	29.3	10.9	2,620	168		428

J. Use-specific numeric criteria.

(1) Table of numeric criteria: The following table sets forth the numeric criteria applicable to existing, designated and attainable uses. For metals, criteria represent the total sample fraction unless otherwise specified in the table. Additional criteria that are not compatible with this table are found in Subsections A through I, K and L of this section.

Pollutant	CAS Number	DWS	Irr/Irr storage	LW	WH	Aquatic Life			Type
						Acute	Chronic	HH-OO	
Aluminum, dissolved	7429-90-5		5,000			750 i	87 i		
Aluminum, total recoverable	7429-90-5					a	a		
Antimony, dissolved	7440-36-0	6						640	P
Arsenic, dissolved	7440-38-2	10	100	200		340	150	9.0	C,P
Asbestos	1332-21-4	7,000,000 fibers/L							

Pollutant	CAS Number	DWS	Irr/Irr storage	LW	WH	Aquatic Life			Type
						Acute	Chronic	HH-OO	
Barium, dissolved	7440-39-3	2,000							
Beryllium, dissolved	7440-41-7	4							
Boron, dissolved	7440-42-8		750	5,000					
Cadmium, dissolved	7440-43-9	5	10	50		a	a		
Chloride	1688-70-06					860,000	230,000		
Chlorine residual	7782-50-5				11	19	11		
Chromium III, dissolved	16065-83-1					a	a		
Chromium VI, dissolved	18540-29-9					16	11		
Chromium, dissolved	7440-47-3	100	100	1,000					
Cobalt, dissolved	7440-48-4		50	1,000					
Copper, dissolved	7440-50-8	1300	200	500		a	a		
Cyanide, total recoverable	57-12-5	200			5.2	22.0	5.2	400	
Iron	7439-89-6						1,000		
Lead, dissolved	7439-92-1	15	5,000	100		a	a		
Manganese, dissolved	7439-96-5					a	a		
Mercury	7439-97-6	2		10	0.77				
Mercury, dissolved	7439-97-6					1.4	0.77		
Methylmercury	22967-92-6							0.3 mg/kg in fish tissue	P
Molybdenum, dissolved	7439-98-7		1,000						
Molybdenum, total recoverable	7439-98-7					7,920	1,895		
Nickel, dissolved	7440-02-0	700				a	a	4,600	P
Nitrate as N		10 mg/L							
Nitrite + Nitrate				132 mg/L					
Selenium, dissolved	7782-49-2	50	b	50				4,200	P
Selenium, total recoverable	7782-49-2				5.0	20.0	5.0		
Silver, dissolved	7440-22-4					a			
Thallium, dissolved	7440-28-0	2						0.47	P
Uranium, dissolved	7440-61-1	30							
Vanadium, dissolved	7440-62-2		100	100					
Zinc, dissolved	7440-66-6	10,500	2,000	25,000		a	a	26,000	P
Adjusted gross alpha		15 pCi/L		15 pCi/L					
Radium 226 + Radium 228		5 pCi/L		30.0 pCi/L					
Strontium 90		8 pCi/L							
Tritium		20,000 pCi/L		20,000 pCi/L					
Acenaphthene	83-32-9	2,100						90	
Acrolein	107-02-8	18				3.0	3.0	400	
Acrylonitrile	107-13-1	0.65						70	C
Aldrin	309-00-2	0.021				3.0		0.0000077	C,P
Anthracene	120-12-7	10,500						400	
Benzene	71-43-2	5						160	C
Benzidine	92-87-5	0.0015						0.11	C
Benzo(a)anthracene	56-55-3	0.048						0.013	C

Pollutant	CAS Number	DWS	Irr/Irr storage	LW	WH	Aquatic Life			Type
						Acute	Chronic	HH-OO	
Benzo(a)pyrene	50-32-8	0.2						0.0013	C,P
Benzo(b)fluoranthene	205-99-2	0.048						0.013	C
Benzo(k)fluoranthene	207-08-9	0.048						0.13	C
alpha-BHC	319-84-6	0.056						0.0039	C
beta-BHC	319-85-7	0.091						0.14	C
gamma-BHC (Lindane)	58-89-9	0.20				0.95		4.4	
Bis(2-chloroethyl) ether	111-44-4	0.30						22	C
Bis(2-chloro-1-methylethyl) ether	108-60-1	1,400						4,000	
Bis(2-ethylhexyl) phthalate	117-81-7	6						3.7	C
Bis(chloromethyl) ether	542-88-1							0.17	C
Bromoform	75-25-2	44						1,200	C
Butylbenzyl phthalate	85-68-7	7,000						1	C
Carbaryl	63-25-2					2.1	2.1		
Carbon tetrachloride	56-23-5	5						50	C
Chlordane	57-74-9	2				2.4	0.0043	0.0032	C,P
Chlorobenzene	108-90-7	100						800	
Chlorodibromomethane	124-48-1	4.2						210	C
Chloroform	67-66-3	57						2,000	
Chlorpyrifos	2921-88-2					0.083	0.041		
2-Chloronaphthalene	91-58-7	2,800						1,000	
2-Chlorophenol	95-57-8	175						800	
Chrysene	218-01-9	0.048						1.3	C
Demeton	8065-48-3						0.1		
Diazinon	333-41-5					0.17	0.17		
2,4-Dichlorophenoxyacetic acid	94-75-7							12,000	
Dichlorodiphenyldichloroethane (DDD)	72-54-8							0.0012	C
Dichlorodiphenyldichloroethylene (DDE)	72-55-9							0.00018	C
Dichlorodiphenyltrichloroethane (DDT)	50-29-3							0.0003	C,P
4,4'-DDT and derivatives		1.0			0.001	1.1	0.001		
Dibenzo(a,h)anthracene	53-70-3	0.048						0.0013	C
Dibutyl phthalate	84-74-2	3,500						30	
1,2-Dichlorobenzene	95-50-1	600						3,000	
1,3-Dichlorobenzene	541-73-1	469						10	
1,4-Dichlorobenzene	106-46-7	75						900	
3,3'-Dichlorobenzidine	91-94-1	0.78						1.5	C
Dichlorobromomethane	75-27-4	5.6						270	C
1,2-Dichloroethane	107-06-2	5						6,500	C
1,1-Dichloroethylene	75-35-4	7						20,000	
2,4-Dichlorophenol	120-83-2	105						60	
1,2-Dichloropropane	78-87-5	5.0						310	C
1,3-Dichloropropene	542-75-6	3.5						120	C
Dieldrin	60-57-1	0.022				0.24	0.056	0.000012	C,P
Diethyl phthalate	84-66-2	28,000						600	

Pollutant	CAS Number	DWS	Irr/Irr storage	LW	WH	Aquatic Life			Type
						Acute	Chronic	HH-OO	
Dimethyl phthalate	131-11-3	350,000						2,000	
2,4-Dimethylphenol	105-67-9	700						3,000	
Dinitrophenols	25550-58-7							1,000	
2,4-Dinitrophenol	51-28-5	70						300	
2,4-Dinitrotoluene	121-14-2	1.1						17	C
Dioxin	1746-01-6	3.0E-05						5.1E-08	C,P
1,2-Diphenylhydrazine	122-66-7	0.44						2.0	C
alpha-Endosulfan	959-98-8	62				0.22	0.056	30	
beta-Endosulfan	33213-65-9	62				0.22	0.056	40	
Endosulfan sulfate	1031-07-8	62						40	
Endrin	72-20-8	2				0.086	0.036	0.03	
Endrin aldehyde	7421-93-4	10.5						1	
Ethylbenzene	100-41-4	700						130	
Fluoranthene	206-44-0	1,400						20	
Fluorene	86-73-7	1,400						70	
Guthion	86-50-0						0.01		
Heptachlor	76-44-8	0.40				0.52	0.0038	0.000059	C
Heptachlor epoxide	1024-57-3	0.20				0.52	0.0038	0.00032	C
Hexachlorobenzene	118-74-1	1						0.00079	C,P
Hexachlorobutadiene	87-68-3	4.5						0.1	C
Hexachlorocyclohexane (HCH)-Technical	608-73-1							0.1	C
Hexachlorocyclopen-tadiene	77-47-4	50						4	
Hexachloroethane	67-72-1	25						1	C
Ideno(1,2,3-cd)pyrene	193-39-5	0.048						0.013	C
Isophorone	78-59-1	368						18,000	C
Malathion	121-75-5						0.1		
Methoxychlor	72-43-5						0.03	0.02	
Methyl bromide	74-83-9	49						10,000	
3-Methyl-4-chlorophenol	59-50-7							2,000	
2-Methyl-4,6-dinitrophenol	534-52-1	14						30	
Methylene chloride	75-09-2	5						10,000	C
Mirex	2385-85-5						0.001		
Nitrobenzene	98-95-3	18						600	
Nitrosamines	Various							12.4	C
Nitrosodibutylamine	924-16-3							2.2	C
Nitrosodiethylamine	55-18-5							12.4	C
N-Nitrosodimethylamine	62-75-9	0.0069						30	C
N-Nitrosodi-n-propylamine	621-64-7	0.050						5.1	C
N-Nitrosodiphenylamine	86-30-6	71						60	C
N-Nitrosopyrrolidine	930-55-2							340	C
Nonylphenol	84852-15-3					28	6.6		
Parathion	56-38-2					0.065	0.013		
Pentachlorobenzene	608-93-5							0.1	
Pentachlorophenol	87-86-5	1.0				19	15	0.4	C

Pollutant	CAS Number	DWS	Irr/Irr storage	LW	WH	Aquatic Life			Type
						Acute	Chronic	HH-OO	
Phenol	108-95-2	10,500						300,000	
Polychlorinated Biphenyls (PCBs)	1336-36-3	0.50			0.014	2	0.014	0.00064	C,P
Pyrene	129-00-0	1,050						30	
1,2,4,5-Tetrachlorobenzene	95-94-3							0.03	
1,1,2,2-Tetrachloroethane	79-34-5	1.8						30	C
Tetrachloroethylene	127-18-4	5						290	C,P
Toluene	108-88-3	1,000						520	
Toxaphene	8001-35-2	3				0.73	0.0002	0.0071	C
1,2-Trans-dichloroethylene	156-60-5	100						4,000	
Tributyltin (TBT)	Various					0.46	0.072		
1,2,4-Trichlorobenzene	120-82-1	70						0.76	C
1,1,1-Trichloroethane	71-55-6	200						200,000	
1,1,2-Trichloroethane	79-00-5	5						89	C
Trichloroethylene	79-01-6	5						70	C
2,4,5-Trichlorophenol	95-95-4							600	
2,4,6-Trichlorophenol	88-06-2	32						28	C
2-(2,4,5-Trichlorophenoxy)propionic acid (Silvex)	93-72-1							400	
Vinyl chloride	75-01-4	2						16	C

(2) Notes applicable to the table of numeric criteria in Paragraph (1) of this subsection.

(a) Where the letter "a" is indicated in a cell, the criterion is hardness-based and can be referenced in Subsection I of 20.6.4.900 NMAC.

(b) Where the letter "b" is indicated in a cell, the criterion can be referenced in Subsection C of 20.6.4.900 NMAC.

(c) Criteria are in µg/L unless otherwise indicated.

(d) Abbreviations are as follows: CAS - chemical abstracts service (see definition for "CAS number" in 20.6.4.7 NMAC); DWS - domestic water supply; Irr/Irr storage- irrigation and irrigation storage; LW - livestock watering; WH - wildlife habitat; HH-OO - human health-organism only; C – criteria based on cancer-causing endpoint; P - persistent toxic pollutant.

(e) The criteria are based on analysis of an unfiltered sample unless otherwise indicated. The acute and chronic aquatic life criteria for aluminum are based on analysis of total recoverable aluminum in a sample that is filtered to minimize mineral phases as specified by the department.

(f) The criteria listed under human health-organism only (HH-OO) are intended to protect human health when aquatic organisms are consumed from waters containing pollutants. These criteria do not protect the aquatic life itself; rather, they protect the health of humans who ingest fish or other aquatic organisms.

(g) The dioxin criteria apply to the sum of the dioxin toxicity equivalents expressed as 2,3,7,8-TCDD dioxin.

(h) The criteria for polychlorinated biphenyls (PCBs) apply to the sum of all congeners, to the sum of all homologs or to the sum of all aroclors.

(i) The acute and chronic aquatic life criteria for dissolved aluminum only apply when the concurrent pH is less than 6.5 or greater than 9.0 S.U. If the concurrent pH is between 6.5 and 9.0 S.U. then the hardness-dependent total recoverable aluminum criteria in Paragraphs (1) and (2) of Subsection I of 20.6.4.900 NMAC apply.

K. The criteria for total ammonia consider sensitive freshwater mussel species in the family Unionidae, freshwater non-pulmonate snails, and *Oncorhynchus* spp. (a genus of fish in the family Salmonidae), hence further protecting the aquatic community. The total ammonia criteria magnitude is measured as Total

Ammonia Nitrogen (TAN) mg/L. TAN is the sum of NH_4^+ and NH_3. TAN mg/L magnitude is derived as a function of pH and temperature (EPA 2013).

L. The acute aquatic life criteria for TAN (mg/L) was derived by the EPA (2013) as the one-hour average concentration of TAN mg/L that shall not be exceeded more than once every three years on average. The EPA acute criterion magnitude was derived using the following equation:

Acute TAN Criterion Magnitude for 1-hour average=

$$\text{MIN}\left(\left(\frac{0.275}{1+10^{7.204-pH}}+\frac{39}{1+10^{pH-7.204}}\right),\left(0.7249\text{x}\left(\frac{0.0114}{1+10^{7.204-pH}}+\frac{1.6181}{1+10^{pH-7.204}}\right)\text{x}\left(23.12\times 10^{0.036(20-T)}\right)\right)\right)$$

*T (*temperature C) and *pH* are defined as the paired values associated with the TAN sample.

(1) Temperature and pH-dependent values of the acute TAN criterion magnitude -when *Oncorhynchus* spp. absent.

	Temperature (°C)																				
pH	0-10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	51	48	44	41	37	34	32	29	27	25	23	21	19	18	16	15	14	13	12	11	9.9
6.6	49	46	42	39	36	33	30	28	26	24	22	20	18	17	16	14	13	12	11	10	9.5
6.7	46	44	40	37	34	31	29	27	24	22	21	19	18	16	15	14	13	12	11	9.8	9
6.8	44	41	38	35	32	30	27	25	23	21	20	18	17	15	14	13	12	11	10	9.2	8.5
6.9	41	38	35	32	30	28	25	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	7.9
7.0	38	35	33	30	28	25	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	7.9	7.3
7.1	34	32	30	27	25	23	21	20	18	17	15	14	13	12	11	10	9.3	8.5	7.9	7.2	6.7
7.2	31	29	27	25	23	21	19	18	16	15	14	13	12	11	9.8	9.1	8.3	7.7	7.1	6.5	6
7.3	27	26	24	22	20	18	17	16	14	13	12	11	10	9.5	8.7	8	7.4	6.8	6.3	5.8	5.3
7.4	24	22	21	19	18	16	15	14	13	12	11	9.8	9	8.3	7.7	7	6.5	6	5.5	5.1	4.7
7.5	21	19	18	17	15	14	13	12	11	10	9.2	8.5	7.8	7.2	6.6	6.1	5.6	5.2	4.8	4.4	4
7.6	18	17	15	14	13	12	11	10	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5
7.7	15	14	13	12	11	10	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5	3.2	2.9
7.8	13	12	11	10	9.3	8.5	7.9	7.2	6.7	6.1	5.6	5.2	4.8	4.4	4	3.7	3.4	3.2	2.9	2.7	2.5
7.9	11	9.9	9.1	8.4	7.7	7.1	6.6	3	5.6	5.1	4.7	4.3	4	3.7	3.4	3.1	2.9	2.6	2.4	2.2	2.1
8.0	8.8	8.2	7.6	7	6.4	5.9	5.4	5	4.6	4.2	3.9	3.6	3.3	3	2.8	2.6	2.4	2.2	2	1.9	1.7
8.1	7.2	6.8	6.3	5.8	5.3	4.9	4.5	4.1	3.8	3.5	3.2	3	2.7	2.5	2.3	2.1	2	1.8	1.7	1.5	1.4
8.2	6	5.6	5.2	4.8	4.4	4	3.7	3.4	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2
8.3	4.9	4.6	4.3	3.9	3.6	3.3	3.1	2.8	2.6	2.4	2.2	2	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1	0.96
8.4	4.1	3.8	3.5	3.2	3	2.7	2.5	2.3	2.1	2	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1	0.93	0.86	0.79
8.5	3.3	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	0.98	0.9	0.83	0.77	0.71	0.65
8.6	2.8	2.6	2.4	2.2	2	1.9	1.7	1.6	1.5	1.3	1.2	1.1	1	0.96	0.88	0.81	0.75	0.69	0.63	0.58	0.54
8.7	2.3	2.2	2	1.8	1.7	1.6	1.4	1.3	1.2	1.1	1	0.94	0.87	0.8	0.74	0.68	0.62	0.57	0.53	0.49	0.45
8.8	1.9	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37
8.9	1.6	1.5	1.4	1.3	1.2	1.1	1	0.93	0.85	0.79	0.72	0.67	0.61	0.56	0.52	0.48	0.44	0.4	0.37	0.34	0.32
9.0	1.4	1.3	1.2	1.1	1	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37	0.34	0.32	0.29	0.27

(2) Temperature and pH-dependent values for the acute TAN criterion magnitude-when *Oncorhynchus* spp. are present.

	Temperature (°C)																
pH	0-14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	33	33	32	29	27	25	23	21	19	18	16	15	14	13	12	11	9.9
6.6	31	31	30	28	26	24	22	20	18	17	16	14	13	12	11	10	9.5
6.7	30	30	29	27	24	22	21	19	18	16	15	14	13	12	11	9.8	9

6.8	28	28	27	25	23	21	20	18	17	15	14	13	12	11	10	9.2	8.5
6.9	26	26	25	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	7.9
7.0	24	24	23	21	20	18	17	15	14	13	12	11	10	9.4	8.6	8	7.3
7.1	22	22	21	20	18	17	15	14	13	12	11	10	9.3	8.5	7.9	7.2	6.7
7.2	20	20	19	18	16	15	14	13	12	11	9.8	9.1	8.3	7.7	7.1	6.5	6
7.3	18	18	17	16	14	13	12	11	10	9.5	8.7	8	7.4	6.8	6.3	5.8	5.3
7.4	15	15	15	14	13	12	11	9.8	9	8.3	7.7	7	6.5	6	5.5	5.1	4.7
7.5	13	13	13	12	11	10	9.2	8.5	7.8	7.2	6.6	6.1	5.6	5.2	4.8	4.4	4
7.6	11	11	11	10	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5
7.7	9.6	9.6	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5	3.2	3
7.8	8.1	8.1	7.9	7.2	6.7	6.1	5.6	5.2	4.8	4.4	4	3.7	3.4	3.2	2.9	2.7	2.5
7.9	6.8	6.8	6.6	6	5.6	5.1	4.7	4.3	4	3.7	3.4	3.1	2.9	2.6	2.4	2.2	2.1
8.0	5.6	5.6	5.4	5	4.6	4.2	3.9	3.6	3.3	3	2.8	2.6	2.4	2.2	2	1.9	1.7
8.1	4.6	4.6	4.5	4.1	3.8	3.5	3.2	3	2.7	2.5	2.3	2.1	2	1.8	1.7	1.5	1.4
8.2	3.8	3.8	3.7	3.5	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2
8.3	3.1	3.1	3.1	2.8	2.6	2.4	2.2	2	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1	1
8.4	2.6	2.6	2.5	2.3	2.1	2	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1	0.9	0.9	0.8
8.5	2.1	2.1	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1	0.9	0.8	0.8	0.7	0.7
8.6	1.8	1.8	1.7	1.6	1.5	1.3	1.2	1.1	1	1	0.9	0.8	0.8	0.7	0.6	0.6	0.5
8.7	1.5	1.5	1.4	1.3	1.2	1.1	1	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5
8.8	1.2	1.2	1.2	1.1	1	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4
8.9	1	1	1	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3
9.0	0.88	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3

M. The chronic aquatic life criteria for TAN (mg/L) was derived by the EPA (2013) as a thirty-day rolling average concentration of TAN mg/L that shall not be exceeded more than once every three years on average. In addition, the highest four-day average within the 30-day averaging period should not be more than 2.5 times the CCC (e.g., 2.5 x 1.9 mg TAN/L at pH 7 and 20°C, or 4.8 mg TAN/L) more than once in three years on average. The EPA chronic criterion magnitude was derived using the following equation:

Chronic TAN Criterion Magnitude for 30-day average=

$$0.8876 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times \left(2.126 \times 10^{0.028\times(20-MAX(T,7))}\right)$$

*T (*temperature °C) and *pH* are defined as the paired values associated with the TAN sample.

Temperature and pH-Dependent Values of the Chronic TAN Criterion Magnitude.

	Temperature (°C)																							
pH	0-7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	4.9	4.6	4.3	4.1	3.8	3.6	3.3	3.1	2.9	2.8	2.6	2.4	2.3	2.1	2	1.9	1.8	1.6	1.5	1.5	1.4	1.3	1.2	1.1
6.6	4.8	4.5	4.3	4	3.8	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1
6.7	4.8	4.5	4.2	3.9	3.7	3.5	3.2	3	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1
6.8	4.6	4.4	4.1	3.8	3.6	3.4	3.2	3	2.8	2.6	2.4	2.3	2.1	2	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1
6.9	4.5	4.2	4	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1
7.0	4.4	4.1	3.8	3.6	3.4	3.2	3	2.8	2.6	2.4	2.3	2.2	2	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1
7.1	4.2	3.9	3.7	3.5	3.2	3	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1	1
7.2	4	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1	1	0.9
7.3	3.8	3.5	3.3	3.1	2.9	2.7	2.6	2.4	2.2	2.1	2	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1	1	0.9	0.9

7.4	3.5	3.3	3.1	2.9	2.7	2.5	2.4	2.2	2.1	2	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2	1.1	1	1	0.9	0.9	0.8
7.5	3.2	3	2.8	2.7	2.5	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1	1	0.9	0.8	0.8	0.7
7.6	2.9	2.8	2.6	2.4	2.3	2.1	2	1.9	1.8	1.6	1.5	1.4	1.4	1.3	1.2	1.1	1.1	1	0.9	0.9	0.8	0.8	0.7	0.7
7.7	2.6	2.4	2.3	2.2	2	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6
7.8	2.3	2.2	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1	1	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.5
7.9	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1	1	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.5
8.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	1	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.4	0.4	0.4
8.1	1.5	1.5	1.4	1.3	1.2	1.1	1.1	1	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4
8.2	1.3	1.2	1.2	1.1	1	1	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3
8.3	1.1	1.1	1	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3
8.4	1	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2
8.5	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
8.6	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
8.7	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
8.8	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
8.9	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
9.0	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

[20.6.4.900 NMAC - Rp 20 NMAC 6.1.3100, 10/12/2010; A, 10/11/2002; A, 5/23/2005; A, 7/17/2005; A, 12/1/2010; A, 3/2/2017; A, 4/23/2022]

20.6.4.901 PUBLICATION REFERENCES: These documents are intended as guidance and are available for public review during regular business hours at the offices of the surface water quality bureau. Copies of these documents have also been filed with the New Mexico state records center in order to provide greater access to this information.

A. American public health association. 1992. *Standard Methods for The Examination of Water and Wastewater, 18th Edition.* Washington, D.C. 1048 p.

B. American public health association. 1995. *Standard Methods for The Examination of Water and Wastewater, 19th Edition.* Washington, D.C. 1090 p.

C. American public health association. 1998. *Standard Methods for The Examination of Water and Wastewater, 20th Edition.* Washington, D.C. 1112 p.

D. American public health association. 2018. *Standard Methods for The Examination of Water and Wastewater, 23rd Edition.* Washington, D.C. 1796 p.

E. United States geological survey. 1989. *Methods For Determination of Inorganic Substances In Water And Fluvial Sediments, Techniques of Water-Resource Investigations of The United States Geological Survey.* Washington, D.C. 545 p.

F. United States geological survey. 1987. *Methods For The Determination Of Organic Substances In Water And Fluvial Sediments, Techniques Of Water-Resource Investigations Of The United States Geological Survey.* Washington, D.C. 80 p.

G. United States environmental protection agency. 1983. *Methods For Chemical Analysis Of Water And Wastes.* Office of research and development, Washington, DC. (EPA/600/4-79/020). 491 p.

H. New Mexico water quality control commission. 2020. *State Of New Mexico Water Quality Management Plan and Continuing Planning Process*. Santa Fe, New Mexico. 277 p.

I. Colorado river basin salinity control forum. 2020. *2020 Review, Water Quality Standards For Salinity, Colorado River System.* Phoenix, Arizona. 97 p.

J. United States environmental protection agency. 2002. *Methods For Measuring The Acute Toxicity Of Effluents And Receiving Waters To Freshwater And Marine Organisms.* Office of research and development, Washington, D.C. (5th Ed., EPA 821-R-02-012). 293 p.

K. United States environmental protection agency. 2002. *Short-Term Methods For Estimating The Chronic Toxicity Of Effluents And Receiving Waters To Freshwater Organisms.* Environmental monitoring systems laboratory, Cincinnati, Ohio. (4th Ed., EPA 821-R-02-013). 335 p.

L. United States environmental protection agency. 1991. Ambient-induced mixing, in *Technical Support Document For Water Quality-Based Toxics Control*. Office of water, Washington, D.C. (EPA/505/2-90-001). 335 p.

M. United States environmental protection agency. 1983. *Technical Support Manual: Waterbody Surveys And Assessments For Conducting Use Attainability Analyses, Volume I*:. Office of water, regulations and standards, Washington, D.C. 232 p.

N. United States environmental protection agency. 1984. *Technical Support Manual: Waterbody Surveys And Assessments For Conducting Use Attainability Analyses, Volume III: Lake Systems*. Office of water, regulations and standards, Washington, D.C. 208 p.

[20.6.4.901 NMAC - Rp 20 NMAC 6.1.4000, 10/12/2010; A, 5/23/2005; A, 12/1/2010; A, 3/2/2017; A, 4/23/2022]

HISTORY of 20.6.4 NMAC:

Pre-NMAC History:

Material in the part was derived from that previously filed with the commission of public records - state records center and archives:

WQC 67-1, Water Quality Standards, filed 7/17/1967, effective 8/18/1967
WQC 67-1, Amendment Nos. 1-6, filed 3/21/1968, effective 4/22/1968
WQC 67-1, Amendment No. 7, filed 2/27/1969, effective 3-30/1969
WQC 67-1, Amendment No. 8, filed 7/14/1969, effective 8/15/1969
WQC 70-1, Water Quality Standards for Intrastate Waters and Tributaries to Interstate Streams, filed July 17, 1970;
WQC 67-1, Amendment Nos. 9 and 10, filed 2/12/1971, effective 3/15/1971
WQC 67-1, Amendment No. 11, filed 3/4/1971, effective 4/5/1971
WQC 73-1, New Mexico Water Quality Standards, filed 9/17/1973, effective 10/23/1973
WQC 73-1, Amendment Nos. 1 and 2, filed 10/3/1975, effective 11/4/1975
WQC 73-1, Amendment No. 3, filed 1/19/1976, effective 2/14/1976
WQC 77-2, Amended Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 2/24/1977, effective 3/11/1977
WQC 77-2, Amendment No. 1, filed 3/23/1978, effective 4/24/1978
WQC 77-2, Amendment No. 2, filed 6/12/1979, effective 7/13/1979
WQCC 80-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 8/28/1980, effective 9/28/1980
WQCC 81-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 5/5/1981, effective 6/4/1981
WQCC 81-1, Amendment No. 1, filed 5/19/1982, effective 6/18/1982
WQCC 81-1, Amendment No. 2, filed 6/24/1982, effective 7/26/1982
WQCC 85-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 1/16/1985, effective 2/15/1985
WQCC 85-1, Amendment No. 1, filed 8/28/1987, effective 9/28/1987
WQCC 88-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 3/24/1988, effective 4/25/1988
WQCC 91-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, filed 5/29/1991, effective 6/29/1991
WQCC 91-1, Amendment No. 1, filed 10/11/1991, effective 11/12/1991

History of the Repealed Material:

WQC 67-1, Water Quality Standards, - Superseded, 10/23/1973
WQC 73-1, New Mexico Water Quality Standards, - Superseded, 3/11/1977
WQC 77-2, Amended Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 9/28/1980
WQCC 80-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 6/4/1981
WQCC 81-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 2/15/1985
WQCC 85-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 4/25/1988
WQCC 88-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 6/29/1991
WQCC 91-1, Water Quality Standards for Interstate and Intrastate Streams in New Mexico, - Superseded, 1/23/1995
20 NMAC 6.1, Standards for Interstate and Intrastate Streams, - Repealed, 2/23/2000
20 NMAC 6.1, Standards for Interstate and Intrastate Surface Waters, - Repealed, 10/12/2000

FS Agreement No. 23-MU-11031600-095

Cooperator Agreement No. 23-667-2090-27688

MEMORANDUM OF UNDERSTANDING
Between The
NEW MEXICO ENVIRONMENT DEPARTMENT
And The
USDA, FOREST SERVICE
SOUTHWESTERN REGION

This MEMORANDUM OF UNDERSTANDING (MOU) is hereby made and entered into by and between the New Mexico Environment Department hereinafter referred to as "Environment Department," and the United States Department of Agriculture (USDA), Forest Service, Southwestern Region, hereinafter referred to as the "Forest Service."

Background: The New Mexico Water Quality Protection Agreement is a decades-old MOU between the Environment Department and U.S. Forest Service that was last signed in June 2017. The Environment Department is responsible for overseeing water infrastructure systems and water quality issues throughout New Mexico. The Environment Department closely coordinates with U.S. Forest Service on many programs that focus on protecting the quality of New Mexico's waters and assuring safe and effective infrastructure for delivering clean water to communities throughout the state, which is documented in this MOU.

Title: Water Quality Protection in New Mexico

I. PURPOSE: The purpose of this MOU is to document the cooperation between the parties to have a common objective of improving and protecting the quality of New Mexico's waters by implementing progressive watershed-based restoration protection programs to meet applicable water quality standards in accordance with the following provisions.

II. STATEMENT OF MUTUAL BENEFIT AND INTERESTS:

Whereas:

The New Mexico Water Quality Act, NMSA 1978, §§ 74-6-1 to -17, creates the New Mexico Water Quality Control Commission (Commission) and identifies the Commission as the State water pollution control agency for all purposes of the Clean Water Act in New Mexico;

The Commission has designated the Environment Department as the State's lead agency to implement Sections 208 and 319 of the Clean Water Act;

The Commission has authorized the Environment Department to enter into agreements with federal agencies for the purpose of water quality management, while retaining enforcement authority to ensure compliance with 20.6.4 NMAC;

The Forest Service is authorized and directed by acts of Congress, including but not limited to the Organic Act of June 4, 1897, as amended (16 U.S.C. § 551) and the Multiple-Use Sustained Yield Act of June 12, 1960 (16 U.S.C. §§ 528-31), and by regulations issued by the Secretary of Agriculture to administer and protect the lands and resources of National Forest System (NFS) lands and to cooperate with other agencies;

The Forest Service, under Section 313 of the Clean Water Act, 33 U.S.C. §1323, is directed to meet federal, state, interstate, and local substantive and procedural requirements respecting control and abatement of water pollution in the same manner and to the same extent as a non-governmental entity; and

The Commission has designated the Forest Service as the management agency for implementation of the New Mexico Nonpoint Source Management Program on NFS lands.

Therefore, it is mutually advantageous, and in the public interest, for the parties to coordinate their efforts to:

A. Respond to the water quality objectives defined by Congress in the federal Water Pollution Control Act (Clean Water Act), as amended. The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters;

B. Fulfill the goals and policies of the State of New Mexico as defined in the New Mexico Nonpoint Source Pollution Management Program developed pursuant to Section 319, 33 U.S.C. § 1329, of the Clean Water Act, and as defined in New Mexico's Standards for Interstate and Intrastate Waters (20.6.4 NMAC);

C. Identify the responsibilities and activities to be performed by each agency in carrying out the New Mexico Water Quality Management Plan (WQMP) developed pursuant to section 208, 33 U.S.C, § 1288, of the Clean Water Act and Nonpoint Source Management Program as related to activities on NFS lands, as that term is defined by 16 U.S.C. § 1609(a); and

D. To foster a collaborative effort in implementing watershed approaches to restore those watersheds not meeting clean water, natural resource, and public health goals and to sustain healthy conditions in other watersheds.

In consideration of the above premises, the parties agree as follows:

III. THE ENVIRONMENT DEPARTMENT SHALL:

A. Recommend that the Commission continue its designation of the Forest Service as the Designated Management Agency for implementation of the New Mexico Nonpoint Source Pollution Management Program on NFS lands;

B. Share timely drafts of Environment Department proposed water quality laws, regulations, standards, and policies to the Forest Service for review and comment during their development;

C. Participate in the Forest Service Land Resource Management Plan (LRMP) implementation process in a manner consistent with the Environment Department's regulatory responsibility and authority, in order to make recommendations on necessary LRMPs and implementing projects, activities, or Best Management Practices (BMPs);

D. Review water quality standards when the Forest Service and/or the Surface Water Quality Bureau monitoring indicates that criteria or designated uses may not be appropriate;

E. Coordinate with the Forest Service in all phases of Total Maximum Daily Load (TMDL) development on NFS lands in ensuring that the Forest Service has the timely opportunity to-share input on monitoring site locations and TMDL plans to restore impaired waters;

F. Share information to the Forest Service regarding the Clean Water Act Section 319(h), 33 U.S.C. § 1329(h), grant process;

G. In addition to the other provisions of this MOU, when an Outstanding National Resource Water (ONRW) located on NFS lands could be affected by Forest Service resource management decisions or determined to be impaired through the Environment Department's assessment process, the Surface Water Quality Bureau shall:

   1. Respond to the Forest Service regarding whether a proposed authorization of a use of NFS lands will comply with all requirements of the State's Antidegradation Policy and Implementation Procedures;

   2. Where a Clean Water Act Section 401 certification is required for a proposed authorization of a use on NFS lands, make determinations about compliance with the State's Antidegradation Policy and Implementation Procedures through the Section 401 certification process;

3. Coordinate with the Forest Service to develop shared protocols for implementing ONRW protections, including strategies to prevent future degradation in ONRW streams and wetlands;

4. Inform the Forest Service of potential ONRW degradation as soon as practicable after the Surface Water Quality Bureau determines potential degradation (including but not limited to potential new ONRW impairments identified through assessment of verified and validated data during the development of the Clean Water Act Section 303(d)/305(b) Integrated Report);

5. If potential degradation of an ONRW has been determined, collaborate with Forest Service to review available verified and validated water quality and other data to determine whether degradation has occurred, and in cases where degradation is confirmed, conduct a joint meeting with the Forest Service and interested parties and stakeholders, including the original petitioners of the ONRW, to identify potential sources of degradation and identify action steps to address and/or remedy the degradation; and

6. In cases where degradation of an ONRW has been confirmed, coordinate with the Forest Service to increase water quality sampling efforts and frequency, if resources are sufficient to do so. The goal is to collect additional data to be able to assess water quality standards attainment every two-year Clean Water Act 303(d) listing cycle until the ONRW attains its designated uses and meets standards.

H. Recognize past projects and management actions that have, and may continue to, improve watershed conditions on NFS lands;

I. Offer timely guidance and assistance regarding the Clean Water Act Section 401 water quality certification process for Forest Service conducted projects and activities subject to Clean Water Act Section 404 requirements; and

J. Coordinate with the Forest Service for appropriate authorization for activities on NFS lands as deemed necessary by the Forest Service.

IV. THE FOREST SERVICE SHALL:

A. Serve as the Designated Management Agency within the context of the WQMP for all NFS lands within the State;

B. Recognize New Mexico identified designated uses of water and nonpoint source management program objectives;

C. Ensure all LRMPs, where water quality is an issue, meet requirements of the New Mexico water quality standards (20.6.4 NMAC), WQMP and the

Nonpoint Source Management Program developed pursuant to federal regulations, the Clean Water Act, and the State Continuing Planning Process;

D. Identify program elements needed to support State programs and projects adopted pursuant to Sections 208 and 319 of the Clean Water Act and incorporate them into the Forest Service program planning (including under the National Environmental Policy Act) and budgeting system;

E. The Forest Service can notify the NMED using their email address env.review@env.nm.gov and to other staff and bureaus upon request, for Forest Service projects and actions in New Mexico made available for public review through the National Environmental Policy Act (NEPA).

F. In addition to other provisions of this MOU, when an ONRW located on NFS lands could be affected by Forest Service resource management decisions or determined to be impaired through the Environment Department's assessment process, the Forest Service shall:

1. Serve as the oversight agency for ONRWs located on NFS lands and implement all elements applicable to oversight agencies of the State's Antidegradation Policy for ONRWs (Paragraphs 3 and 4 of Subsection A of 20.6.4.8 NMAC);

2. The Forest Service may inquire with the Surface Water Quality Bureau and a response in writing regarding whether a proposed action will comply with all applicable antidegradation requirements;

3. Coordinate with the Surface Water Quality Bureau to develop shared protocols for implementing ONRW protections, including strategies to prevent future degradation in ONRW streams and wetlands;

4. Notify the Surface Water Quality Bureau, as soon as practicable after the Forest Service detects or determines potential degradation of an ONRW;

5. If potential degradation of an ONRW has been determined, collaborate with the Surface Water Quality Bureau to review available verified and validated water quality and other data to determine whether degradation has occurred, and in cases where degradation is confirmed conduct a joint meeting with the Bureau and interested parties and stakeholders, including the original petitioners of the ONRW, to identify potential sources of degradation and identify action steps to address and/or remedy the degradation;

6. In cases where degradation of an ONRW has been confirmed, collaborate the Surface Water Quality Bureau to increase water quality sampling efforts and frequency in order to submit verified and validated water quality data to the Surface Water Quality Bureau for assessment. The goal

is for the Bureau to be able to assess water quality standards attainment every two-year Clean Water Act 303(d) assessment cycle until the ONRW attains is designated uses and meets standards; and

7. Consider whether a proposed action will impact water quality in an ONRW when conducting analyses under the National Environmental Policy Act (NEPA).

G. Best Management Practices:

1. Ensure that all work schedules and plans for implementation of projects that have potential to impact water quality contain site-specific BMPs, developed through the LRMP implementation process;

2. Consider technical, economic, and institutional feasibility and potential water quality impacts from the proposed activity in the selection of BMPs, but in no case shall economic and institutional feasibility be used as a basis to allow violations of water quality standards (20.6.4 NMAC); and

3. Comply with BMPs on selected activities to ensure they are implemented and are effective and adjust as necessary.

H. Ensure that all new and renewed authorizations for use of NFS lands contain provisions for compliance with all federal, state, and local water pollution control and abatement statutes, regulations, standards, and ordinances, including compliance with Clean Water Act Section 401, 33 U.S.C. § 1341, as enforceable conditions to those authorizations;

I. Consult with the Surface Water Quality Bureau in situations where the Forest Service does not administer the entire watershed and the parties have mutually determined there will be a significant water quality impact due to an activity within the watershed, that the impact will preclude attainment of water quality standards on or off NFS lands, and that the water does not currently meet water quality standards;

J. Share the Surface Water Quality Bureau appropriate and timely opportunity to participate in project and activity plans, beginning with the scoping phase, that have the potential to impact watershed condition, riparian areas, or water quality, including projects requiring Clean Water Act Section 401, U.S.C. §1341 certification;

K. Share with the Surface Water Quality Bureau, to the same extent as required of non-governmental entities, with an annual general assessment of water quality accomplishments, monitoring results, problems, and priorities, including activities that meet the goals and objectives of TMDL plans to restore impaired waters;

L. Share with the Surface Water Quality Bureau water quality and watershed assessment data collected on NFS lands, including GIS data;

M. Forest Service wills strive to increase internal education and training to increase employee awareness of, and sensitivity to, the importance of maintaining and improving water quality and the requirements of State and federal water quality regulations and standards;

N. Collaborate in the TMDL development process, including providing input to the Surface Water Quality Bureau on monitoring locations and implementation plans;

O. Share Clean Water Act Section 404, 33 U.S.C. § 1344, applications or pre-construction notifications for Forest Service conducted activities to the Surface Water Quality Bureau in a timely manner for Clean Water Act Section 401, 33 U.S.C. § 1344, water quality certification review;

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

A. They will work together in setting priorities for planning watershed actions and in developing watershed-based plans and watershed restoration action plans for watersheds not meeting clean water or natural resource goals;

B. Coordinate efforts on preventative or mitigative land management practices, generally referred to as BMPs, to improve or protect the quality of waters on or downstream of NFS lands;

C. Coordinate efforts on identifying existing or potential nonpoint source water pollution problems on NFS lands, including ONRWs;

D. Coordinate efforts to assess or monitor water quality or watershed conditions on NFS lands using consistent scientific approaches when applicable;

E. Share data, data analysis, and watershed assessment results to improve future planning and management activities on NFS lands;

F. Use such water quality information for validating existing water quality criteria and designated uses and, when appropriate, develop the data into proposed standards revisions for consideration by the Commission during regularly scheduled water quality standards reviews;

G. Share training opportunities;

H. Collaborate and support not otherwise available to the other party, to the extent the supplying party's program priorities, budget, and availability of expertise allow;

I. Meet, no less than annually, to maintain coordination and communication, report on water quality management progress and problems, and review proceedings under this MOU, and:

J. Work together to evaluate complaints regarding potential water quality standards violations to assure that sources of potential violations are addressed.

K. PRINCIPAL CONTACTS. Individuals listed below are authorized to act in their respective areas for matters related to this agreement.

Principal Cooperator Contacts:

Cooperator Program Contact	Cooperator Administrative Contact
Abraham Franklin, Program Manager Watershed Protection Section Surface Water Quality Bureau New Mexico Environment Dept. P.O. Box 5469 Santa Fe, NM 87502 Telephone: (505) 946-8952 Email: wpsprogram.manager@state.nm.us	Christina Keyes, Chief Financial Officer Administrative Services Division New Mexico Environment Department P.O. Box 5469 Santa Fe, NM 87502 Telephone: 505-795-2173 Email: christina.keyes@env.nm.gov

Principal Forest Service Contacts:

Forest Service Program Manager Contact	Forest Service Administrative Contact
Kerry Jones NMED Liaison 11 Forest Lane Santa Fe, NM 87508 Telephone: (505) 438-5673 Email: kerry.jones@usda.gov	Lisa Street 333 Broadway Blvd SE Albuquerque, NM 87102 Telephone: 303-579-5992 Email: lisa.street@usda.gov

L. NOTICES. Any communications affecting the operations covered by this agreement given by the Forest Service or the Environmental Department is sufficient only if in writing and delivered in person, mailed, or transmitted electronically by e-mail or fax, as follows:

To the Forest Service Program Manager, at the address specified in the MOU.

To the Environmental Department at the Environmental Department's address shown in the MOU or such other address designated within the MOU.

Notices are effective when delivered in accordance with this provision, or on the effective date of the notice, whichever is later.

M. PARTICIPATION IN SIMILAR ACTIVITIES. This MOU in no way restricts the Forest Service or the Environmental Department from participating in similar activities with other public or private agencies, organizations, and individuals.

N. ENDORSEMENT. Any of the Environmental Department's contributions made under this MOU do not by direct reference or implication convey Forest Service endorsement of the Environmental Department's products or activities.

O. NONBINDING AGREEMENT. This MOU creates no right, benefit, or trust responsibility, substantive or procedural, enforceable by law or equity. The parties shall manage their respective resources and activities in a separate, coordinated and mutually beneficial manner to meet the purpose(s) of this MOU. Nothing in this MOU authorizes any of the parties to obligate or transfer anything of value.

Specific, prospective projects or activities that involve the transfer of funds, services, property, to a party requires the execution of separate agreements and are contingent upon numerous factors, including, as applicable, but not limited to: agency availability of appropriated funds and other resources; cooperator availability of funds and other resources; agency and cooperator administrative and legal requirements (including agency authorization by statute); etc. This MOU neither provides, nor meets these criteria. If the parties elect to enter into an obligation agreement that involves the transfer of funds, services, property, and/or anything of value to a party, then the applicable criteria must be met. Additionally, under a prospective agreement, each party operates under its own laws, regulations, and/or policies, and any Forest Service obligation is subject to the availability of appropriated funds and other resources. The negotiation, execution, and administration of these prospective agreements must comply with all applicable law.

Nothing in this MOU is intended to alter, limit, or expand the agencies' statutory and regulatory authority.

P. USE OF FOREST SERVICE INSIGNIA. In order for the Environmental Department to use the Forest Service insignia on any published media, such as a Web page, printed publication, or audiovisual production, permission must be granted from the Forest Service's Office of Communications. A written request must be submitted and approval granted in writing by the Office of Communications (Washington Office) prior to use of the insignia.

Q. MEMBERS OF U.S. CONGRESS. Pursuant to 41 U.S.C. 22, no U.S. member of, or U.S. delegate to, Congress shall be admitted to any share or part of this agreement, or benefits that may arise therefrom, either directly or indirectly.

R. FREEDOM OF INFORMATION ACT (FOIA). Public access to MOU or agreement records must not be limited, except when such records must be kept confidential and would have been exempted from disclosure pursuant to Freedom of Information regulations (5 U.S.C. 552).

S. TEXT MESSAGING WHILE DRIVING. In accordance with Executive Order (EO) 13513, "Federal Leadership on Reducing Text Messaging While Driving," any and all text messaging by Federal employees is banned: a) while driving a Government owned vehicle (GOV) or driving a privately owned vehicle (POV) while on official Government business; or b) using any electronic equipment supplied by the Government when driving any vehicle at any time. All cooperators, their employees, volunteers, and contractors are encouraged to adopt and enforce policies that ban text messaging when driving company owned, leased or rented vehicles, POVs or GOVs when driving while on official Government business or when performing any work for or on behalf of the Government.

T. PUBLIC NOTICES. It is the Forest Service's policy to inform the public as fully as possible of its programs and activities. The Environmental Department is encouraged to give public notice of the receipt of this agreement and, from time to time, to announce progress and accomplishments. Press releases or other public notices should include a statement substantially as follows:

"Water Resources Program of the Forest Service, Department of Agriculture, Southwestern Region."

The Environmental Department may call on the Forest Service's Office of Communication for advice regarding public notices. The Environmental Department is requested to provide copies of notices or announcements to the Forest Service Program Manager and to The Forest Service's Office of Communications as far in advance of release as possible.

U. FOREST SERVICE ACKNOWLEDGED IN PUBLICATIONS, AUDIOVISUALS AND ELECTRONIC MEDIA. The Environmental Department shall acknowledge Forest Service support in any publications, audiovisuals, and electronic media developed as a result of this MOU.

V. NONDISCRIMINATION STATEMENT – PRINTED, ELECTRONIC, OR AUDIOVISUAL MATERIAL. The Environmental Department shall include the following statement, in full, in any printed, audiovisual material, or electronic media for public distribution developed or printed with any Federal funding.

In accordance with Federal law and U.S. Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, or disability. (Not all prohibited bases apply to all programs.)

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

If the material is too small to permit the full statement to be included, the material must, at minimum, include the following statement, in print size no smaller than the text:

"This institution is an equal opportunity provider."

W. TERMINATION. Any of the parties, in writing, may terminate this MOU in whole, or in part, at any time before the date of expiration.

X. DEBARMENT AND SUSPENSION. The Environmental Department shall immediately inform the Forest Service if they or any of their principals are presently excluded, debarred, or suspended from entering into covered transactions with the federal government according to the terms of 2 CFR Part 180. Additionally, should the Environmental Department or any of their principals receive a transmittal letter or other official Federal notice of debarment or suspension, then they shall notify the Forest Service without undue delay. This applies whether the exclusion, debarment, or suspension is voluntary or involuntary.

Y. MODIFICATIONS. Modifications within the scope of this MOU must be made by mutual consent of the parties, by the issuance of a written modification signed and dated by all properly authorized, signatory officials, prior to any changes being performed. Requests for modification should be made, in writing, at least 30 days prior to implementation of the requested change.

Z. COMMENCEMENT/EXPIRATION DATE. This MOU is executed as of the date of the last signature and is effective through five years for the date of last signature at which time it will expire.

AA. AUTHORIZED REPRESENTATIVES. By signature below, each party certifies that the individuals listed in this document as representatives of the individual parties are authorized to act in their respective areas for matters related to this MOU.

In witness whereof, the parties hereto have executed this MOU as of the last date written below.

DocuSigned by:
Danielle L Gilbert
BD8C44EB00D548E...

4/28/2023

JAMES C. KENNEY, Secretary or Designee — Date
New Mexico Environment Department

SHERRI SCHWENKE
Digitally signed by SHERRI SCHWENKE
Date: 2023.05.02 19:37:41 -06'00'

SHERRI K. SCHWENKE, Deputy Regional Forester — Date
Forest Service, Southwestern Region

The authority and format of this agreement have been reviewed and approved for signature.

Digitally signed by LISA STREET
Date: 2023.04.27 11:08:58 -06'00'

LISA STREET — Date
Forest Service Grants Management Specialist

Burden Statement

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0596-0217. The time required to complete this information collection is estimated to average 3 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call toll free (866) 632-9992 (voice). TDD users can contact USDA through local relay or the Federal relay at (800) 877-8339 (TDD) or (866) 377-8642 (relay voice). USDA is an equal opportunity provider and employer.

Water & The Forest Service

USDA

United States Department of Agriculture • Forest Service
Washington Office • FS-660 • January 2000

Water & The Forest Service

James Sedell, National Interdeputy Water Coordinator, PNW
Maitland Sharpe, Policy Analysis, WO
Daina Dravnieks Apple, Policy Analysis, WO
Max Copenhagen, Watershed and Air, WO
Mike Furniss, Rocky Mountain Research Station, Stream Systems Technology Center

Contributors:

Mike Ash	Engineering, WO
Enoch Bell	Pacific Southwest Research Station
Tom Brown	Rocky Mountain Research Station
Dave Cross	Wildlife, Fish, and Rare Plants, WO
Ed Dickerhoof	Resource Valuation and Use Research, WO
Mary Ellen Dix	Forest Health Protection, WO
Steve Glasser	Watershed and Air, WO
Dave Hohler	Pacific Northwest Research Station
Jim Keys	Watershed and Air, WO
Russ LaFayette	Watershed and Air, WO
Keith McLaughlin	Watershed and Air, WO
John Nordin	Cooperative Forestry, WO
Doug Ryan	Wildlife, Fish, and Watershed Research, WO
Larry Schmidt	Rocky Mountain Research Station, Stream Systems Technology Center
Rick Swanson	Watershed and Air, WO
Paul Tittman	Lands, WO

USDA Forest Service
Policy Analysis
P.O. Box 96090
Washington, DC 20090-6090

Contents

Summary

Public concern about adequate supplies of clean water led to the establishment in 1891 of federally protected forest reserves. The Forest Service Natural Resources Agenda is refocusing the agency on its original purpose.

This report focuses on the role of forests in water supply—including quantity, quality, timing of release, flood reductions and low flow augmentation, economic value of water from national forest lands, and economic benefits of tree cover for stormwater reduction in urban areas.

Healthy Forests are Vital to Clean Water

Forests are key to clean water. About 80 percent of the Nation's scarce freshwater resources originate on forests, which cover about one-third of the Nation's land area. The forested land absorbs rain, refills underground aquifers, cools and cleanses water, slows storm runoff, reduces flooding, sustains watershed stability and resilience, and provides critical habitat for fish and wildlife. In addition to these ecological services, forests provide abundant water-based recreation and other benefits that improve the quality of life.

Maintaining and Restoring Watersheds were Primary Reasons for Establishing the National Forests

Use and development of the water resources of the United States underwent major changes during the 19th century in response to the growing demands of a population that had increased nearly 20-fold since the founding of the country. Westward expansion, and navigable rivers, canals, and harbors for transportation transformed the Nation's economy. As the Nation experienced this period of massive development, major problems emerged from overuse and poor management of its water resources:

- Urban water supplies were a major source of disease.
- The capacity of many lakes and streams to assimilate wastes was exceeded.
- The survival of people living in arid or flood-prone areas depended on unpredictable precipitation patterns.

The 1897 Organic Administrative Act said these forest reserves were to protect and enhance water supplies, reduce flooding, secure favorable conditions of water flow, protect the forest from fires and depredations, and provide a continuous supply of timber

By 1915, national forests in the West had been established in much the form they retain today. These national forests, which included 162 million acres in 1915, were essentially carved out of the public domain. At that time, few Federal forests were designated in the East because of the lack of public domain. Public demands for eastern national forests resulted in passage of the 1911 Weeks Act, authorizing the acquisition of Federal lands to protect the watersheds of navigable streams. From 1911 to 1945, about 24 million acres of depleted farmsteads, stumpfields, and burned woodlands were incorporated into the eastern part of the National Forest System.

This report focuses on the role of forests in water supply—including quantity, quality, timing of release, flood reductions and low flow augmentation, economic value of water from national forest lands, and economic benefits of tree cover for stormwater reduction in urban areas.

Water is the Central Organizer of Ecosystems

Throughout human history, water has played a central, defining role. It has sculpted the biological and physical landscape through erosion and disturbance. The amount, place, and timing of water are reflected in the vegetative mosaic across the landscape. Water has also played a key role in shaping the pattern and type of human occupancy; routes of travel and transportation, patterns of settlement, and the nature and scope of human land-use all owe their characteristics largely to water regimes.

Conversely, social demands on the water resource system have produced major effects on virtually every aspect of that system including quality, quantity, distribution, and form (for example, white water vs. impoundments).

The human uses and values of water shape how it is managed, and the biological and physical characteristics of water shape human values and uses. Thus, water resource management requires a systems approach that includes not only all of the constituent parts, but also the links, relations, interactions, consequences, and implications among these parts.

Traditionally, water has been valued as an engine of development and as the source of commodity and utilitarian values to society. It has sustained agricultural

production, grown forests, and powered cities and industries. Today, these values remain, but they have been joined by a variety of others. Water is the basis for many of the recreational and amenity values people seek. Increasingly, science shows, and managers recognize, the key role of water flow regimes in ecosystem function and processes. Adequate flow and water quality are essential to maintaining key fish species and fisheries, which in turn, are sources of many economic, cultural, and spiritual values.

Across the Nation, significant challenges to resource managers, scientists, and citizens are presented by emerging conflicts over providing high-quality, abundant flows of water to sustain a burgeoning population, an agricultural industry, historic salmon runs, and populations of other threatened aquatic species.

Questions About the Role of Forests in Water Supply

How Much Water Comes from the National Forests?

Excluding Alaska, about two-thirds of the Nation's runoff comes from forested areas. National forest lands contribute 14 percent of the total runoff. National forest lands are the largest single source of water in the United States and contribute water of high quality. More than 60 percent of the Nation's runoff is from east of the Mississippi River, where 70 percent of the Nation's private and State forests are located. National forests in the East are responsible for 6 percent of this runoff. National forests in the West provide proportionately more water (33 percent) because they include the headwaters of major rivers and forested areas of major mountain ranges. Forest Service literature from the 1940's to the present has claimed that 50 to 70 percent of the Nation's runoff comes from national forest lands. It is now clear that those claims are overstated.

What is the Value of Water from National Forest Lands?

We calculate the marginal value of water from all national forest lands to equal at least $3.7 billion per year. Annual value of water from national forest lands is greatest in the Pacific Northwest and Pacific Southwest Regions, and lowest in the Southwest Region. These values represent a lower limit on the range of values attributable to waters flowing from the national forests. The actual values of this water yield are almost certainly higher, but how much higher is not known.

How Should Municipal Watersheds be Managed?

One issue is whether municipal watersheds should be placed under active or passive management regimes to sustain supplies of high-quality water over the long run. Many Forest Service specialists think that water supplies can be best protected by actively managing these watersheds to maintain forest vegetation and watershed processes within their natural range of variation. Conversely, many people in urban centers believe that, in the interest of water quality and safety, people should not alter watersheds in any way, other than to divert the water. Scientific evidence indicates that watersheds can be effectively managed for safe, high-quality water and still provide other resource outputs as byproducts.

Can Forests be Managed to Improve Stream Flow?

Flooding and sedimentation from cutover lands was one of the primary reasons for establishing national forests. The timing of water yields was also an important issue, especially the desire to augment late-season flows.

Vegetative cover and on-site control measures effectively reduce flood peaks. However, significant shifts in the timing of late-season runoff are not likely to be achieved through managing forest vegetation and snow across national forest lands. Treatments that restore slopes, meadows, and channels; increase the routing time between precipitation and runoff; and recharge ground waters can be expected to have a greater effect in sustaining late-season flows.

Although theory suggests that vegetation management can produce more streamflow, for a variety of reasons, general water-yield increases through forest management are likely to fall in an undetectable range. The data suggest that relying on augmentation from national forests will not be a viable strategy for dealing with water shortages. Greater gains can be made by reducing water consumption, improving conservation, and establishing water markets to allocate scarce supplies more efficiently. Providing cold, clear waters of high quality for aquatic organisms and human use is probably the proper focus for managing water on the National Forest System. There is relatively little management can do to increase total water yield, but forest management can have major effects

on water quality—affecting temperature, nutrient loadings, sediment yields, and toxic contaminants.

What is the Agency's Role in Protecting Instream Flow and Ground Water?

The Forest Service must actively participate in the processes that allocate surface water, ground water, and water rights. To be effective, this participation must be timely and of impeccable technical quality.

Three needs stand out:

- Forest plan revisions should incorporate instream flow needs to maintain public values. When a State undertakes a basin-wide adjudication of water rights, all beneficial consumptive and instream water uses on national forest lands should be claimed in accordance with State and Federal laws.
- Early and intensive collaboration among existing and potential water users is likely to be the most effective approach. Public and interagency collaboration in forest planning has great potential for solving problems and achieving acceptable solutions, lessening the costly litigation common to water rights issues.
- In many places, the Forest Service lacks the technical expertise in hydrology needed to protect instream flows. Our present workforce of in-house expertise must be conserved and enhanced if costly failures are to be avoided.

What is the Agency's Role in Hydroelectric Relicensing?

From the 1940's to the 1960's, 325 hydroelectric projects were licensed and built on the national forests. These facilities have provided power and recreation for the Nation. However, many of these projects have also had significant adverse effects on national forest resources.

During the next 10 years, more than 180 of these projects come up for relicensing. The relicensing process presents the only opportunity for the Forest Service to address resource damage, mitigate future adverse effects, and significantly influence how these projects will operate for the next 30 to 50 years.

Forest Service participation in the relicensing process could strengthen mitigation and restoration programs on national forest lands that would lead to improved aquatic habitats and increased water quality. Estimates of these benefits to national forest lands exceed a billion dollars. Potential benefits include new and upgraded recreational facilities, restored instream flow regimes, and enhanced habitats for aquatic and terrestrial wildlife. The relicensing effort offers a cost-effective, immediate means to address the goals outlined in the Natural Resources Agenda and Clean Water Action Plan.

What is the Agency's Role in Conserving Aquatic Biodiversity?

National forest lands and waters play a pivotal role in anchoring aquatic species and maintaining biodiversity. More then one-third of national forest lands have been identified as important to maintaining aquatic biodiversity. Five recent, large-scale, ecosystem-based Forest Service assessments identified networks of aquatic conservation watersheds: the Northwest Forest Plan, the Interior Columbia Basin Ecosystem Management Project, the Tongass National Forest Land Management Plan, the Sierra Nevada Framework Project, and the Southern Appalachians Assessment. Such a commitment and a special effort of lands to the purposes of aquatic species conservation could be regarded as the core of the national forest aquatic and biodiversity conservation strategy.

Can the Watershed Condition on National Forests be Restored?

The most comprehensive landscape-scale assessment to date—the Interior Columbia Basin Assessment—found that the momentum from past events will push the system further from the desired condition over the decades to come. Even with aggressive management, that momentum will not be overcome within the next 100 years under projected funding. Progress toward forest health restoration can be expected to proceed very slowly. In the interim, vegetative composition and structure at the landscape scale will be determined by unnaturally large, high-intensity fires. These findings suggest that it will not be feasible to restore all degraded areas. We will have to strategically focus restoration efforts on selected watersheds where we can hope to make a meaningful difference.

What is the Role of Urban Forests in Water Supply?

Counties classified as "urban" contain one-quarter of the total tree cover of the coterminous United States. Urban trees affect water quantity by intercepting precipitation, increasing water infiltration rates, and transpiring water. They can materially reduce the rate and volume of storm water runoff, flood damage, stormwater treatment costs, and other problems related to water quality.

The Agency Challenge.

The challenge for the Forest Service will be to simultaneously perform the following:

- Systematically restore damaged watersheds on the national forests.
- Mitigate additional watershed damage from land uses and the inevitable major wildfires.
- Foster partnership efforts to meet the most pressing watershed restoration needs when they fall outside of national forest boundaries.

Issues and Policy

Maintaining supplies of clean water and protecting watersheds were major reasons why public domain forests and rangelands were reserved. It was the headwaters of the western rivers, and cutover and eroded lands in the East, that became the National Forest System. With passage of environmental laws, such as the Clean Water Act and Endangered Species Act, clear standards for water quality were set by Federal and State agencies. Despite water quality improvements resulting from applying these standards, many streams in the Nation are still highly altered from their natural cycles. Under human influences, neither the range of natural conditions nor the full expression of ecological interactions between aquatic and terrestrial ecosystems is permitted.

Many factors affect water quality, production, and quantity. The national population will nearly double within the next 50 years. America's population is getting older, more ethnically diverse, and concentrated in urban areas. The population of the West has increased 50 percent in the last 20 years and is expected to increase another 300 percent by 2040. Much of the West was unproductive as farmland until lands began to be irrigated in the late 1930's. As a result of population growth, large-scale reliance on irrigation, and a host of other factors that have increased water use, water in western streams is generally over appro-

Figure 1. National forest watersheds integrate multiple processes and issues that must be considered in aggregate. Isolated, single-issue solutions won't work.

priated (Moody 1990, NRC 1992). In Oregon and Washington, 40 to 90 percent of the land areas of individual national forests west of the Cascade Range crest are in municipal watersheds. The population surge in the West is increasing the diversion and consumption use of water and, at the same time, demand for water-based recreation (Brown et al. 1991).

This trend will continue and intensify. Most recreation in national forests is associated with some body of water (lakes, reservoirs, or streams). Recent publications (Gillian and Brown 1998) have more closely linked instream-flow issues to recreational activities and have described the complex relationships of recreation uses and water. For example, even without incorporating many of the economic facets of the recreational uses documented in the arid West, the value of instream flows for recreational fishing is greater than the value of that water for irrigation (Hansen and Hallam 1990).

There are more than 180 non-Federal dams on national forests that provide hydroelectricity as well as recreation. These dams are due for relicensing in the next 5 to 10 years. The Forest Service, under the Federal Power Act of 1920, is legally bound to condition the licenses to mitigate the effects of these dams on fish, wildlife, water quality, and recreation values.

The Nature Conservancy (1996) and other recent assessments have described the deteriorating condition of freshwater species and ecosystems in the United States. More than 300 freshwater species are listed or proposed for listing under the Endangered Species Act. More than 37 percent of native fish species are at risk of extinction, including all of the major populations of salmon and steelhead trout on the west coast south of Alaska. National forest lands contain the best habitat and strongest remaining populations of most of the species at risk. The Nature Conservancy estimated that protecting and restoring 327 watersheds (~800,000 acres each) or 15 percent of the total number of subbasins in the United States would conserve populations of all at-risk freshwater fish and mussel species in the country. National forest lands influence 181 of these watersheds and will be the anchoring habitat for nearly all of the west coast salmon and trout populations.

Interplay Among Issues

In addition to the agency's need to consider each of these issues independently, the interplay among them must also be considered (see figure 1). For instance, many of the reservoirs in national forests were built to meet many different needs, including water for agriculture. On the west side of the Oregon Cascades, only 5 percent of the water that agricultural water rights holders are entitled to has been claimed. If they begin to claim more of their entitlement, flows, water quantity, and recreation will likely be affected in major ways. Moreover, several species of salmonids already listed under the Endangered Species Act need more water in certain locales. Recognizing the loss of natural function and natural hydrologic regimes in these highly altered streams, the Forest Service has been pursuing Federal water rights and adjusting conditions in special-use permits to require bypass-flows. Changes of the status quo in water appropriation deeply concern western State governments and senior water-rights holders. Regional climate shifts and global climate change could further exacerbate these issues and confound them with other water issues.

Various Federal interagency water initiatives are addressing aspects of these issues. But, to date, there has been no effort to characterize the particular role of national forest lands in supplying the Nation's water, or to define the role of Federal lands and water in the matrix of State and private lands.

The Nation's water resources face growing scientific, management, and political challenges. The Forest Service will play a major role in these discussions, improving the ability of policymakers, managers, and citizens to develop options, anticipate consequences and implications, and fashion responsive, informed programs. ❖

Water Quantity and the National Forests

World Water Supply

Although 70 percent of the Earth's surface is covered with water, the amount of fresh water available on land surfaces is a tiny fraction of the total; 97.5 percent of the water on the planet is in the oceans — too salty to drink or to grow crops. Most of the 2.5 percent that is not salt water is locked up out of practical reach in the vast icecaps of Greenland and Antarctica. Less than 1 percent is fresh water, present in the form of groundwater, on the land surface, and in the atmosphere. Less than eight ten-thousandths of 1 percent is annually renewable and available in rivers and lakes for human use including agriculture, and for use by aquatic species (see figure 2).

Water is continuously cycled between the Earth's surface and atmosphere through evaporation and precipitation. The fresh water that falls on land as rain or snow, or that has been accumulated and stored over thousands of years as groundwater, is what people use to meet most of their needs. That supply, although replenished daily, is both limited and vulnerable to human actions and abuse. Over-appropriated rivers and excessive groundwater pumping are serious problems. Many of America's important food-producing regions are sustained by the hydrologic equivalent of deficit financing—using water that is not being replaced. The rational use and protection of water resources are among today's most acute and complex scientific and technical problems. Shortages of fresh water and the increasing pollution of water bodies are becoming limiting factors in the economic development of many countries, even countries not in arid zones. Under these conditions, assessing and managing water resources is vital. Reliable estimates of annual streamflows, their fluctuations, and water resources stored in lakes, aquifers, snowpack, and glaciers are critical to a clear understanding of natural water cycles and the effects of human activities.

All types of waters are renewed, but the rates of renewal differ sharply. Water in rivers is completely renewed every 16 days on average, and water in the atmosphere is renewed every 8 days, but the renewal periods of glaciers, groundwater, ocean water, and the largest lakes run to hundreds or thousands of years. These are, essentially, nonrenewable resources. When people use or degrade these water supplies, useable water resources are lost and natural water cycles may be disrupted.

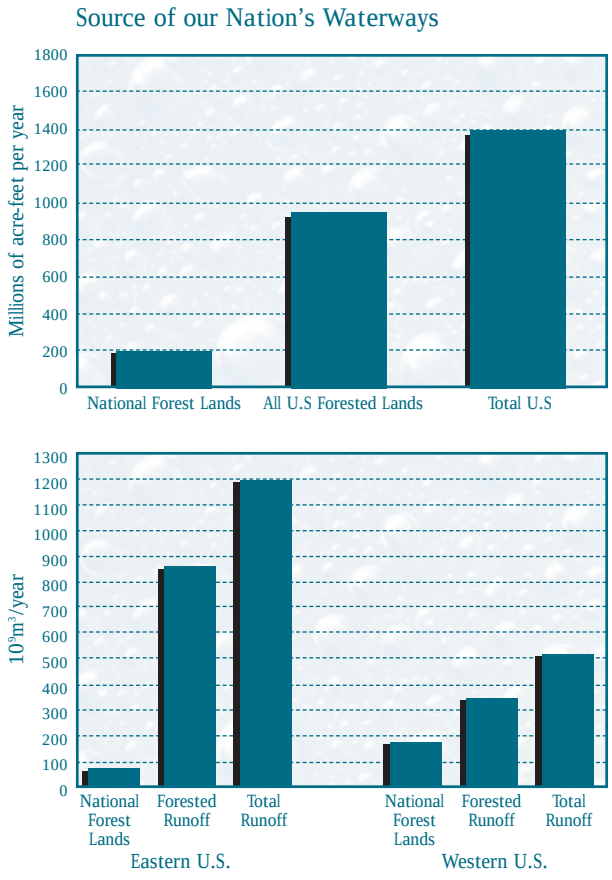
Figure 2. Only a miniscule proportion of the Earth's water is fresh and available to humans and terrestrial and freshwater aquatic life, making it a most precious resource.

The Quantity of Water from Forested Lands

Forest Service literature from the 1940's to the present (Gillian and Brown 1998) has asserted that 50 to 70 percent of the Nation's runoff derives from national forest lands. But that assertion is only an often repeated estimate, without a clear empirical basis. More accurate knowledge of how much water comes off national forest lands, where it flows, and how it is used is essential for understanding what waters forest managers are managing, their economic values, and the options for their future use.

In order to answer the fundamental questions about yield and value of waters flowing from the national forests, we estimated runoff using a sophisticated, spatially explicit simulation model. The model found that water yields from national forests are less than 20 perent of the total surface runoff from the contiguous 48 States (see figure 3). This is significantly below the estimates of water yield found in earlier Forest Service literature.

Figure 3. Proportion of runoff from all forested lands and national forest of the continental United States (upper graph), derived from Neilson, 1995. Proportion of runoff from all forested lands and national forest lands east and west of the Mississippi River (lower graph).



Water runoff from forested areas, including national forests, was derived using the Mapped Atmosphere Plant-Soil-System (MAPSS) model (Neilson 1995). The MAPSS model simulates the distribution of forests, savannas, grasslands, and deserts with reasonable accuracy. It is more accurate for forested than nonforested areas, and confidence is lower in the topographically complex and arid Western States. The model produced annual estimates of runoff per 100-square-kilometer grid cell in the continental United States. Forested areas, national forest lands, and watershed boundaries were overlaid on this grid to estimate runoff. In addition, runoff was estimated for the national forests in each of the 18 water-resource regions in the contiguous 48 States.

The model accurately reproduces observed monthly runoff. At the continental and hydrographic-region scales, the model performs well compared to published maps and U.S. Geological Survey data on measured runoff.

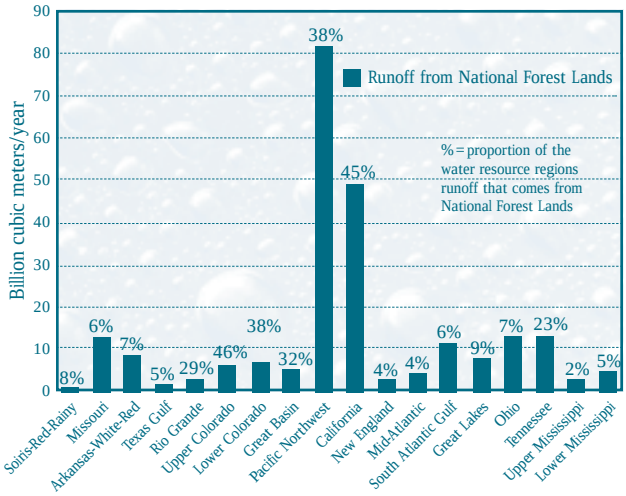
About two-thirds of the Nation's runoff, excluding Alaska, comes from forested areas. National forest lands, which represent 8 percent of the contiguous U.S. land area, contribute 14 percent of the runoff. National forest lands are the largest single source of water in the United States. National forests yield water of unusually high quality. This high quality water and its associated watersheds anchor native fishes, mussels, and amphibians. Forested watersheds east of the Mississippi River generally receive more rainfall and produce more surface water per unit area than forested lands to the west. They also tend to have a more even distribution of runoff during the year. Their floods are usually caused by hurricanes or tropical storms, unlike western watersheds in the snow zone where spring snowmelt, sometimes supplemented by rainfall, causes the annual peak flows. Low flows in the East usually occur during dry summers when evapotranspiration rates are greatest; in the western mountains, annual low flows usually occur in midwinter. More than 60 percent of the Nation's runoff is from east of the Mississippi River, where 70 percent of the Nation's private and State forests are located. National forests in the East are responsible for 6 percent of this runoff (see the lower graph in figure 3).

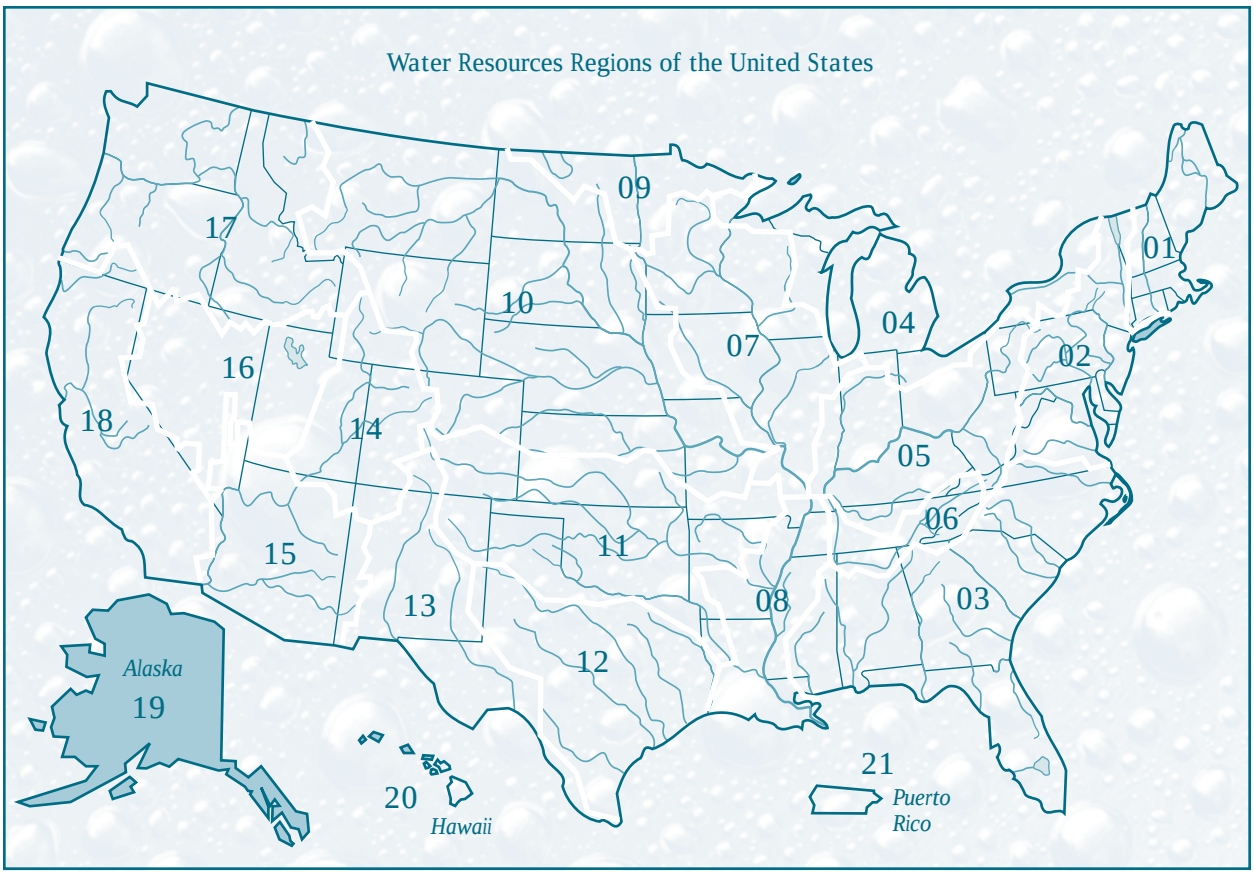
We estimated the actual runoff from national forest lands for the 18 water resource regions of the

contiguous United States (see figures 4 and 5). The greatest yield of water from national forest lands is from the Pacific Northwest (Columbia River plus coastal and Puget Sound rivers) and California. These regions have more than 20 percent of their area in national forest lands. The Tennessee River basin has about 6 percent national forest lands, but these are the wettest parts of the basin and yield much more water than their land area would suggest. Although water from national forest land contributes only 6 percent of the Missouri River, it is most of the water from Wyoming, Montana, and Colorado. Nearly half of the water from the Upper Colorado basin flows from national forest lands, yet it yields only about half the water a smaller area of national forest land produces in the Ohio River basin.

Figure 4. Water resources regions of the United States (Source U.S. Geologic Survey). 1 New England; 2 Mid-Atlantic; 3 South Atlantic-Gulf; 4 Great Lakes; 5 Ohio; 6 Tennessee; 7 Upper Mississippi; 8 Lower Mississippi; 9 Soiris-Red-Rainy; 10 Missouri; 11 Arkansas-White-Red; 12 Texas-Gulf; 13 Rio Grande; 14 Upper Colorado; 15 Lower Colorado; 16 Great Basin; 17 Pacific Northwest; 18 California; 19 Alaska; 20 Hawaii; 21 Puerto Rico.

Figure 5. The contribution and proportion of water runoff from national forest lands to the 18 water resource regions of the contiguous United States. Runoff estimate was derived using the MAPPS model (Neilsen 1995). The bars represent yearly water yields from national forest lands. Percentages are the proportion of the total runoff from the water resource region that flows from national forest lands.





National forests in the West provide proportionally more water (33 percent) because they include the major mountain ranges and the headwaters of the principal rivers. For example, in California, national forest lands occupy 20 percent of the State but produce nearly 50 percent of the State's runoff. The Pacific Northwest shows the same pattern.

The agency is using basins and watersheds in the latest rounds of forest plan revisions, regional environmental impact statements, and assessments. Because of higher rainfall in the East, the smaller and more fragmented national forest lands in the Eastern and Southern Regions generate large volumes of runoff compared to the contiguous mountain forests in the Rocky Mountain, Southwest, and Intermountain Regions (see figures 6 and 7). The runoff from the regions provided the basis for calculating the marginal value of water discussed in the next section.

Figure 7. Stream flows from national forest lands for each region. Because of the greater rainfall in the Eastern and Southern United States, more streamflow per unit area comes from these national forests.

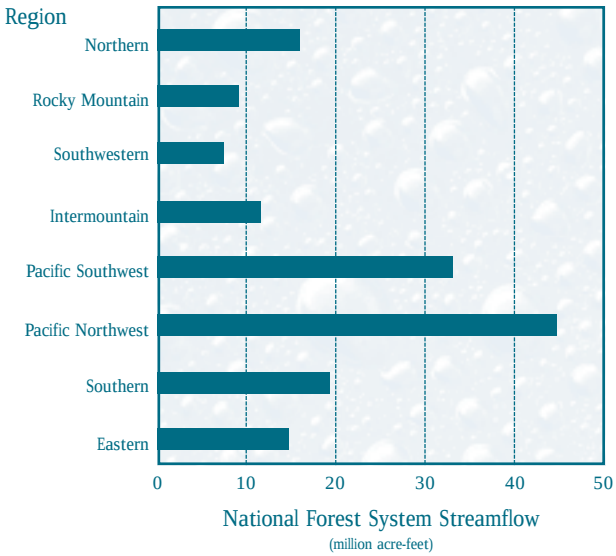
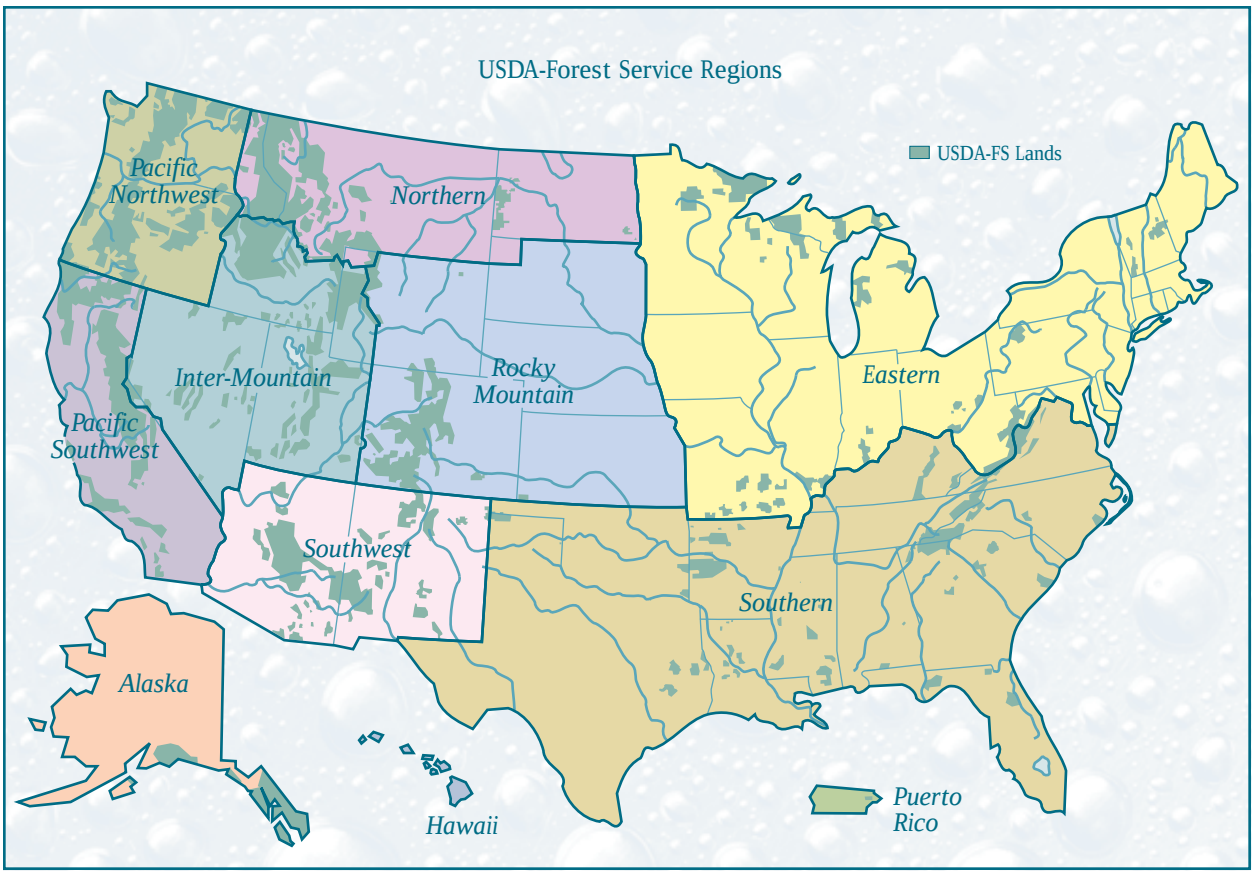


Figure 6. The Forest Service has eight administrative regions in the continental United States. The boundaries do not match up well to watersheds or water resource regions.



Comparing water supplies to current withdrawals indicates the likelihood that a small change in flow would affect off-stream uses. If only a small proportion of available flow is diverted, off-stream users are unlikely to be affected by a small change in flow, except perhaps in a very dry year. This comparison was performed for the 18 water-resource regions of the contiguous 48 States, with the exception that the upper and lower Colorado regions were combined because so much of the lower basin's supply originates in the upper basin. The proportion of water supply in each region withdrawn for off-stream use is shown in figure 8. In general, off-stream users in regions with ratios below about 0.2 are not likely to be affected by a marginal change in flow. But these regions are large and areas of shortage may exist even in regions with very low total ratios of withdrawal to supply.

Even though the MAPSS model is biased toward underestimating runoff, water yields from national forests are much lower than the estimates that appear in the reports of the Chief dating back to 1947. The figures reported here are more accurate but not precise enough to use on a forest-by-forest basis. Additional work is needed to refine the estimates to the national forest scale.

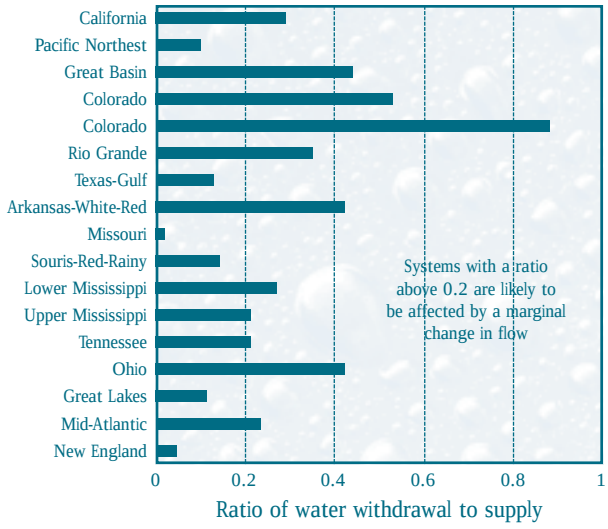
Determining a Water Value for the National Forest System

The economic importance of water can be characterized in two ways, by estimating its economic effects in terms of jobs or income, and by estimating what the public is willing to pay for it. Willingness to pay, the value addressed here, can exist for anything of value—a market good like bottled water, a nonmarket good like a recreational fishing experience, or a so-called "nonuse" service like the knowledge that a certain riparian habitat is well cared for. Measuring these values is anything but straightforward, and most estimates are only approximate.

Most economic valuation studies of water have focused on the marginal value of water volumes available for instream and offstream uses. The estimated marginal values reflect our willingness to pay for a change in the amount of water, and they are of interest because management actions typically cause only small changes. In some water-short areas, water markets have emerged that also provide indications of marginal values. Evidence from these two sources suggests that (Brown 1999):

- Economic studies of water value tend to be performed, and water markets tend to develop, where water is scarce. The values determined in such studies or markets are likely to overestimate values for water supplies where water is not so scarce.
- Marginal values of streamflow in any one use depend on the degree of water scarcity, which in turn depends on localized water demand and supply factors, including the capacities of water facilities like reservoirs and canals. Degree of scarcity is highly site-specific, which makes transferring values reliably from one site to another difficult.
- The marginal value of streamflow depends on the variety of uses to which the flow may be put. Its value for instream uses—producing electricity at hydroelectric plants or providing for habitat, recreation, and waste dilution—must be added to values in off-stream uses. Most diversions to off-stream uses consume some water but also provide some return flows that can be used by others downstream.
- The marginal value of streamflow in off-stream uses can be zero in locations with ample water supplies. Depending on recreation demand and hydroelectric plant capacities, the marginal value of water in instream uses may be positive even in water-rich areas.
- Although values vary widely from one site to another, for typical areas without ample water supply,

Figure 8. The proportion of water supply that is withdrawn to off-stream use in the 18 water-resource regions of the United States. If only a small proportion of available flow is diverted off-stream, off-stream users are unlikely to be affected by a small change in flow, except perhaps in very dry years. (Alaska and Hawaii not included)



economic studies and transaction evidence suggest a marginal value of streamflow delivered to off-stream uses of roughly $40 per acre-foot, on average. A few economic studies report higher values than this for municipal and industrial water, but the evidence is too limited to be applied to broad areas in large-scale assessments such as this one.

- Marginal values of water in producing electricity at hydroelectric plants range as high as $40 per acre-foot for flow originating at the headwaters of one highly developed watershed, but the values are much lower for most places. Average values per acre-foot of flow in each of the 18 water-resource regions (U.S. Water Resources Council 1978) of the contiguous 48 States are conservatively estimated to range from $0.26 to $17.00, with most below $2.
- Marginal values of streamflow for recreation differ widely from one site or season to another, depending on a host of factors, but evidence from economic studies suggests that the marginal value of streamflow for recreation is below $10 per acre-foot in most places.
- The total value of streamflow from national forests depends on the average value over the entire amount of use, not on the marginal value. Because average values may greatly exceed marginal values, the average value of streamflow from national forests may be high even where the marginal value is modest, especially in watersheds where national forests contribute a substantial portion of the total water supply. Average values are not observed in the market place and are difficult to measure; therefore, estimating the total value of streamflow is difficult. Nevertheless, with appropriate assumptions and the use of marginal values as a lower bound on average values, a rough estimate of total value may be obtained.
- The estimates of runoff from the national forests were adjusted to correct for discrepancies between the total land area within the mapped boundaries of the national forests and the area the Forest Service actually manages. As expected, the difference is greatest in Regions 8 and 9, where the Federal holdings are more fragmented. This correction removed the difference between the "gross acreage" and the "National Forest System acreage" (USDA Forest Service 1997). The volume of runoff from the national forests as estimated by the MAPSS model, corrected to reflect the actual land area under Forest Service management, is the national forest instream flow shown in column 2 of table 1.

Not all water is diverted for off-stream use and much water flows directly to the ocean without passing through irrigation canals, municipal diversions, or the like. Therefore, the numbers for water flowing from units of the National Forest System were corrected to include only the water actually used offstream. Data on water withdrawals were taken from the U.S. Geological Survey (Solley et al. 1998). The percentage of total runoff in each region attributable to national forest lands was divided by the total runoff from all lands in the corresponding Forest Service region, as determined by the MAPSS model. The resulting fraction was multiplied by the total runoff in each Forest Service region that goes to offstream uses based on the U.S. Geological Survey data. The results are shown in column 3 of table 1.

The lower bound on the value of runoff from Forest Service lands was estimated by applying the average marginal values discussed above (Brown 1999) to the estimates of water yield shown in table 1 for each Forest Service region. Withdrawals to offstream uses were valued at $40 per acre-foot, and instream flow was valued at $17 per acre-foot in the West and $8 per acre-foot in the East for recreation and hydropower combined. Dilution, navigation, and nonuse values were assumed to be nil. The results of these calculations are shown by Forest Service region in figure 9. The value of water flowing from national forests, in both offstream and instream uses, is conservatively estimated to be at least $3.7 billion per year.

This estimate makes it possible to compare the total value of the water originating on the national forests with similar values for other forest resources. It provides a general idea of the relative importance to

Table 1. Water Supply from National Forests by Forest Service Region

Sources: Derived from Solley et al. (1998) and Neilson (1995)

Region	National Forest Instream Flow	National Forest Offstream Use
	Acre-feet	*Acre-feet*
Northern	15,914,000	3,815,342
Rocky Mountain	9,144,792	2,150,811
Southwestern	7,428,051	1,971,245
Intermountain	11,458,855	4,785,689
Pacific Southwest	33,201,475	9,496,005
Pacific Northwest	44,658,346	4,806,316
Southern	19,041,809	3,587,515
Eastern	14,714,248	3,376,458

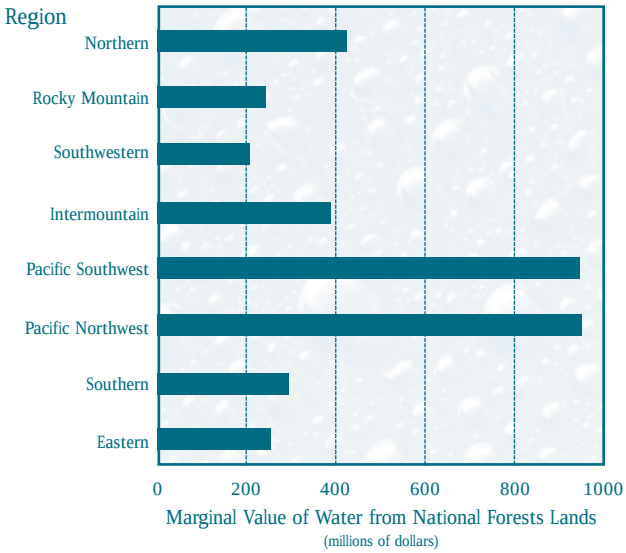
society of the various resources and equips the public to make informed decisions about alternative uses of their forests.

Water runoff is different from many other resources, in terms of the degree of Federal ownership and control. Although the agency generally has legal authority to decide about the sale or use of timber stumpage, livestock grazing, and recreation access, the Federal Government has not established a legal right to most of the water flowing from the forests. Hard-rock minerals and fish and wildlife present a contrasting case, more like that of water runoff. Locatable minerals are owned by the Federal Government, but the agency does not control access. Fish and wildlife are owned by the State, with access controlled by the agency and "take" controlled by the State. In both cases, although the resources are not owned by the Federal Government, they do have value to society, and in both cases the Forest Service estimates and reports on those values.

True Value of Water is Underestimated

This estimate of of value understates the true value of water flowing from the national forests in three ways. First, our analysis counts marginal value rather than average value, even though average values may greatly exceed marginal values. Second, our estimates ignore values attached to navigation, waste dilution, channel maintenance, and such ecological services as aquatic habitats and wetland functions. Third, our analysis does not count nonuse values—existence value, option value, and bequest value—even though some studies indicate that nonuse values may be substantial. The values estimated through this analysis thus represent a lower limit on the range of values attributable to waters flowing from the national forests. The actual values of these flows are almost certainly higher, but how much higher is not known.

Figure 9. Annual value of water from national forests by region. The marginal value of water from all national forest lands is at least $3.7 billion per year.



Providing cold, clear waters of high quality for aquatic organisms and human use is probably the proper focus for managing water on the National Forest System. There is relatively little management can do to increase total water yield. But forest management can have major effects on water quality—affecting temperature, nutrient loadings, sediment yields, and toxic contaminants. Management can also affect the storage capacity of soils and alluvial deposits, marginally affecting magnitude of peak streamflow and the duration of dry-season streamflows.

Water quality changes affect aquatic habitats, downstream water management facilities, recreation opportunities, and water treatment costs. Land management can cause increases in flood peaks and reduced channel stability, and impact the ability of downstream water users to benefit from the streamflow. The values of changes in the quality or timing of streamflows have received less attention by economists than has total quantity, partly because quality and timing are more difficult to monitor. The economic value of careful forest management—management that protects soils and water quality and takes full advantage of the watershed's ability to temporarily store water and ameliorate downstream flood damage—calls for additional study, but it is not addressed in detail in this paper. The economic analysis in this paper provides only a first approximation of the minimum value to society of the waters flowing from the national forests. Other measures of value attributable to national forest waters remain to be filled in by further studies

Many Communities Depend on Water from the National Forests

In 1999, the Environmental Protection Agency (EPA) estimated that 3,400 public drinking-water systems are located in watersheds containing national forest lands. About 60 million people live in these 3,400 communities. We will eventually have a more accurate picture of the role of the forests in providing munici-

pal water supplies. All 50 States and many participating tribes are now delineating the surface watersheds and groundwater recharge areas that provide public drinking water to the 68,000 communities that rely on surface water or groundwater for their public water supplies. This effort will extend over the next 4 years, as required by the Safe Drinking Water Act.

In most of the West, a relatively few public water systems and watersheds supply most of the population. For example, in Washington State, 86 percent of the population is served by a few very large public water systems, nearly all of which draw from national forest lands. However, the 69 percent of public water systems that serve less than 100 connections (see figure 10) could also be of major concern to the Forest Service, because of the large number of such systems and the passion with which people pursue protection of their water supplies.

An update of the 1978 inventory by Region 6 showed that the number of communities in Oregon obtaining drinking water from National Forest System watersheds in 1998 was more than 50 percent higher than in 1978. Water from national forest lands supply about 80 percent of Oregon's population of 2.8 million people.

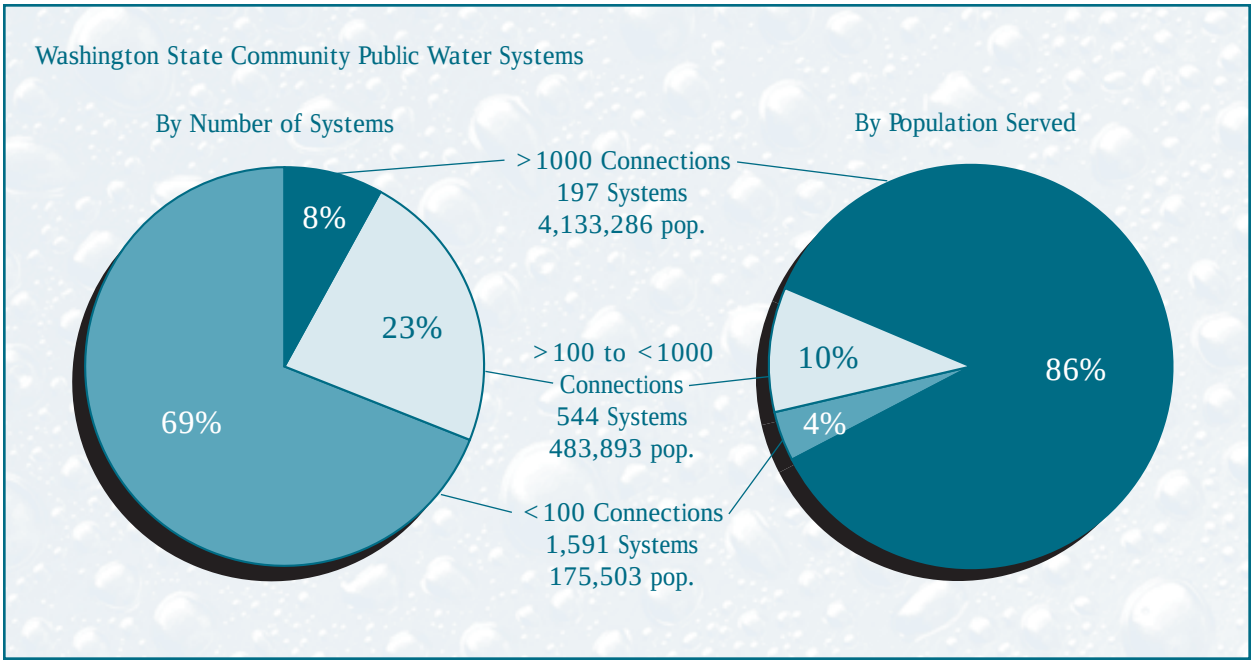
Figure 10. Washington's community water systems. A relatively small number of water systems supply large numbers of people. Numerous water systems serve small numbers of people each, but each of them that includes National Forest could be an important issue for the Forest Service.

The Siuslaw National Forest in Region 6 has identified 136 public water systems on national forest lands encompassing 36 percent of the forest. Municipal water supply watersheds encompass 85 percent of the Rogue River National Forest and 94 percent of the Umpqua National Forest.

In the Northern United States (21 States), 76.5 million people are served by water from nearly 4,000 surface water systems. National forest lands contain 925 water systems serving about 7.75 million people. In Massachusetts, 11 percent of the area of the State serves the water needs of nearly 7 million people. The municipal watersheds there are more than 72 percent forested. New York City's municipal watershed is more than 60 percent actively managed forest.

California's State Water Project, with 22 dams and 600 miles of canals, delivers water that originates largely on national forest lands in the Sierra Nevada—more than 2 million acre-feet annually—to 20 million urban and agricultural users in both the San Francisco Bay and southern California. The Federal Central Valley Project includes another 20 reservoirs and more than 500 miles of canals that deliver another 7 million acre-feet to irrigate 3 million acres in the Central Valley and provide drinking water to 2 million urbanites.

More than 900 cities rely on National Forest System watersheds, including: Portland, Salem, Eugene, and Medford, OR; Eureka, Oakland, and Berkeley, CA; Denver, Fort Collins, and Colorado Springs, CO; Hele-



na, Butte, and Bozeman, MT; Salt Lake City, UT; Reno, and Carson City, NV; Little Rock, AR; and Ely, MN. Relatively more western than eastern cities use national forest water because of the relatively larger land base in the Western States.

Should municipal watersheds be managed under an active or a passive regime? Many Forest Service specialists believe that long-term supplies of high-quality water can best be sustained under an active program of vegetation management designed to maintain the forest system and watershed processes within their natural range of variability. Many people in urban centers believe that humans should not alter watersheds in any way, other than to divert water. The scientific evidence indicates that watersheds can be effectively managed for high-quality water while providing for other resource outputs as byproducts. ❖

Water Quantity Issues for Forest Planning

Streamflow Regimes, Timing, and Floods

The experience of widespread flooding and sedimentation following on the heels of logging and fire was one of the primary reasons for establishing national forests. The timing of water yields was also an important issue, especially the desire to augment late-season flows. Extending the irrigation season and limiting the adverse effects of drought were also significant concerns.

A wide range of human activities, including forest management, roads, reservoir and dam operation, loss of wetlands, development and urbanization of floodplains and other flood-prone areas, and stream channelizing have been implicated as factors increasing the destructive potential of floods.

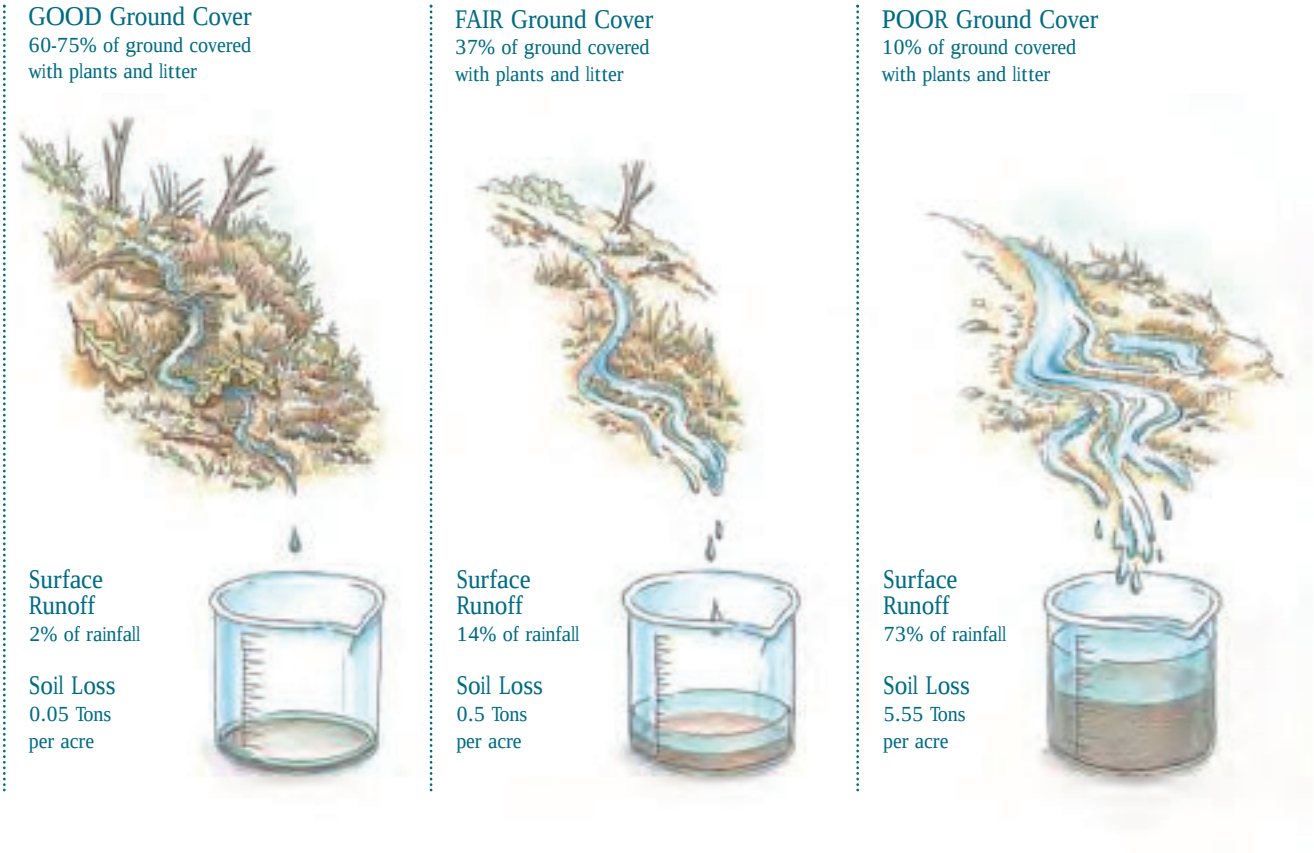
A wide range of agencies is responsible for various aspects of flood prediction and control, but no one agency or group of agencies is charged with evaluating the consequences of its actions in relationship to other parties. Although forest practices may increase peak flows and sediment transport from upland streams, downstream effects may be minimized where reservoir operation reduces flood peaks and sediment accumulates in reservoirs. On the other hand, sustained high-flow releases from dams may contribute to higher sediment and turbidity problems downstream compared to shorter but higher natural peak flows.

In the Intermountain and Southwest Regions, the relationship between healthy vegetation groundcover and reduction of summer floods from high-intensity storms has been well established, as summarized by Coleman (1953)(see figure 11).

The change in runoff associated with different degrees of ground cover shows that watershed cover and on-site water control measures can reduce flood threats. Similar reductions in flood peaks have been observed in the East after watershed restoration. For more humid areas, the effect of vegetation management and healthy upland watershed conditions is still important in limiting erosion and sedimentation effects from floods.

Substantial and dependable beneficial shifts in timing of peak runoff are unlikely to be achieved through managing forest vegetation and snow. In the Eastern United States and to some degree in the West, harvest

Figure 11. Experimental results of the effects of watershed condition on rainstorm runoff and erosion (data from Great Basin Experimental Area, UT).



activities have increased late-season flows. These changes are typically short lived, however, because of vegetation regrowth. Sustaining late-season flows is an important issue and limited scientific studies have focused on the relation between healthy watershed conditions and sustaining late-summer flows. Anecdotal observations from a variety of watershed and channel restoration projects suggest that perennial flows have often been restored to apparently ephemeral channels by managing and restoring vegetation. Many watersheds and meadows have been incised as a result of poorly located travelways and roads. Other areas have greatly expanded channel networks as a result of excessive livestock use that produced gullys and incised channels. The effect of these slope, meadow, and channel incisions is to drain local groundwater storage and transmit flows downstream more rapidly. This process leaves little effective ground storage to sustain late-season flows or to carry over water storage into a drought year. Preventing incisions and restoring incised slopes, meadows, and streams could improve late-season flows (see figure 12). Improving these conditions should be a focus of watershed restoration efforts. Concurrently, additional research is needed to understand the process and consequences of incision and the values obtained in late season flows through restoration activities. Roads and their effects on draining slopes and increasing channel density need additional study as well.

In summary, limited but valuable opportunities through forest management could shift the timing of flows. A vital aspect is to prevent or limit incisions in slopes, meadows, and channels. Treatments that restore these areas and thus restore the relation of channels to the floodplains and increase the contact time of runoff on slopes and meadows are likely to recharge soil profiles and shallow ground water reservoirs, which would greatly increase the likelihood of sustaining late-season flows.

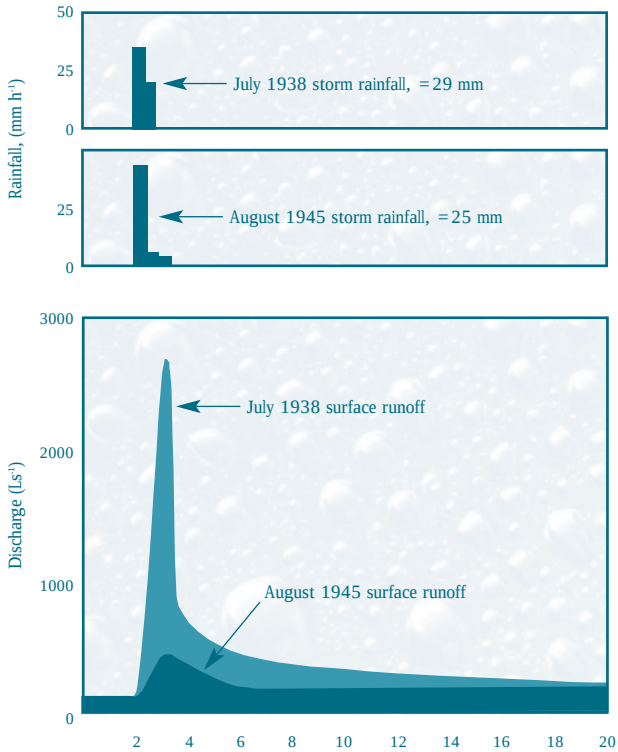
Augmenting Streamflow

Producing substantial and extensive increases in water yields from the national forests does not appear to be practical. Research has demonstrated that water yields can be increased by removing vegetation and trapping additional snow. But application of the vegetation management practices needed to increase flows on a watershed scale is limited in practice by Forest Service mandates to manage for a wide range of resource values. Legal constraints, land allocations, technological limits, as well as societal values and environmental, ecological, and biological concerns all favor not committing national forest lands to the management regimes that would be needed to increase water yields.

Ziemer (1987) offers one of the best summaries and evaluations of the potentials and limitations of augmenting water yield on forested lands in the United States. His findings indicated that for a variety of reasons, water yield increases are likely to be undetectable. Forest research has demonstrated that cutting trees, type converting of brush to grass, and snow management can produce increased water yields. These increases generally come from lands that receive more than 15 inches of annual precipitation. In general, areas with higher precipitation, typified by mixed conifer species; spruce, fir, and lodgepole pine forests; and eastern hardwoods produce more yield per unit area than other forest types.

Although water-yield increases can result from forest management activities, the increases produced by normal silvicultural methods applied in the context of multiple use are modest. Even in wet environments of the Northwest (Harr 1983) and the Sierra Nevada of California (Kattelmann and others 1983) these

Figure 12. Comparative rainfall and storm runoff hydrographs, White Hollow, TN, before and after watershed rehabilitation.



increases could be in the range of 6 percent, if water yield were strongly emphasized, but more likely 1 percent under normal management. Detecting and measuring this small change is outside the limits of current technology (Ziemer 1987). The most productive areas for this potential would have the shortest duration because of rapid regrowth of vegetation reoccupying the site.

Properly evaluating augmentation potential often overlooks the legacy of historical forest management actions. Frequently, much of the potential for augmentation is already being realized. For example, in the Southwest, Schmidt and Solomon (1981) estimated that about 50 percent of the potential was already being realized.

Strategies for dealing with water shortages should avoid relying on augmentation from national forests as a substitute for practices to reduce water consumption and improve conservation.

Instream Flow Requirements

Sustaining viable native populations of aquatic species on national forest lands will require securing instream flows that fall within the range of natural variation. Natural streamflows exhibit complex regimes, with important and life-sustaining variations in their frequency, magnitude, duration, and timing. Fish and other aquatic and riparian organisms depend directly on this regime and the habitats that it forms and maintains. Some departure from these regimes is tolerable and will not extirpate organisms, but this threshold is difficult to define. The Forest Service must actively participate in the processes that allocate water and water rights to secure instream flows sufficient to sustain native populations.

Policy Implications

Forest plans should be integrated with watershed assessments (assessments are conducted on all lands within a watershed not just national forest lands) and with watershed recovery plans so that goals are clear and of sufficient scope to include watershed management and restoration opportunities across ownerships. See figure 13 for examples of past and future strategies to obtain instream flows.

Greater involvement of partners and other members of the public in the planning process would likely need a better understanding of the need to integrate management opportunities on all lands within a watershed including private lands.

Forest plans, when they are revised, should identify and quantify the amounts of surface and groundwater needed to meet present and future consumptive and instream water uses on national forest lands. When a State undertakes a basinwide adjudication of water rights, all beneficial water uses on national forest lands should be claimed in accordance with Federal and State procedural and substantive laws and regulations, unless otherwise directed by the Office of the General Counsel. Forest planning should use the most defensible methods and avoid inconsistent and piecemeal analyses.

Early and intensive collaboration among existing and potential water users is a cost-efficient approach in most situations. Public collaboration in forest planning can achieve acceptable solutions and may lessen or avoid the costly litigation common to water rights issues.

In many places, the Forest Service lacks the necessary technical expertise in hydrology. Our present level of in-house expertise must be conserved and

Figures 13. Past strategies have been to litigate to secure favorable flows and protect the public interest. In the future, the agency will incorporate flows needed to meet multiple-use mandates through forest planning, as well as by litigation and negotiation.

enhanced if costly failures, both in collaboration and in court, are to be avoided.

FERC Relicensing

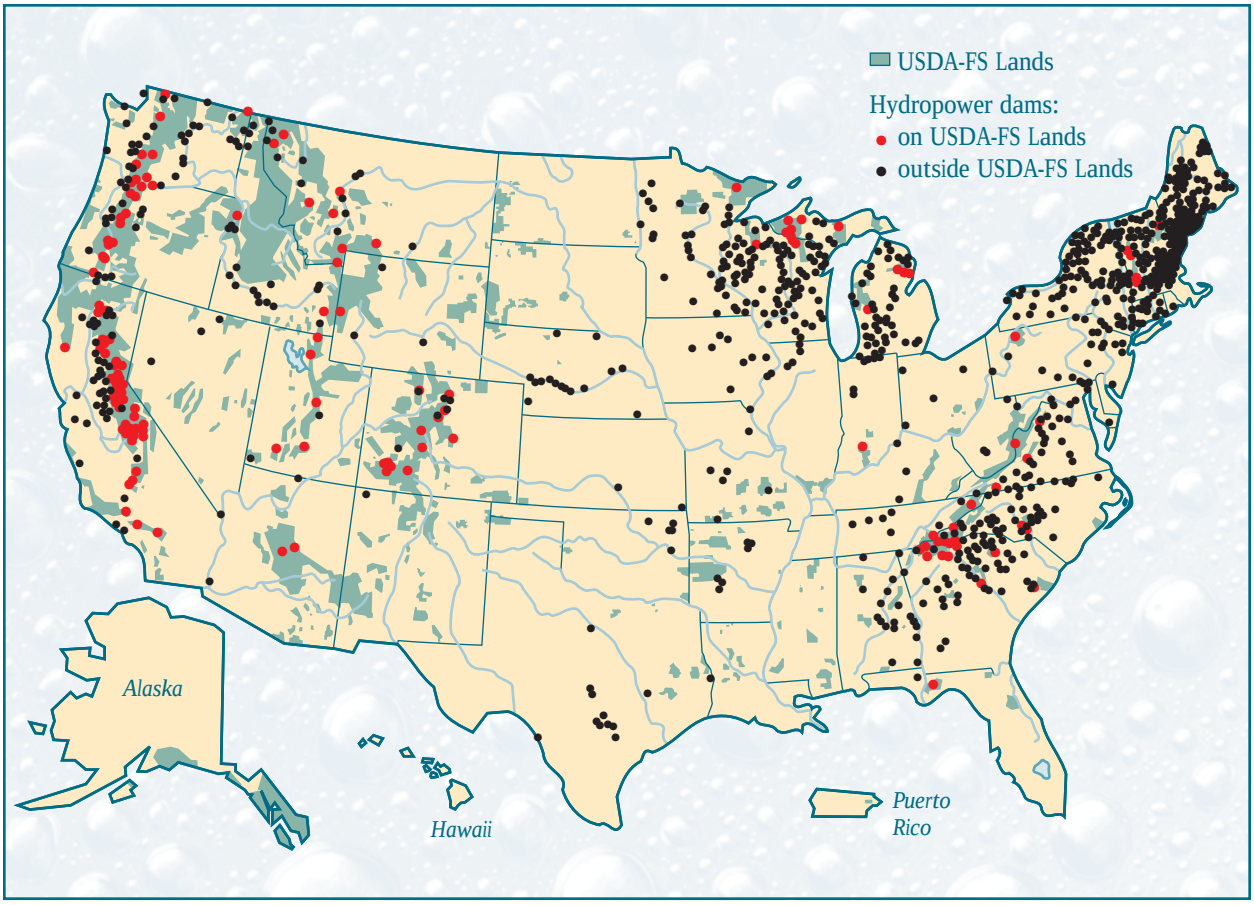
From the 1940's to the 1960's, 325 hydroelectric projects were licensed and built on the national forests (see table 2). These facilities have generated power and provided recreation opportunities. But building and operating these projects has also resulted in significant adverse effects on national forest resources. During the next 10 years, as more than 180 of these projects come up for relicensing, the Forest Service will have a unique opportunity to determine how these projects will operate for the next 30 to 50 years. The relicensing process presents the only chance for the Forest Service to reverse existing resource damage, improve water quality and aquatic habitat, mitigate future adverse effects, and significantly increase recreational opportunities to forest users.

The national distribution of dams provides an interesting look at how these dams are spread across national forest lands (see figures 14 and 15).

Table 2. Hydroelectric dams licensed by the FERC in each Forests Service region, both on and off national forests lands. Data derived from the National Inventory of Dams maintained by the U.S. Army Corps of Engineers, compiled and developed by the Pacific Northwest Research Station.

Forest Service Region	Number on NFS land	Number off NFS land	Total
Northern (R1)	9	21	30
Rocky Mountain (R2)	21	71	92
Southwest (R3)	3	3	6
Intermountain (R4)	10	34	44
Pacific Southwest (R5)	152	87	239
Pacific Northwest (R6)	35	74	109
Southern (R8)	49	246	295
Eastern (R9)	31	1,318	1,349
Alaska (R10)	15	15	30
Total	325	1,869	2,194

Figure 14. Hydroelectric dams in the 48 States both on and off national forest lands. The largest number of small hydroelectric dams is in the New England, Great Lakes, southern Appalachian, and Mid-Atlantic areas.



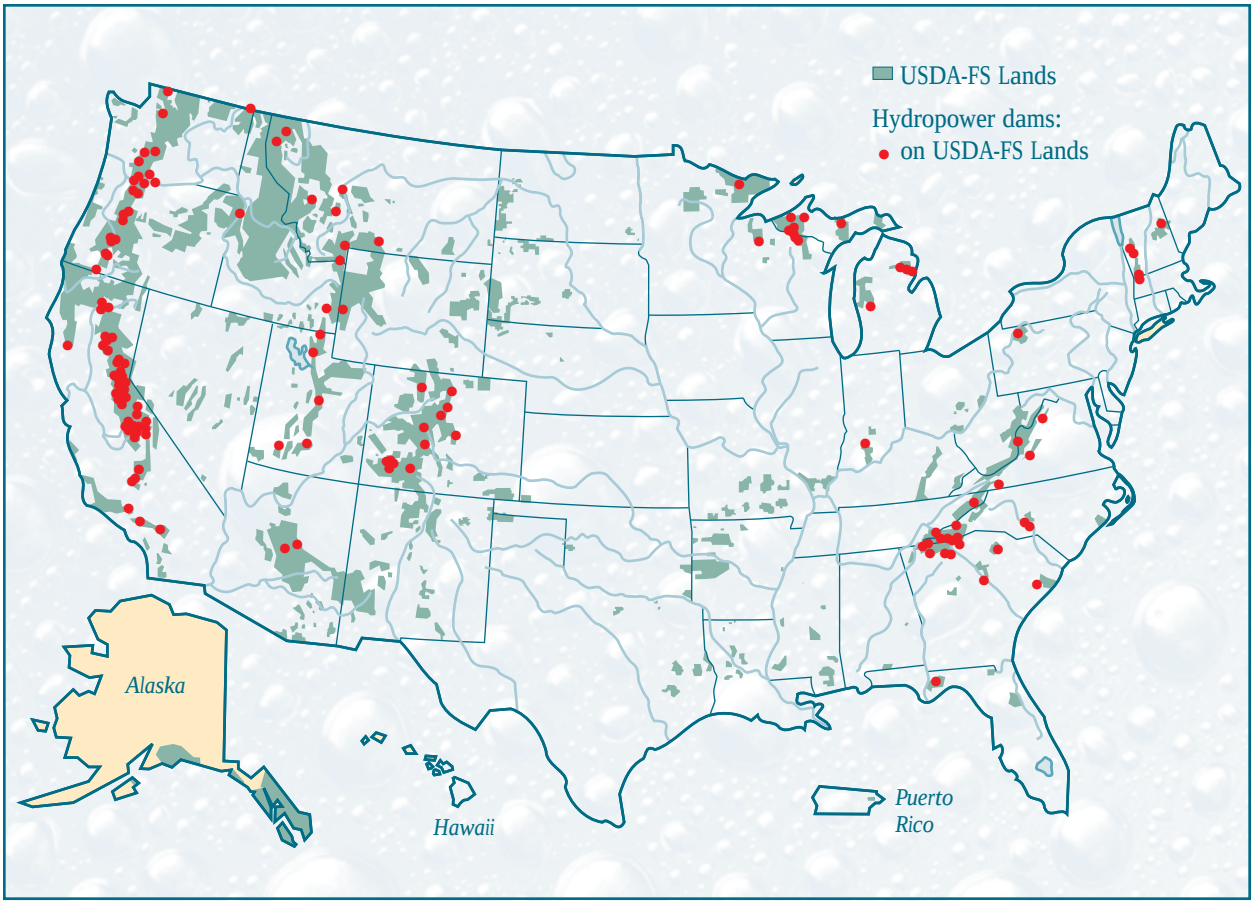
There are nearly 2,200 hydroelectric dams in the United States, excluding Hawaii and Puerto Rico; about 15 percent of these are on national forest lands. Forest Service strategies for dealing with relicensing may differ among the regions because the issues and complexity vary with factors such as dam size, the river basin and biological contexts, interbasin water transfers, and cumulative effects.

The large-scale hydrologic effects of American dams have recently been assessed by Graf (1999). Graf found that the greatest density of dams and the greatest segmentation of river systems in California, the Texas-Gulf, and South Atlantic water resource regions (see figures 14 and 15). Regions with high ratios of storage capacity to drainage area show the highest potential for changes to instream flows and ecological disruption. The greatest flow effects are in some western mountain and plain regions, where dams can store more than 3 years of runoff. The least effects to flow are in the Northeast, Upper Midwest, and Northwest where storage is as little as 25 percent of the annual runoff.

The regional variability of impacts and numbers of dams suggests that the Forest Service cannot tackle every dam relicensing on national forests with the same intensity. Nationally and regionally, we must focus strategically on the basins and dams where we can expect to achieve the greatest benefits for biodiversity, recreation, and ecosystem function in large, complex, mixed-ownership watersheds.

The Forest Service has binding statutory authority and responsibility from the Federal Power Act (FPA) to stipulate license conditions the Federal Energy Regulatory Commission (FERC) must include in the new license. To successfully condition these licenses, the Forest Service must develop a substantial and defensible administrative record to support the articles that have been "demonstrated necessary for the adequate protection and utilization of national forest resources." Developing the administrative record requires a significant commitment by the Forest Ser-

Figure 15. Hydroelectric dams in the 48 States on national forest lands. The largest number of these dams are on the west coast.



vice in terms of technical and process personnel and financial support. Relicensing processes normally take 5 to 10 years.

Forest Service participation in the relicensing process could strengthen mitigation and restoration programs on national forest lands that would lead to improved aquatic habitats and increased water quality. Estimates of these benefits to national forest lands exceed a billion dollars. Recreation, fish and wildlife, and watershed resources are the primary areas affected by hydroelectric generation, and these resources stand to realize the greatest benefits from the relicensing efforts. Potential benefits include new and upgraded recreational facilities, restored instream flow regimes, enhanced aquatic habitats, and improved wildlife habitat. Recent relicensing experiences have demonstrated that the benefit-to-cost ratio can be greater than 30:1; no other Forest Service program has a higher potential payoff.

Groundwater

The groundwater resource under the surface of national forest lands has never been assessed at the national, regional, or forest scales. The U.S. Geological Survey has compiled a national atlas of groundwater in the United States, and published detailed regional studies of all major aquifers. Although neither of these sources show national forest lands, we can infer some things from them about groundwater in some parts of the national forest lands. We also have access to well logs where wells have been drilled on national forest lands by the agency or others. Many forest acres serve as recharge areas for aquifers in nearby valleys that many citizens depend on for their drinking and irrigation water. We are unable to quantify the amount, timing, or quality of this recharge with available data.

Over centuries, groundwater has been replenished by inflows from rivers, lakes, and wetlands. At shallow depths, the water table fluctuates with annual precipitation affecting lake levels and river flows. The value of groundwater depends on the depth of the water table due to drilling and pumping costs. We are not aware of any studies that have quantified the economic values of groundwater functions.

The States vary in their regulation of underground water. In many States, there is little if any regulation or monitoring of the extraction of underground water and there are unresolved jurisdictional questions over who has control over water extraction within the boundaries of the forests.

The ownership of groundwater is unresolved or unaddressed in many States. For example, the State of Virgina claims the water underlying Federal lands and it remains unclear if such a claim has merit.

Some existing special use permits involve the extraction of groundwater on national forest lands, but there is no agency policy on environmental effect analysis, valuation, metering, or resale of this water.

At least three groundwater-related issues affect national forest lands:

- Some communities want to change from contaminated groundwater wells to surface water supplies, and national forests are the logical or sole source.
- Groundwater extraction by adjacent communities or landowners may be drying up nearby streams and affecting riparian vegetation and aquatic habitat.
- The status of groundwater ownership within the national forests is unresolved in many States. The Forest Service lacks the scientific expertise and data on the groundwater resources underlying its lands to effectively cope with these growing issues.

Policy Implications

The growth of urban interface adjacent to the National Forest System has exceeded the agency's ability to respond to the challenges of increased water demand. Most current forest plans do not address water resources in a comprehensive manner. Forests are not adequately staffed with technical experts to handle the issues related to water that evolve faster than they can be inventoried. Claims on water originating from the National Forest System far outstrip the agency's ability to track them, much less manage the issues.

Starting points for developing an effective approach to the complex issues involved in water resources management include: a comprehensive inventory of State law, an analysis of conflicts with agency resource management objectives, and a complete inventory of Water Rights that are vested in the United States (within the National Forest System). ❖

Water Quality

Forested watersheds have a well-deserved reputation for producing clean water. The Forest Service has conducted long-term research on the effects of land management on water quality at experimental forests—such as Hubbard Brook in New Hampshire, H. J. Andrews in Oregon, and Coweeta in North Carolina. Research shows that the quality of water in undisturbed forests and grasslands is usually good. In managed ecosystems, water quality depends on the particular land-use practices being implemented. Some land-use practices can protect or restore water quality, but others may degrade or pose risks to clean water. Long-term studies conducted by the Forest Service have provided much of the current understanding of watershed processes in forests and grasslands, and such studies will need to be continued to assess the effects of forest management on water quality at landscape scales and over longer periods of time.

Most watersheds have several different land uses that affect source waters in complex patterns. These uses overlap across the landscape and change over time. A few studies have examined the interactions among multiple land uses and their cumulative effects over time, but most have examined small watersheds over short periods. More information is needed to assist managers in dealing with the complexity of these interactions for larger watersheds and longer time periods.

A key action of the Clean Water Action Plan directs the Departments of Agriculture and the Interior to consult with other Federal agencies, States, tribes, and other stakeholders to develop a Unified Federal Policy to enhance watershed management for protecting water quality and the health of aquatic ecosystems on Federal lands. The purpose of the Unified Federal Policy is to ensure a consistent approach to managing Federal lands on a watershed basis, to protect, maintain, and improve watershed conditions and water quality.

In summary, forests and grasslands often produce high-quality water. Long- term studies have shown this to be generally true in undisturbed ecosystems and for some classes of land use. Other forms of land use have been found to degrade water quality to varying degrees. The most significant water quality problems found on national forests are typically sediment (turbidity and bedload), nutrients, temperature, and hazardous chemicals. Measures to protect, restore, or mitigate water quality have been devised for many management practices. New research will be needed to understand the effects on water quality of innovative land management systems currently being devised as part of ecosystem management and to understand the cumulative effects of multiple management actions that overlap in space and time across large landscapes.

Total Maximum Daily Loads

Section 303(d) of the Clean Water Act requires that total maximum daily loads (TMDL) be established by States, tribes, U.S. territories, and EPA for waterbodies for which water quality standards are not being attained. Such waterbodies are generally referred to as "impaired" or "water quality limited." Forest Service policy is to participate in preparing and implementing TMDL's. The Forest Service is collaborating with the EPA and Bureau of Land Management (BLM) to prepare a policy and framework for developing and implementing TMDL's in forest and rangeland environments.

TMDL's for a pollutant is defined by the EPA as the sum of the waste load allocation for point sources, plus load allocation for nonpoint sources of pollution, plus a load to allow a margin of safety (40 CFR 130.2). The load allocation for nonpoint sources of pollution includes "natural" background loads and the margin of safety accounts for uncertainty. The TMDL approach is a mechanism for improving impaired waters and a process for determining tradeoffs between point and nonpoint sources. It provides a focus for future watershed management actions.

A collaborative approach by all landowners in a watershed is the potential strength of the TMDL process. Its weaknesses are the current technical and scientific barriers to connecting water-quality standards to specific nonpoint sources, particularly where the pollutants of concern are native components of stream systems, like sediment and heat. Because of highly variable natural background regimes and long delays between the introduction of pollutants and downstream effects, relating water quality standards to the effectiveness of individual control measures is often difficult or impossible. The lack of precision and reliability limits the utility of the TMDL process in allocating loads to specific management practices or to individual landowners in forest and rangeland settings. Creative approaches will be needed to salvage useful gains from a legal framework that was designed for point-source pollution control and fits nonpoint source control poorly. The Forest Service should continue to develop and monitor best management practices, ensure a high rate of implementation, and revise those

practices that are not effective, as the fundamental basis of our water quality management program.

New technology developed by EPA and the Forest Service for temperature monitoring uses forward-looking infrared radar to provide a spatially continuous thermal profile over hundreds of miles of streams. This technology is providing a framework for restoring water quality and a picture of what sections are meeting and not meeting water-quality standards for temperature. This relatively cheap and accurate method is an important tool in providing landscape context to water-quality problems.

Abandoned Mine Lands and Hazardous Materials Sites

At least 38,000 abandoned mine lands and hazardous material waste sites exist on national forest lands. These sites, most common on western forests, often cause severe and chronic water pollution. In the early 1990's EPA proposed that discharges from abandoned mines be subject to permits under the Clean Water Act. As an alternative, a "watershed approach" agreement was made to coordinate the efforts of all land managers and owners to efficiently and comprehensively address restoration projects in entire watersheds, rather than spot-treating individual sites. Key steps in the interagency agreement include setting priorities—among watersheds in each State and mine sites within each priority watershed—and monitoring. Several watersheds were selected as pilots, including Boulder River in Montana and Upper Animas River in Colorado. Now included in the Clean Water Action Plan, cooperation and collaboration among States, Federal agencies, and tribes is fundamental to the watershed approach. This program is relatively new, and few mines have been completely restored. ❖

Watershed Condition and Restoration

National forest activities have affected water quality and productivity of the land. Problem watersheds and processes are often masked by the size of the landscape, or noticeable only when flooding or other disturbances occur. Although most watersheds on national forests appear healthy on a large scale, extensive localized rehabilitation needs still exist on these lands.

Concerns include soil degradation, lack of vegetative cover, eroding stream channels, gullies, landslides, abandoned roads, and compacted rangeland. Some watersheds can be restored by emphasizing land management requirements and practices. Some watersheds are so seriously affected that making a difference will be hard. Other watersheds are expected to respond to intensive investment in erosion control features. Some types of work are intensive, structural, and expensive for a relatively small site and need to be monitored and maintained. Biological treatments, like seeding, are extensive and require little maintenance.

Disturbances in forest and grassland vegetation from drought, wind, fire, insects, and diseases are part of properly functioning ecosystems in watersheds. However, some past management practices—such as fire exclusion, timber harvesting, and human development—have created watersheds that experience more frequent or intense fire disturbances than in the past. Many of these forests and grasslands are overcrowded with increased susceptibility to drought, and insect and disease outbreaks. The excessive amounts of dead wood and grass, especially in watersheds that historically burned at frequent intervals, heighten the risk of high-intensity, destructive fires. Large-scale vegetative disturbances in a watershed adversely affect waterbodies by increasing soil erosion and nutrient runoff. With dense stands of vegetation and large amounts of dead fuel on the ground, the size and intensity of fires can increase significantly and be accompanied by greater risks of erosion, severity of floods, and decreases in water quality.

The long-term view is that healthy watersheds can only be achieved if the ecosystems on the watershed are healthy. Watershed restoration includes recovery of natural timber and grass stands and fuels composition. Thinning, prescribed burning, and other management projects are needed on a watershed (landscape) scale to significantly alter the predicted course of events leading toward large-scale erosion, flooding, and nutrient loss on disturbed watersheds.

In the most comprehensive landscape assessment to date—the Interior Columbia Basin Assessment—current condition of forest and rangeland areas had drastically departed from the historical condition. Fire suppression and harvest of the large pine trees resulted in the buildup of fuels and changes in the ponderosa pine forests. Rangelands have been invaded by exotic weeds. Different management scenarios were modeled out over the next 100 years.

The model found that, at the landscape scale, current momentum toward further departure from the desired condition will not be overcome in the next 100 years, even with the most aggressive proposed management. Management could not reverse the trend of forest changes at current or reasonably foreseeable levels of staff, activities, and budget.

The sobering news is that, in the Interior Columbia Basin, forest and range health restoration will proceed at such a slow rate that unnaturally large, high-intensity fires will continue to reset landscape vegetation. This is probably true in many other areas as well. These findings suggest that a more realistic assessment of the prospects for success is needed; effective restoration of all degraded areas is simply not feasible. We do not have the resources to make a difference at landscape scale unless we strategically focus our restoration efforts. Focusing on selected watersheds at the scale of 200,000 to 500,000 acres, where we can hope to make a difference, is a more realistic and promising approach.

Wetlands and Riparian Areas

Of the nearly 192 million acres managed as national forests and grasslands, fewer than 10 percent are considered wetlands and riparian areas. Higher percentages are found in Regions 8, 9, and 10 with significantly lower percentages (less than 2 percent) in the arid and semi-arid portions of Regions 1, 2, 3, 4, 5, and 6. These are rough estimates because the Forest Service has not conducted specific inventories of these areas. Because of their limited extent and usually narrow configuration, wetlands and riparian areas have often been mapped as inclusions in larger mapping units during soil surveys, range analysis, and other inventory and analysis efforts. A more definitive estimate is needed for improved management.

These areas are often the most productive and most used portions of the landscape because they have more available water, deeper and more fertile soils, robust vegetation, and cooling shade. Riparian and wetland areas also receive the most intense use because they provide abundant forage for wildlife and

domestic livestock, serve as transportation corridors, commonly produce quality timber, concentrate recreational use, and may hold valued minerals.

The total grazing use of Federal lands has decreased steadily since the mid-1950's. However, in the Pacific Northwest, grazing has increased on private lands near waterbodies and in riparian areas, bringing corresponding increases in grazing-related damage to riparian function and watershed condition.

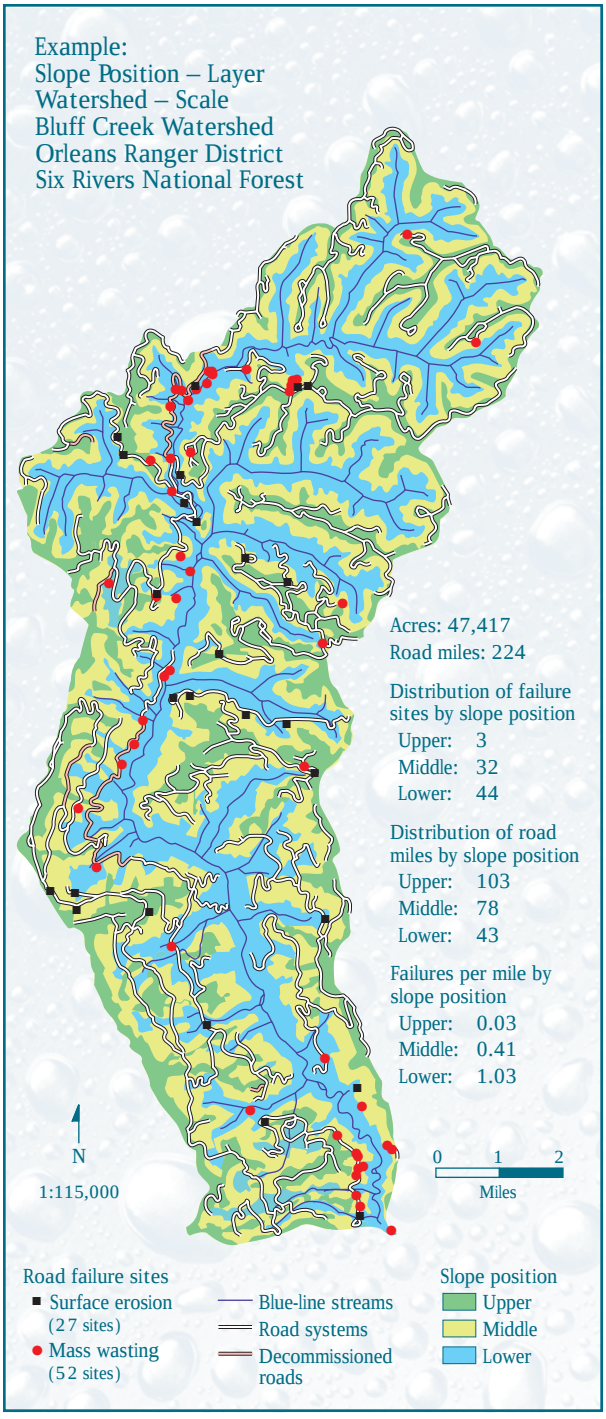
The condition of riparian areas and wetlands varies considerably across the Nation, depending on a number of physical and land use factors. Estimates indicate that conditions on national forest lands are good in over 90 percent of Alaska, 70 percent of the East, 60 percent of the South, and in the West ranges from over 50 percent in the more humid sections to less than 30 percent in semiarid and arid areas. Reasons for poor conditions vary significantly across the country. Past timber harvest, roading, recreation, and urban encroachment account for much of the problems in the East, South, Alaska, and humid portions of the West. Livestock grazing, roading, recreation, mining, and urban encroachment account for much of the concern in the drier parts of the West.

Although these areas are easily overused and damaged, they also respond quickly to improved management. Watershed improvement programs, fisheries habitat improvements, range betterment efforts, enlightened road placement and maintenance, and restoration of abandoned mines all contribute to improving these important areas. Key elements of the Forest Service's Natural Resources Agenda and Clean Water Action Plan focus on restoring and managing wetland and riparian areas.

Roads

After the Second World War, the growing demand for wood products fueled an exponential growth in forest road mileage. From a limited mileage in 1960, the system of forest roads has grown to more than 400,000 miles. During this period, conventional wisdom held that as long as a road remained intact—comfortably drivable—the surrounding area would benefit from increased access. People also believed that adverse effects from roads could be corrected and that physical and biological resources would not suffer long-term changes. The engineering emphasis was on protecting the road from damage by water; other physical or biological effects received little attention. In fact, many roads posed severe problems and risks for forest resources, both as land disturbance and as

Figure 16. Road failures are strongly related to slope position in this northern California watershed. Note that most of the failures are in middle and lower positions, with only three in the upper slope position (USDA Forest Service 1999). Effects vary greatly among roads, and substantial effort is needed to distinguish high-impact and low-impact roads to set priorities for watershed restoration.



access routes that concentrate human activities and pollution. Damages to watersheds and aquatic and riparian ecosystems accumulated in many places.

In recent years, a growing concern for water quality, runoff, and flood damage in forests and rangelands has focused attention on roads and their effects on water quality and watershed functions. The current Forest Service Natural Resources Agenda reflects this concern.

Many studies have shown that roads in forests have elevated erosion rates and often increase the likelihood of landslides in steep or unstable terrain. Both of these effects can be especially pronounced where roads cross or run near streams, resulting in sediment discharge to surface waters. Roads are also likely sites for chemical spills associated with traffic accidents, with the highest risk of water contamination where roads cross streams. Proper road engineering, application of Best Management Practices (BMP), and emergency preparedness can reduce but not eliminate these risks. Unfortunately, most of the roads on national forests and grasslands were built before current engineering practices and BMP's were used, and the cost of upgrading to current standards is high. Other transportation corridors, such as pipelines and powerline rights-of-way, also pose problems and risks.

Not all roads have the same effects on watersheds. Variation is great and discriminating between high-impact and low-impact roads and road networks is an important analytical challenge. For example, studies on national forest watersheds in northern California (USDA 1999) found that roads at or near ridgetops had far fewer failures and generated far less sediment to streams than roads in lower slope positions (see figure 16) . The specific effects of roads are strongly influenced by a variety of factors, including road building techniques, soils and bedrock, topography, and severity of storm events.

Research has shown that improved design, construction, and maintenance can reduce the effects of roads on water quality, wetlands, and watershed function. Remarkably little is known about road effects on hydrology at watershed and subbasin scales, so there is inadequate basis to evaluate the hydrologic functioning of the road system at large scales. Analytical techniques need to be developed further. The specific range of ongoing and likely watershed effects should be evaluated at both regional and landscape scales. ❖

Conserving Aquatic Biodiversity and Threatened Species

In conserving and recovering at-risk species and maintaining biodiversity, a strong consensus among conservation biologists supports the need for refugia or designated areas capable of providing high-quality habitat. For aquatic species, watersheds are the basic unit for such a conservation strategy. Watersheds that have maintained hydrologic functions and processes, and those that support healthy populations of the species of interest or their specific habitats have been identified. These areas receive a combination of low-risk land allocations, special land-use standards, or priority for analysis and restoration efforts.

Networks of refugia must be large and well distributed to anchor the persistence and recovery of the at-risk species in current and future disturbance regimes and ever-changing landforms and vegetation cover. Refugia alone are not assumed to be sufficient to conserve species. Lands between refugia are expected to be subject to land allocations and practices that will promote watershed function and conserve species, complementing the special focus on refugia.

Some aquatic species (for example, invertebrates) depend on local habitats. They may exist only in a single spring or a spring-stream system in a single watershed. Where habitats are isolated or unique (because of water chemistry, vegetation, and a multitude of contributing factors), the potential for rare species is high. The distribution of these habitats is not restricted to any set of watersheds, lithology, or other ecological units. The importance of these "rare" habitats must be recognized, with proper inventory and site-specific protection measures.

Where lands are set aside or allocated for special low-risk management, broad conservation benefits accrue, not just for targeted rare species, but for biodiversity and watershed health as well. These areas provide a hedge against unanticipated problems with species viability and large-scale disturbances and climate changes.

Five recent, large-scale, ecosystem-based Forest Service assessments have identified networks of aquatic conservation watersheds: the Northwest Forest Plan (FEMAT 1993), the Interior Columbia Basin Ecosystem Management Project, The Tongass National Forest Land Management Plan, the Sierra Nevada Framework Project, and the Southern Appalachians Assessment.

Of these, the Northwest Forest Plan and the Tongass National Forest Land Management Plan have records of decision that delineate key watersheds or central areas for biodiversity. The stage is set and progress is being made in the other areas to identify special emphasis watersheds and to protect and, where needed, restore them.

Table 3. Land areas identified for aquatic conservation, biodiversity, and clean water in various recent large-scale ecosystem analyses.

Assessement Area	*Number of Refugia watersheds*	*Total area, refugia watersheds (acres)*	*Proportion of total NF area**
Northwest Forest Plan (key watersheds) [1]	*164*	*8,678,600 (includes BLM lands)*	*33%*
Tongass National Forest [2]	*Too many to count*	*13,662,000***	*80%*
Interior Columbia Basin (strongholds) [3]	*1,693*	*19,977,824 (includes BLM)*	*40%*
Sierra Nevada [4] *(proposed emphasis watersheds)*	*139*	*5,747,261*	*47%*
Southern Appalachians (aquatic diversity areas) [5]	*45*	*10,303,360 (17% is National Forest)*	*38%*

**In the analysis area.*

*** Conserve and restore land-use designations*

1. *FEMAT 1994.*
2. *Tongass Land Management Plan revision, 1997.*
3. *Interior Columbia Basin Ecosystem Management Project.*
4. *Draft information from of the Sierra Framework project, Pacific Southwest Region (Joseph Furnish, pers. comm).*
5. *Southern Appalachian Assessment.*

These efforts represent a substantial actual and potential commitment of lands to conserving aquatic species and could be regarded as a major part of a national forest aquatic and biodiversity conservation strategy. More than 53 percent of national forest lands are represented by the assessments in table 3. The role that the national forest lands play in anchoring fish and other aquatic species is not trivial, with greater than one-third of national forest lands identified as important to maintaining aquatic biodiversity.

The Inland West Water Initiative, which includes Regions 1, 2, 3, and 4, will have completed its assessment and delineated special waterbodies and watersheds by early FY 2000. The asssessment will identify which watersheds are important and for what purposes (in a spatially explicit format), for more than 80 percent of national forest lands in the four regions.

Recent strategies for national forests have focused on restoring the natural ecological processes that will create and maintain diverse and resilient aquatic habitat (Northwest Forest Plan, Tongass National Forest, PACFISH; proposed for the Sierra Nevada provinces and the Interior Columbia Basin.) These efforts will move east and probably be incorporated into revised forest plans in the next several years. ❖

Integrating Watersheds from the Headwaters Through the Cities

National forests typically occupy the headwaters of large river basins. Forest activities affect the water resource; so do downstream land uses. In general, watersheds on the national forests are in relatively good shape compared to soils, waters, and riparian areas on private lands, ranches, and farms, and urban areas that typically occupy the lower parts of a large river basin. It will take a comprehensive, watershed approach to improve water quality or restore the full range of watershed function to the system.

Water quality problems, and solutions, are disproportionately tied to urban areas. Urban areas are often forested and make a major contribution to maintaining and improving water quality. Counties classified as "urban" now contain one-quarter of the total tree cover of the coterminous United States.

Urban trees affect the volume of runoff by intercepting precipitation, slowing water infiltration rates, and transpiring water. By intercepting and retaining or slowing the flow of precipitation reaching the ground, trees (in conjunction with soils) play an important role in urban hydrologic processes. They can reduce the rate and volume of storm water runoff, flooding damage, stormwater treatment costs, and other problems related to water quality. Estimates of runoff for an intensive storm in Dayton, OH, showed that the existing tree canopy (22 percent) reduced potential runoff by 7 percent and that a modest increase in canopy cover (29 percent) would reduce runoff by nearly 12 percent (Sanders 1986). A study of the Gwynns Falls watershed in Baltimore indicated that heavy forest cover can reduce total runoff by as much as 26 percent and increase low-flow runoff by up to 13 percent, compared with treeless areas, for equivalent land-use conditions (Neville 1996). Tree cover over pervious surfaces reduced total runoff by as much as 40 percent; tree canopy cover over impervious surfaces had a limited effect on runoff. In reducing runoff, trees function like retention structures. In many communities, reduced runoff from rainfall interception can also reduce costs of treating stormwater by decreasing the volume of water handled during periods of peak runoff (Sanders 1986).

Hydrologic costs may also be associated with urban vegetation, particularly in arid environments where water is increasingly scarce. Increased water use in desert regions could alter the local water balance and various ecosystem functions tied to the desert water cycle. In addition, annual costs of water for sustaining vegetation can be twice as great as energy savings from shade for tree species that use large amounts of water, such as mulberry (McPherson and Dougherty 1989). In Tucson, AZ, 16 percent of the annual irrigation requirement of trees was offset by the amount of water conserved at power plants because of the energy savings from trees (Dwyer et al. 1992).

Urban waterways are strongly influenced by impervious surfaces that generate large volumes of rapid surface runoff, contaminants, and thermal loads. The effects of temperature extremes, nutrient loading, toxins, bed instability, current velocities, and disturbance frequencies are all magnified in urban watersheds. Urban vegetation can reduce many of these adverse effects by cooling air temperatures, shading waterways, removing pollutants from both water and air, reducing surface and subsurface flows, and by reducing pollutant emissions from various sources (Nowak et al. 1998).

Policy Implications

Research is critically needed that integrates these numerous vegetation effects to evaluate the total effects of urban vegetation and various vegetation designs on water quantity and quality. This research should include field measurements, computer modeling, and model validation. The Baltimore long-term ecosystem research project is currently investigating and integrating many of these research issues to help answer this complex question. More research and field measurements are needed to determine appropriate urban vegetation management strategies and designs to improve water and stream quality in and around urban areas, and consequently improve human health and environmental quality in the Nation. ❖

Next Steps

This report contains information that can be used to help articulate and guide the agency's commitment to watershed health and restoration. The report is a first step in identifying the particular role of national forests in providing water to the Nation and restoring watersheds to a healthy, sustainable functioning condition

The report has focused on answering basic questions about the quantity, quality, uses, and value of waters that flow from the national forests; about the condition and trend of national forest watersheds; and about strategies for protecting and restoring degraded waters and watersheds. We have surveyed the published information and tried to capture the current state of our understanding in this paper—though in sharply condensed form. Along the way, we have noted gaps in the data and questions particularly ripe for further inquiry. Action items for additional investigation include:

- Refine water-yield estimates to the national forest scale. Precision estimates by forest and State are necessary to drive water valuation models and aid in revising forest plans. This action could be completed in 6 to 12 months, with a term or post-doctoral position.
- Refine our estimate of the value of water on and flowing from national forest lands. The estimate of the value of water from national forest lands in this paper is a first approximation that does not include dilution, navigation, quality of water, and nonuse values nor does it estimate the value of careful forest management in sustaining a watershed's ability to store and distribute water and moderate downstream flooding.
- Convene a leadership forum to examine the particular role that the Forest Service plays in providing clean water to the Nation and determine the kinds of watershed and forest management programs that will maintain long-term, high-quality water and keep national forest watersheds operating within their historical range of variability.
- Develop and activate a communications strategy on the connection of forested watersheds and clean water in urban settings, addressed to urban and suburban publics and policymakers. This strategy would highlight the contributions that national forest lands, technical assistance, and stewardship programs can make to water quality, reduced storm runoff, drought reduction, and watershed health.
- Complete an agency-wide assessment of special-emphasis and biodiversity watersheds, modeled on the assessment work of the Inland West Water Institute.

In the meantime, the Forest Service is actively pursuing initiatives to restore watersheds, improve water quality, and protect aquatic habitats. The Chief has made watershed health and restoration, recreation, sustainable forestry, and roads management the agency's top priorities. The Committee of Scientists recommended that the Secretary of Agriculture highlight the need to plan for conserving and restoring watersheds through maintaining flow regimes. These efforts recognize that watershed integrity will be maintained and restored, in part, through sustainable management of the national forests. But watersheds are larger than forests, watershed health will be achieved only through collaborative partnership efforts at the watershed scale as envisioned in the Clean Water Action Plan headed by the Administrator of the EPA and Secretary of Agriculture. The Forest Service has a vital role to play on both sides of the national forest boundaries.

The challenge for watershed-based approaches will be to develop a shared vision for healthy and productive watersheds, based on understanding natural and human-induced variability at scales ranging from small (<20,000 acre) to large (>1,000,000 acre). New strategies are needed for managing in mixed-ownership watersheds, as well as creating new partnerships for effective learning, assimilating new knowledge, and implementing our shared vision. ❖

References

Brown, T. 1999. Notes on the Economic Value of Water from National Forests. Unpublished report. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Coleman, E.A. 1953. Vegetation and Watershed Management. The Ronald Press.

Croft, A.R. and Bailey, Reed W. May 1964. Mountain Water. USDA Forest Service, Intermountain Region, Ogden, UT

Dwyer, J.F., Nowak, D.J., Noble, M.H., and Sisini, S.M. (in press). Connecting People with Ecosystems in the 21st Century: An Assessment of our Nation's Urban Forests (PNW GTR xxx): U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, OR.

Forest Ecosystem Management Assessment Team: An Ecological, Economic, and Social Assessment Report of the Forest Ecosystem Management Assessment Team (FEMAT) 1993.

Frederick, K. D. and Sedjo, R. A. 1991. America's Renewable Resources: Historical Trends and Current Challenges. Resources for the Future, Washington, DC.

Frederick, K. D. 1991. Water Resources: Increasing Demand and Scarce Supplies. In: America's Renewable Resources: Historical Trends and Current Challenges, Kenneth D. Frederick and Roger A. Sedjo, eds., Resources for the Future, Washington, DC.

Gillian, D.M. and Brown, T.C. 1997. Instream flow protection: Seeking a balance in western water use. Island Press, Washington, DC.

Gleick, P. H. 1993. Water in Crisis: A Guide to the World's Fresh Water Resources. Oxford University, Oxford.

Gleick, P. H. 1998. The World's Water: The Biennial Report on Freshwater Resources. Island Press. Washington, DC.

Graf, W.L. 1999. Downstream Geomorphic Impacts of Large Dams on American Rivers. Arizona State University, Department of Geography, Tempe, AZ, (unpublished manuscript).

Hansen, T. and Hallum, A. 1990. Water allocation tradeoffs: Irrigation and recreation. Agricultural Economic Report number 634, Resources and Technology Division, Economic Research Service, U.S. Department of Agriculture.

Hann, W.J., Jones, J.L, Karl, M.G. [et al.] 1997. Landscape dynamics of the basin. In Quigley, T.M.; Arbelbide, S.J., (tech. eds.). An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-405, Chapter 3. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, OR.

Harr, R. D. 1983. Potential for Augmenting Water Yield Through Forest Practices in Western Washington and Western Oregon. Water Resources Bulletin 19(3):383-394.

Kattelmann, R. C., Berg, N. H., and Rector, J. 1983. The Potential for Increasing Streamflow from Sierra Nevada Watersheds. Water Resources Bulletin 19(3):395-402.

MacCleery, D. W. 1992. American Forests: A History of Resiliency and Recovery. USDA Forest Service, FS-540, in cooperation with the Forest History Society, Durham, NC.

McPherson, E.G. and Dougherty, E. 1989. Selecting trees for shade in the Southwest, J. Arboriculture 15:35-43.

Modeling the effects of urban vegetation on air pollution, In: Air Pollution Modeling and Its Application XII. (S. Gryning and N. Chaumerliac, eds.) Plenum Press, New York, pp. 399-407.

Neville, L.R. 1996. Urban Watershed Management: the Role of Vegetation. Ph.D. dissertation, SUNY College of Environmental Science and Forestry, Syracuse, NY.

Moody, D.W. 1990. Groundwater contamination in the United States. Journal of Soil and Water Conservation 45: 170-179.

National Research Council. 1992. Restoration of aquatic ecosystems. National Academy Press, Washington, DC.

The Nature Conservancy. 1996. Aquatic/Wetland Species at Risk Map, in: The Index of Watershed Indicators, U.S. EPA. EPA-841-R-97-010, September 1997. p. 22

Neilson, Ronald. 1995. A model for predicting continental-scale vegetation distribution and water balance. Ecological Applications 5(2):362-385.

Noble, E. 1965. Sediment Reduction through Watershed Rehabilitation. USDA Agricultural Research Service, Washington DC. Paper 18, Interagency Sedimentation Conference 1963, p. 114-123. In: Proc. Fed. Misc. Pub. 970

Nowak, D.J., Civerolo, K.L., Rao, S.T., Sistla, G., Luley, C.J., and Crane, D.E., in review. The impact of urban trees on ozone in the Northeastern United States. Atmos. Env.

Pinchot, G. 1947. Breaking New Ground. Harcourt and Brace, New York.

Rodgers, A. D. III. 1991. Bernard Eduard Fernow: A story of North American Forestry. Forest History Society, Durham, NC.

References

Sanders, R.A. 1986. Urban vegetation impacts on the urban hydrology of Dayton Ohio, Urban Ecology 9:361-376.

Schmidt, L. J. and Solomon, R.M. 1981. The National Forest Role in Augmenting the Drop of Water. In: Arizona Water Symposium 25th Annual Proceedings, Arizona Department of Water Resources, Report #3.

Shiklomanov, I. A. 1993. World Fresh Water Resources. In: Water in Crisis: A Guide to the World's Fresh Water Resources. Oxford University Press, Oxford.

Solley, W. B., Pierce, R., Perlman, H. 1998. Estimated use of water in the United States. In: 1995 U.S. Geological Survey. Circular 1200, Denver, CO.

Souch, C.A. and Souch, C. 1993, The effect of trees on summertime below canopy urban climates: a case study, Bloomington, Indiana. J. Arboric. 19(5):303-312.

Steen, H. K. 1991. The Beginning of the National Forest System. FS-488, USDA Forest Service. Washington DC

Taha, H. 1996. Modeling impacts of increased urban vegetation on ozone air quality in the South Coast Air Basin, Atmos. Env. 30(20):3,423-3,430.

Tongass National Forest, Land and Resource Management Plan, Record of Decision, signed April 12, 1999.

USDA Forest Service. 1998. Land Areas of the National Forest System, 1997. FS-383. Washington, DC.

USDA Forest Service. 1999. Roads Analysis: Informing Decisions About Managing the National Forest Transportation System. FS-643. Washington, DC.

U.S. Water Resources Council. 1978. The Nation's Water Resources 1975-2000. Washington, DC: Government Printing Office.

U.S. Water Resources Council, Second National Water Assessment, Vol. I: Summary, 052-045-00051-7, Washington, DC: Government Printing Office, 1978. pp. 20, 21.

Ziemer, R. 1987. Water Yields from Forests: An Agnostic View. In: R.Z. Callaham and J.J. DeVries (Tech. Coord.) Proceedings of the California Watershed Management Conference, November 18-20, 1986, West Sacramento, CA. 74-78. Wildland Resources Center, University of California, Berkeley CA. Report 11, Feb. 1982.

ENVIRONMENTAL RESEARCH
LETTERS

LETTER • OPEN ACCESS

Forested lands dominate drinking water supply in the conterminous United States

To cite this article: Ning Liu *et al* 2021 *Environ. Res. Lett.* **16** 084008

ENVIRONMENTAL RESEARCH
LETTERS

OPEN ACCESS

RECEIVED
5 April 2021

REVISED
7 June 2021

ACCEPTED FOR PUBLICATION
9 June 2021

PUBLISHED
22 July 2021

LETTER

Forested lands dominate drinking water supply in the conterminous United States

Ning Liu[1,2], Peter V Caldwell[1], G Rebecca Dobbs[1,3], Chelcy Ford Miniat[1,5], Paul V Bolstad[2], Stacy A C Nelson[3] and Ge Sun[4]

[1] Coweeta Hydrologic Lab, Southern Research Station, U.S. Department of Agriculture Forest Service, Otto, NC 28763, United States of America
[2] Department of Forest Resources, University of Minnesota, St. Paul, MN 55108, United States of America
[3] Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC 27695, United States of America
[4] Environmental Threat Assessment Center, Southern Research Station, U.S. Department of Agriculture Forest Service, Eastern Forest, Research Triangle Park, NC 27709, United States of America
[5] Maintaining Resilient Dryland Ecosystems, Rocky Mountain Research Station, U.S. Department of Agriculture Forest Service, Albuquerque, NM 87102, United States of America

E-mail: Ning.Liu@usda.gov

Keywords: drinking water, hydrologic modeling, forest ownership, WaSSI, water supply, water yield

Supplementary material for this article is available online

Abstract

Forests provide the most stable and highest quality water supplies among all land uses. Quantitatively evaluating the benefits of forest water supply functions is important to effectively mitigate the impacts of land development, climate change, and population growth. Here, by integrating a water balance model and national drinking water data, we determined the amount of surface water yield originating on different forest ownership types at a fine resolution (88,000 watersheds) and tracked that water through the river network to drinking water intakes and the populations they serve. We found that forested lands comprised 36% of the total land area but contributed 50% of the total surface water yield. Of the 23,983 public surface drinking water intakes depending on surface water sources, 89% (serving around 150 million people) received some (>0.01%) surface water from forested lands, and 38% (serving about 60 million people) received more than 50% of their surface drinking water supply from forested lands. Privately-owned forests were the most important water source in the eastern U.S., benefiting 16 million people, followed by federal forests (14.4% of the total water supply). In contrast, federally-owned forested lands were the dominant water source (52% of the total water supply) in the West. Privately-owned forests are the most vulnerable to future land use change and associated water supply impacts. Continuing programs that support private forest landowners with financial and technical assistance through federal and state forest management agencies and potentially developing payment for ecosystem service schemes could maximize benefits for landowners so they may retain their land assets while minimizing forest loss and associated impacts on critical ecosystem services including the provisioning a clean and reliable water supply for the American public.

1. Introduction

Forests provide the most stable and highest quality supply of water among all land types (Brown *et al* 2008, Vose *et al* 2016, Murphy 2020). Early policy makers in the U.S. recognized this linkage and in the Organic Administration Act of 1897 wrote '*No National Forest shall be established, except to improve and protect the forest within the boundaries, or for the purpose of securing favorable conditions of water flows*…'. Forests regulate streamflow quantity and quality through affecting precipitation partitioning (i.e. evapotranspiration and infiltration), water storage, nutrient cycling, and soil erosion and sediment transport processes at multiple scales (Andréassian 2004, Farley *et al* 2005, Ellison *et al* 2012, 2017, Filoso *et al* 2017, Zhang and Wei 2021). In general, the greater the forest coverage in a watershed, the

higher the water quality (Tu 2013, Giri and Qiu 2016). Forest conversion to residential, commercial, and agricultural lands reduces water quality (Moore *et al* 2005, Mapulanga and Naito 2019), and increases runoff and flood risk (Li *et al* 2020). In addition, unlike other natural ecosystems (i.e. shrublands, grasslands) (Buytaert *et al* 2006, Shi *et al* 2017), forests in the U.S. are found in areas with relatively higher precipitation but lower potential evapotranspiration (Sun *et al* 2012) representing areas with high water yield (Sun *et al* 2011).

Drinking water utilities are increasingly seeking ways to maintain forested lands to protect water quality and sustain water supply (Warziniack *et al* 2017). Apart from increasing water demand, population growth will also affect the quality of water supply as forests are converted to developed areas (e.g. Tu 2013). Exurban growth is one of the fastest land use changes over the past four decades, with increasing development beyond the suburban fringe (Radeloff *et al* 2005, Theobald 2005). Exurban growth threatens water quality even at low development densities (McGrane 2016). About one third of the land in the conterminous U.S. (CONUS) is now covered by forests, after declining from 4.14 million km^2 (46% of total land area) in 1,630 to 3.10 million km^2 (33% of land area) in 2012 (Oswalt *et al* 2014). Although the total amount of forest area has stabilized in recent decades in the U.S. (Homer *et al* 2020), forested lands are predicted to decline by 2–3.7% as the population grows by 2050 (D'Annunzio *et al* 2015, U.S. EPA 2020).

Forest ownership patterns differ between the eastern and western regions of the U.S. While the federal government owns 2.59 million km^2 of forested land in the U.S., most of it (75%) lies in the 11 western contiguous states. In contrast, most of the forested land in the eastern U.S. is privately owned. Across the South, forests owned by State and local governments, corporations, families, and other private entities account for about 90% of the total forested land area. Family-owned forests are the majority of privately owned forest lands in the South (55%), followed by corporately owned forests (26%) (Hewes *et al* 2017). Most family-owned forest land is used for aesthetics, wildlife habitat, and family income and legacy, while corporations that own forested land with wood-processing facilities traditionally have been a major source of U.S. timber production (Oswalt *et al* 2014). The projected forest loss due to urban development and agriculture expansion (D'Annunzio *et al* 2015, U.S. EPA 2020) will likely occur in privately owned forests (McNulty *et al* 2013), and is expected to negatively affect surface water supply for downstream communities (Martinuzzi *et al* 2014, Dudley *et al* 2020, Li *et al* 2020).

Despite the recognition that forests are critical for reliable and high quality water supplies (Ellison *et al* 2017), few studies have quantified the relationship between forests, water, and people at regional- or national scales (Brown *et al* 2008, 2016, Caldwell *et al* 2014). This study is the first to link this information to public water systems and the communities and populations they serve in the CONUS scale. We combined a national database of public drinking water systems with high-resolution estimates of water supply generated in each 12-digit, or sixth-level, Hydrologic Unit Code (HUC12) watershed that were generated using a continental-scale water balance model. We quantified the dependence of people relying on each municipal and rural surface water supply system to specific forest ownership types and identified the populations and water supplies that are potentially threatened by future forest loss.

2. Materials and methods

We quantified the proportion of the available surface water to a given public surface drinking water intake that originated on each forest ownership type across the CONUS (figures 1 and S1 (available online at stacks.iop.org/ERL/16/084008/mmedia)) using the Water Supply Stress Index (WaSSI) hydrologic model (supplement: 1. The WaSSI model). The study area covers approximately 88,000 HUC12 watersheds with a mean size of about 90 km^2, including neighboring watersheds in Canada and Mexico that contributed water supply in the U.S. (figure S2). Water yield (mm yr^{-1}) is calculated for each forest ownership type in a given HUC12 as the sum of surface runoff from pervious and impervious surfaces, interflow, and baseflow after accounting for losses that include changes in water storage in the soil, evaporation, and transpiration from vegetation (figure S2(A)). The total water supply is the sum of the water yield generated in all HUC12s upstream of a given location on the river network expressed in m^3 yr^{-1} (figure S2(B)). Forest ownership types (Federal, Tribal, State, Local, Corporate, Family, and Other private) depicted in figure 1 were derived from a dataset of CONUS forest ownership circa 2014 (Hewes *et al* 2017; supplement: 2. Forest ownership). The relative contribution of forest ownership types to the total water supply was calculated for any point along a stream network, such as the location of a surface drinking water intake, by routing water yield originating from each forest ownership type lands through the river network. Surface water originating on each forest ownership type was linked to people through United States Environmental Protection Agency's (U.S. EPA) Safe Drinking Water Information System database (figure S3) (U.S. EPA 2017; supplement: 3. Linking water yield from forests to surface drinking water intakes). We overlaid the surface drinking water intakes on the HUC12 watershed boundaries and assumed that the WaSSI-estimated proportion of water from forest lands at the outlet of the HUC12 watershed in which a given

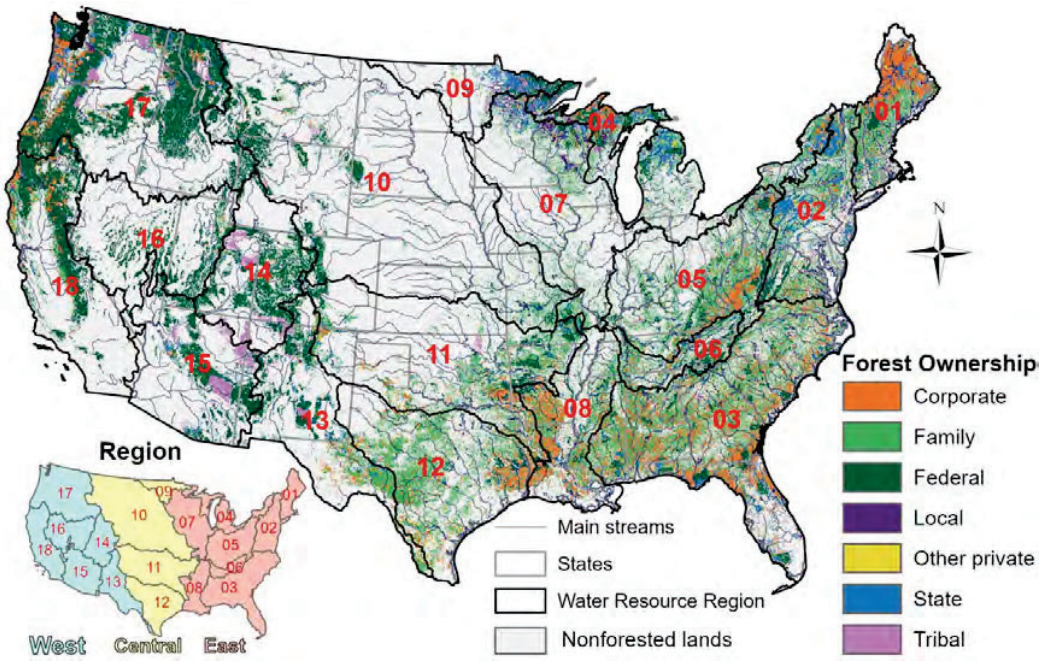


Figure 1. Forested lands by ownership (ca. 2014) in the 18 water resource regions (WRR) across the conterminous United States. Three regions were defined as follows: East (WRR 1–8), Central (WRR 9–12) and West (WRR 13–18).

intake was located was representative of the intake location. Integrated Climate and Land Use Scenarios (ICLUS) v2.1 land use projections by the fifth scenario among the five global socioeconomic scenarios (SSP5) (U.S. EPA 2020) was used to detect the communities that are vulnerable to future forest loss (supplement:4. Identifying the population potentially threatened by forest loss). This scenario is selected to show the worst potential forest loss under the rapidly growing global economy and the U.S. population scenario in the middle-term future (2050).

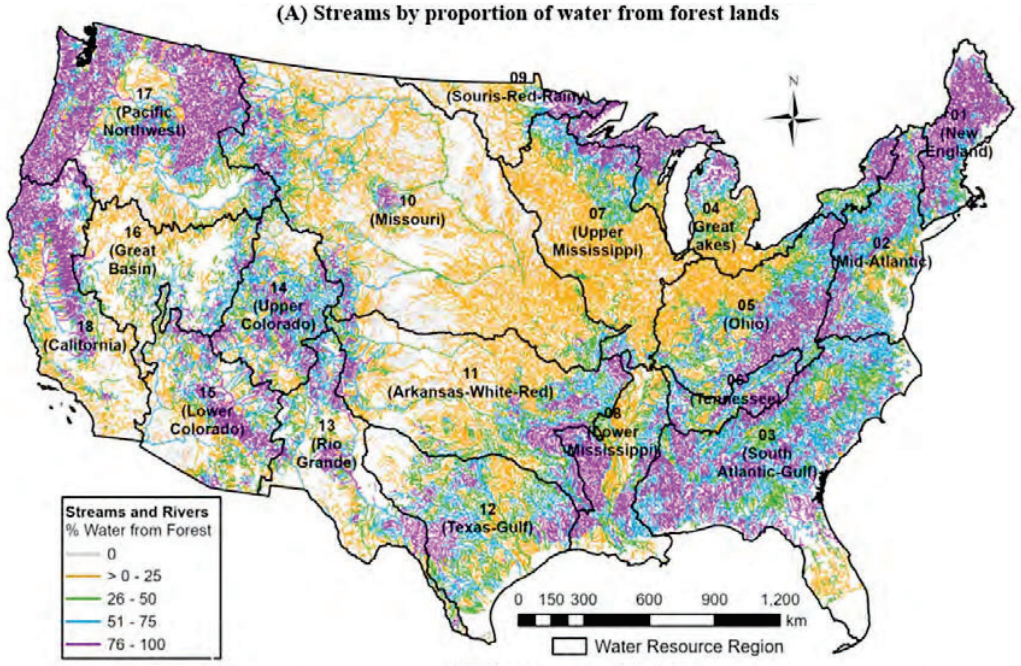
Three regions were defined based on the 18 water resource regions (WRR) in CONUS (U.S. Geological Survey and U.S. Department of Agriculture Natural Resources Conservation Service 2013) for result summaries. The WRR boundaries were used to separate the three regions because this work is watershed-based (figure 1), and the aggregated WRR for each of the regions approximate U.S. EPA Level I ecoregions (McMahon *et al* 2001). The three regions include: *East*, eastern temperate forests—moderate to humid climate with dense and diverse forest cover, including WRR 1 (New England), 2 (Mid-Atlantic), 3 (South Atlantic-Gulf), 4 (Great Lakes), 5 (Ohio), 6 (Tennessee), 7 (Upper Mississippi), 8 (Lower Mississippi); *Central*, great plains—sub-humid to semiarid climate with grasslands and a paucity of forests, including 9 (Souris-Red-Rainy), 10 (Missouri), 11 (Arkansas-White-Red), 12 (Texas-Gulf); *West*, North American deserts, northwestern forested mountains, and mediterranean California, including 13 (Rio Grande), 14 (Upper Colorado), 15 (Lower Colorado), 16 (Great Basin), 17 (Pacific Northwest), 18 (California).

3. Results

3.1. Water supply from forested lands

Forested lands produce disproportionate contributions to the total water supply across the CONUS in comparison with non-forested lands (figure 2). Forested lands comprised 35.7% of the total land area but contributed 50.0% of the total available water supply, similar to the result from Brown *et al* (2008). There are around 30,000 (36%) of HUC12s receiving more than 50% of their total available water from forested lands, with most of them located in the southeast, northeast and northwest (figure 2(A)). By forest ownership type, Family forests comprised the majority of the land area (13.2%) and supplied the most water (18.5%), followed by Federal forests comprising 11.0% of the land area and supplying 14.4% of water (figure 2(B)).

Overall, forested land area and the proportion of water supply that originated on forested lands were closely linked (less than 10% difference in percentage of forest coverage and water supply) in the East, while forested lands contributed a much higher percentage of total water supply than non-forested lands in the West (figure 3). For instance, forested lands accounted for 54% of the total lands in Mid-Atlantic (WRR2) and contributed to 51% of the total water supply, while forested lands accounted for 33% of the total



(B) Forest ownership type

	Federal	State	Local	Family	Corporate	Other private	Tribal	Total
Area (%)	11.0%	3.3%	0.6%	13.2%	5.9%	0.6%	1.1%	**35.7%**
Water supply (%)	14.4%	4.8%	0.9%	18.5%	10.0%	0.9%	0.6%	**50.0%**

Figure 2. Percentage of the total 2001–2010 mean annual water supply in streams that originated on forested lands (A) and summarized for CONUS by forest ownership type (B).

lands in California region (WRR 18) but contributed to 71% of the total water supply (figure S4). In addition, nonforested lands tended to have a greater runoff coefficient than forested lands in the East, while the opposite result was found in the West (figure S5(B)).

3.2. Population and communities served by water from forested lands

Approximately 150 million people, around half of the total population in the CONUS in 2017, derived some portion (>0.01%) of their surface drinking water supply from forested lands (figure 4(A)). The population was served by water from forests to different extents depending on the size of the communities (as represented by their public drinking water systems) (figure 5(A)) and their proximity to upstream forested lands. Approximately 60 million people received >50% of their water supply from forested lands. Of the 23,983 surface drinking water intakes in 6,237 communities in the study area, 21,371 intakes (89.1%) received some portion of their source water from forested lands, with 9,177 intakes in 3,595 communities receiving >50% of their source water from forested lands. Public forests (primarily Federally owned) were the main water source in the West (figure 5(B)), while private forest lands dominated the water supply in the East (figure 5(C)). For instance, 13 of 34 intakes of City of Sacramento, CA in the West obtains more than 85% of their water supply from public forest lands and serves 175,000 people, whereas the City of Austin Water and Wastewater Utility in Texas obtains more than 50% of their water supply from private forest lands, serving 973,000 people.

By forest ownership, Family-owned forests provide some portion of the surface drining water supply to the largest number of people (~125 million) in the CONUS, followed by State and Corporate forests (~100 million people) (figure 4(B)). More than 52 million people received more than 20% of the total water supply from Family-owned forests, while 22 million people received more than 20% of the total water supply from Federal forests. For people receiving >50% of their water supply from a forest ownership lands, Federal forests served many more people (~9.4 million) than other forested lands. Overall, most of the population served by Tribal, State, Local, Other Private, and Corporate forests derived less than 20% of their total water from these forested lands (figure 4(B)).

Regionally, forested lands served the largest population (27.1 million) in the Mid-Atlantic (WRR 2), with half of them receiving the majority (>50%) of their surface drinking water supply from forested lands. Similar results were also found across the entire eastern U.S. The exception to this was the Tennessee

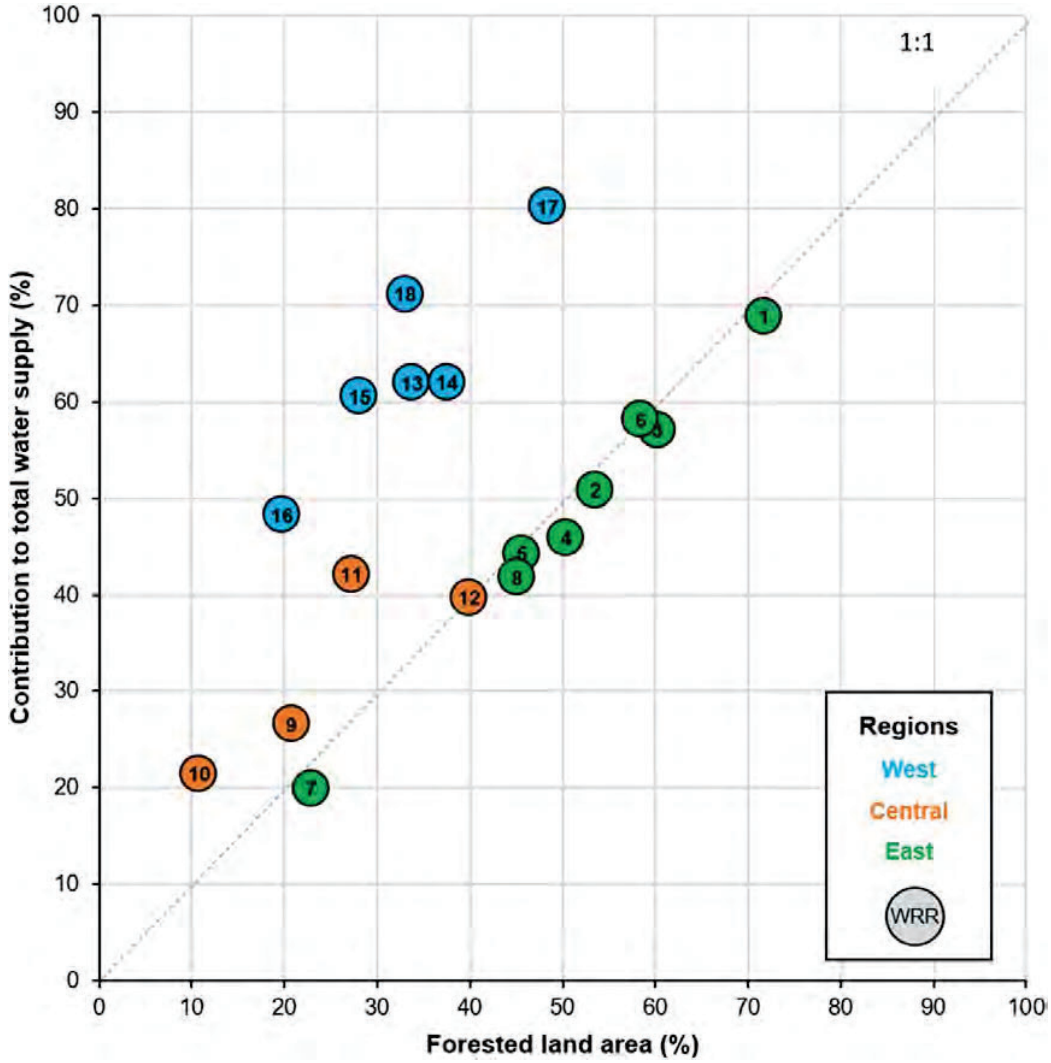


Figure 3. The contributions of forested lands to the total water supply by the 18 water resource regions (WRR) color coded by three large regions (see figure 1 insert). Descriptions of water resource region and characteristics of the three large geographic regions are in the Method section.

region (WRR 6) where a majority of people receive more than 60% of their water supply from forested lands. For the semi-arid Central region, only a small proportion of the population receives more than half of their water from forested lands due to the low forest coverage in the region (figure S6). In West U.S. Region, forested lands are the dominant source in Upper Colorado, Great Basin and Pacific Northwest regions (WRR 14, 16 and 17), however, it is not the same case for Rio Grande, Lower Colorado and California regions (WRR 13, 15 and 18). For example, 4.0 of 5.5 million people receive the majority of their surface water supply from forested lands in the Pacific Northwest region (WRR 17), whereas only 2.4 of 22.5 million people receive the majority of their surface water supply from forested lands in the California region (WRR 18) (figure S7). Some surface drinking water intakes serve large populations and receive >20% of their water supply from forested lands, including Washington, DC and Baltimore, MD; Philadelphia, PA; Minneapolis, MN; Denver, CO; New York, NY; Birmingham, AL; Atlanta, GA; Natchitoches, LA; Charlotte and Raleigh, NC; Greenville, SC; Nashville, TN; Richmond, VA; and Austin, TX.

3.3. Population potentially threatened by forest loss

We found that 66,338 km^2 (3.7%) forested lands could be converted to urban development in the CONUS from 2010 to 2050 (figure 6(A)). Most of the projected forest loss was in the Eastern states, such as GA, NC, SC, AL and MS (figure 6(A)). There would be around 5,600 surface drinking intakes in 2,105 communities downstream of these areas of forest loss, serving around 50 million people

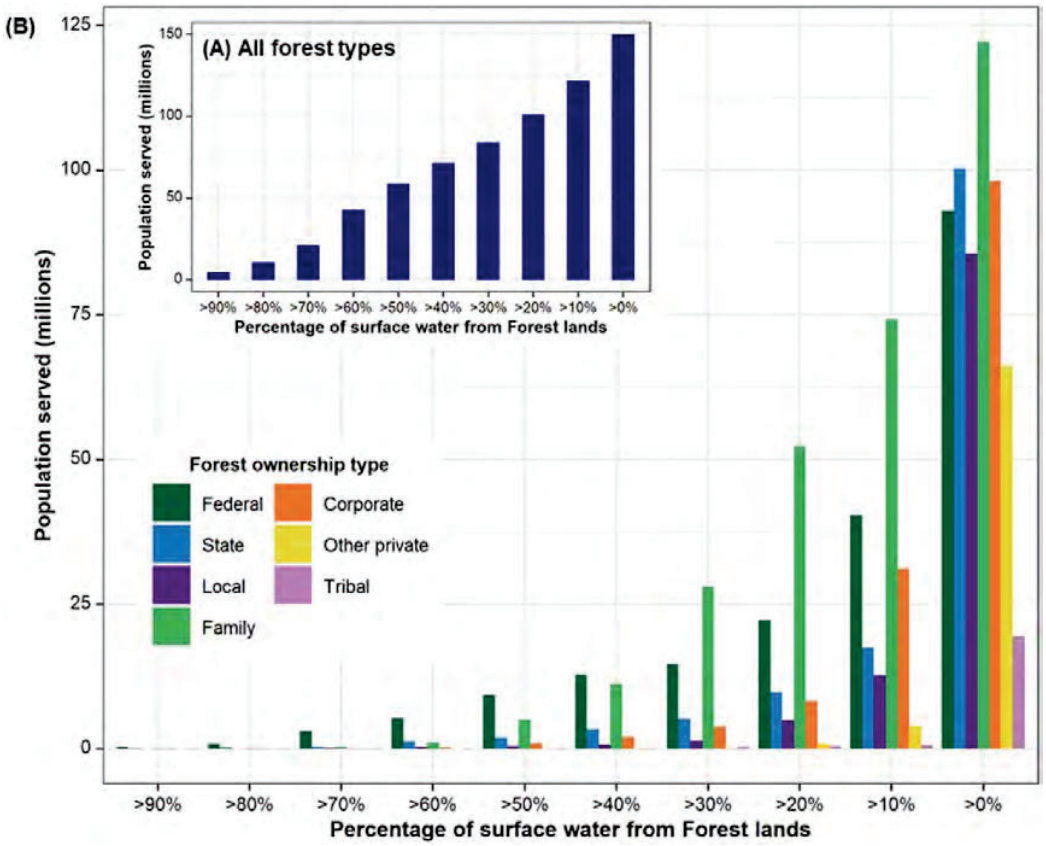


Figure 4. Cumulative frequency of population served according to percentage of water coming from forested lands (A) and from different forest ownership types (B).

(figure 6(B)). Of the 5,600 surface drinking water intakes potentially affected by forest loss, 839 intakes (15%) showed more than 5% forest loss in their upstream area, serving 7.4 million people in total. Private forests in the East would be the most vulnerable to the development, with nearly 1 million people potentially affected by more than 10% forests loss (figures 6(A) and (B)).

4. Discussion

4.1. Forests serve as 'water towers'

The term 'water tower' is widely used for expressing the importance of upstream watersheds for providing freshwater for populations downstream; an estimated 1.9 billion people are supported by water towers globally (Immerzeel *et al* 2020). As there is a strong connection between climate and forests, forested lands serve as the 'water towers' for high quality water supply. Although the proportions of surface water supply originating from forested lands varied across CONUS, our study clearly shows that because over half of the population of CONUS benefits from surface drinking water supply from forests, these forests serve as 'water towers' and are critical for national water supply. Of the 6,237 communities in the study area, 3,595 communities (57.6%) receiving >50% of their source water from forested lands. For people receiving >50% of their water supply from forested lands, Federal forests serve many more people (∼9.4 million) in the West, followed by Family forest (∼5 million) in the East. Public forests (primarily Federally owned) were the main water source in the West (figure 5(B)), while private forest lands dominated the water supply in the East (figure 5(C)).

The considerable difference in the relative contribution of different forest ownerships and regions to water supply reflected the abundance and spatial distribution of forests in relation to the spatial patterns of precipitation. Forested lands in the West tend to have much higher annual precipitation (972 ± 678 mm yr^{-1}) than nonforested lands (358 ± 275 mm yr^{-1}). In addition, the runoff coefficient was much higher in forested lands than in nonforested lands, especially in the Pacific Northwest (WRR 17) and California (WRR 18) regions (figure S5(B)). In the East, the contribution of forest to water supply closely reflected forest area (figure 3) because precipitation was similar across different land cover types and most of this region is not water-limited (Renner and Bernhofer 2012). For nonforest and forest that had the same amount of precipitation in the East, nonforested lands tended to have

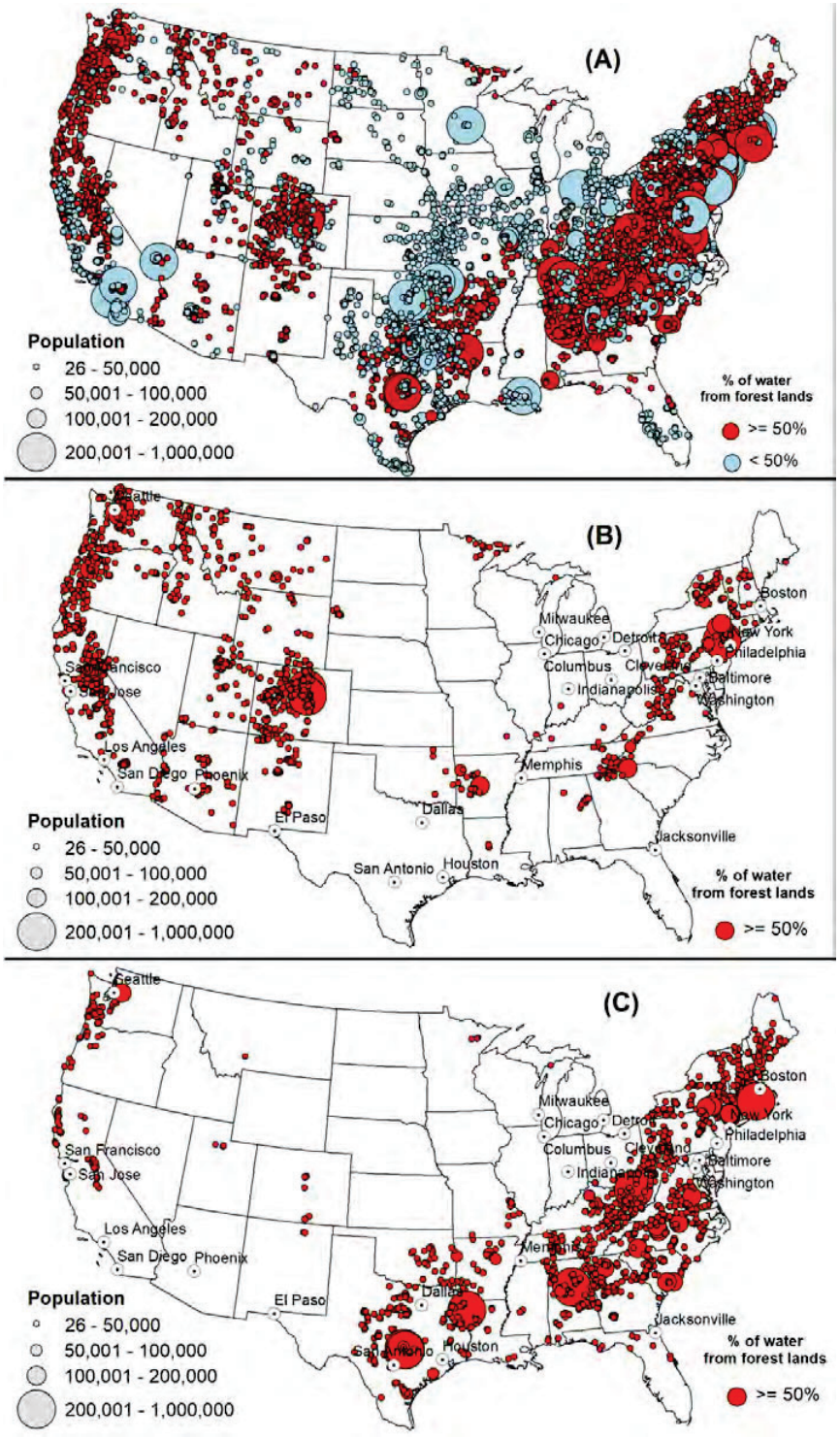


Figure 5. Surface drinking water intakes within percentage of surface water available from all forested lands (A), public forest lands (B) and private forest lands (C) at intake (symbol color) and population served by each intake (symbol size).

a significantly ($p < 0.05$) greater water yield than forested lands, which led to higher respective percentage of water supply than their percentage of total land, reflecting the lower ET and runoff coefficients associated with nonforested lands relative to forests (figure S5). However, the higher water yield and runoff coefficients associated with forest disturbance (converting forest to urban or agriculture) comes at the expense of water quality (McDonald *et al* 2016, McGrane 2016, Murphy 2020). New York City, for example, benefits greatly from receiving most of its unfiltered raw water from the Catskill/Delaware

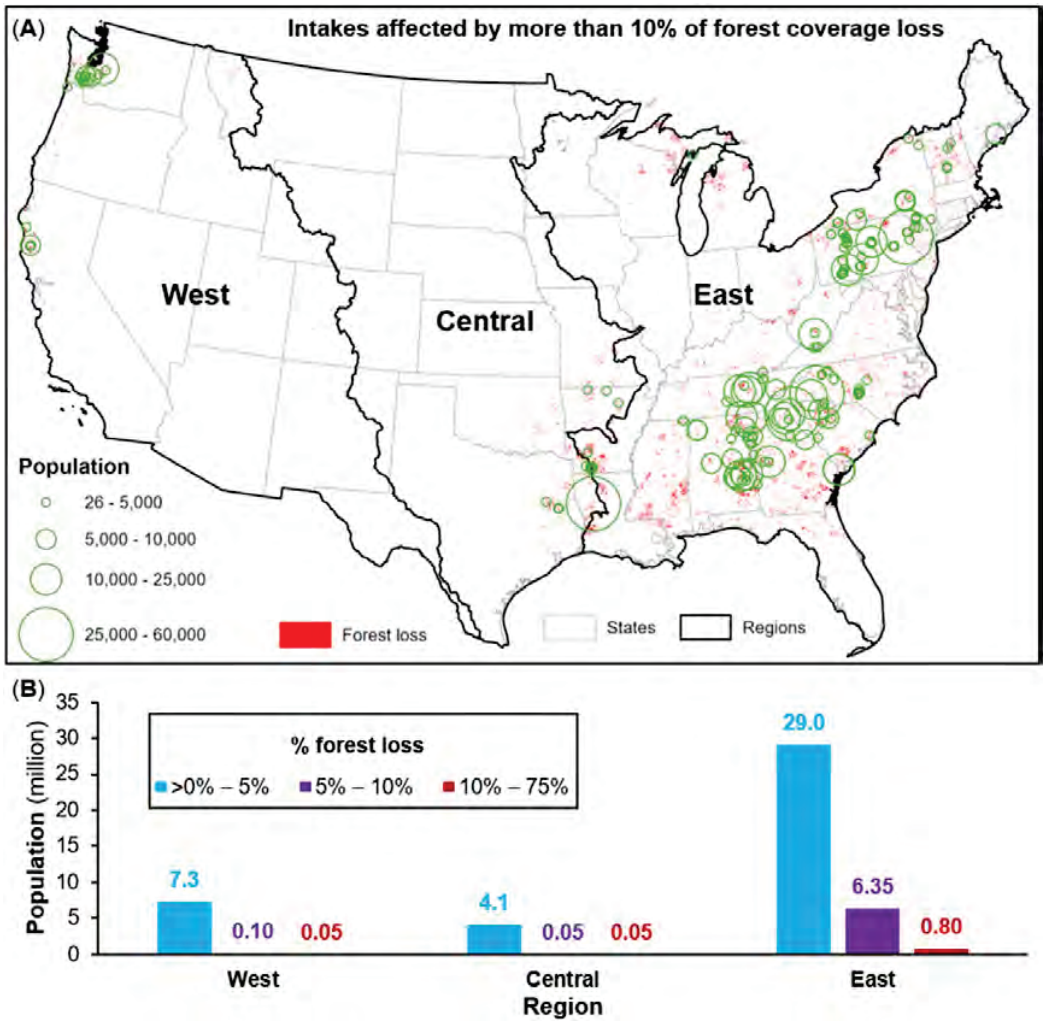


Figure 6. Predicted forest loss by 2050 upstream of surface drinking water intakes and population served by each intake (symbol size) (A), and total population affected by the predicted forest loss for each region (B). Labels above the bar are total population for each category.

watershed, enabling the city to avoid water treatment costs associated with water supplies generated on nonforested lands (Mehaffey *et al* 2005, NYCDEP 2017).

4.2. Implications for forest management

Previous studies suggest that forests reduce raw water treatment costs (Abildtrup *et al* 2013, Warziniack *et al* 2017, Lopes *et al* 2019). However these forest-based ecosystem services are increasingly threatened by land use change as well as climate change impacts (Hoegh-Guldberg *et al* 2018). With continued climate change, larger deficits between water supply and demand will likely occur in forests across several regions in the U.S. (Naumann *et al* 2018, Brown *et al* 2019). The increase in population and urbanization in some parts of the country will increase demand for clean water while putting more emphasis on keeping existing forested lands from development (Brown *et al* 2019). By 2050, we project that the water supply for around 50 million people could be affected by forests loss in the CONUS (figure 6(B)). Forest conversion to urban use in some areas might relieve water stress conditions locally by increasing water yield (Suttles *et al* 2018); however, dispersed development on private forest lands might degrade water quality through increased sediment delivery (McGrane 2016). Therefore, protecting existing forests from fragmentation and addressing other environmental threats becomes even more critical for surface water supplies that depends on privately owned forests (figure 5(C)).

Forest management differs across forest ownership types. For more than a century, U.S. federal legislation has emphasized the importance of protecting forests and water resources through a series of Acts; The Weeks Act of 1911, Clarke-McNary Act of 1924, and Bankhead-Jones Act of 1937 all had water-related objectives and were based on the original purposes outlined in the Organic Administration Act of 1897—securing favorable conditions of flow. As the primary

forest management agency in the U.S., the U.S. Department of Agriculture (USDA) Forest Service upholds this legislation and is dedicated to the future improvement of water resources through restoration and enhancement of public forests and through partnerships with state government forest management agencies. Similarly, state and local governments and forest management agencies have their own management plans for government-owned forests, and provide technical assistance to private forest landowners to maximize benefit to landowners while protecting water resources. For example, the New York City water supply system reliably delivers more than 1.1 billion gallons of high-quality raw water daily to nearly nine million city and rural residents by applying long-term watershed protection programs on non-industrial private forest lands (Brunette and Germain 2003). Similarly, the City of Seattle obtained the ownership of Tolt River Watershed to protect 30% of its drinking water supplied to 1.4 million people in and around Seattle (Seattle Public Utilities 2011). Although corporate forested lands are generally managed with a profit motive, many forest industry companies tend to be environmentally sensitive and most planning considers multiple objectives (Tew *et al* 2015).

The biggest challenge is the management of Family-owned forests, which is owned by about 11 million private forest owners and represents 49% of all forest land in the eastern US (37% across CONUS). These owners have a variety of management objectives, and nearly three-quarters of those Family-owned forests are less than 20 acres in size (Oswalt *et al* 2014). As privately-owned forests become increasingly fragmented due to land use change, forest management options become more limited and the economic viability of forest ownership declines. For example, smaller forested tracts can be impractical and more costly to apply prescribed fire while few loggers will find it profitable to harvest small and/or disconnected parcels. As a result, private forest landowners are less able to sustain a profit through forest management while they are increasingly bearing the financial burden (e.g. property taxes) for the critical ecosystem services their forests provide. Conservation easements (i.e. land sold or donated to a government agency or conservation organization) provide financial support for private forest landowners to keep their forest land but may limit their use of the land and management options. Alternatively, providing economic returns for ecosystem services provisioned by privately-owned forest land could allow them to keep their forest in forest land use or apply best management practices to achieve their management objectives while maintaining water quality. For example, Payment for Ecosystem Service schemes can be implemented to forest landowners in headwater watersheds to compensate them for the downstream benefits of keeping their forested land in forest for water supply (McDonald *et al* 2016).

Water supply provisioning is not the only ecosystem service that forests provide (see Brockerhoff *et al* 2017), and forests can be effectively managed to balance multiple ecosystem service objectives. While it was beyond the scope of this study to examine potential tradeoffs among water supply and other management objectives, there is sufficient literature to suggest that working forests can be managed in ways that minimize impacts on water resources (e.g. Vose *et al* 2016). For example, forest harvesting Best Management Practices have allowed forests to be actively managed for timber production while protecting water quality (Cristan *et al* 2016). Similarly, forest thinning, understory vegetation control, and fuel load management through the use of prescribed fire has been shown to minimize wildfire risk while having a negligible effect on water quality (Ryan *et al* 2013).

4.3. Limitations and opportunities for future studies

This assessment is limited to surface water supply from forests. Over 37 million people in the contiguous U.S. get their drinking water from public and private groundwater wells (Johnson *et al* 2019). Groundwater systems may get recharged by surface water in forested lands; therefore, our study might underestimate the contribution of forested lands on water supply. In addition, this study assumed that the total population served by each water supply system was divided equally among the intakes in that system, but intakes in the same system receiving more water from forested lands could serve much more population than other intakes (NYCDEP 2017). Forests not only affect surface water quality but also affect groundwater quantity and quality (Lopes *et al* 2019). Thus, our estimates on the population who benefits from forests for drinking water were conservative.

Because detailed inter-basin transfers (IBTs) were not accounted for in this study. We assumed that water originating from the forested lands followed the natural flow network. However, IBTs remain a significant factor that affects the contribution of water from forested land to people living in the western U.S. Many cities such as Denver and Los Angeles draw much of their water supply from the Colorado River via IBTs to meet rising water demand as a result of their population increase (Richter *et al* 2020). Thus, the number of people and the proportion of population receiving their water supply from forested lands in the western regions are likely much higher than we report here (figures 5–6).

5. Conclusions

Our modeling analysis demonstrates that forests and water supply are tightly connected in the U.S. Although forested lands make up only 36% of total

land area, they produce half of the total surface water yield. Over half of the U.S. population benefits from forests for drinking water supply. Family forest lands are the largest contributors to water supply among all forest ownerships in terms of water volume and population served. However, currently water supply is generally not a primary goal of private forest management. Therefore, more support for forest management activities that consider forest water-related ecosystem services as high a priority should be provided to private forest owners. Our study provides benchmark data for water supply from different forest ownership types and highlights the water-related benefits of forested lands to about 150 million people in the lower 48 states. Future forest loss potentially affect the water supplies for around 50 million people (mostly in the East) vulnerable to water quality degradation.

Data availability statement

The data that support the findings of this study are available upon reasonable request from the authors.

Acknowledgments

This study was supported by the U.S. Department of Agriculture (USDA) Forest Service, Southern Research Station and the Southern Group of State Foresters (SGSF) by agreement number 18-JV-11330140-007 to Dr Stacy Nelson at North Carolina State University, and USDA Forest Service, Washington Office, Water and Aquatic Resources by agreement number 17-CS-11330140-028 to Dr Paul Bolstad at the University of Minnesota. We also want to thank Drs C Rhett Jackson, Georgina Sanchez, James Vose, Matthew J Cohen, Brian Richter, and two anonymous reviewers for helpful comments on this manuscript.

ORCID iDs

Ning Liu https://orcid.org/0000-0003-0956-3208
Stacy A C Nelson https://orcid.org/0000-0003-4681-7270
Ge Sun https://orcid.org/0000-0002-0159-1370

References

Abildtrup J, Garcia S and Stenger A 2013 The effect of forest land use on the cost of drinking water supply: a spatial econometric analysis *Ecol. Econ.* **92** 126–36

Andréassian V 2004 Waters and forests: from historical controversy to scientific debate *J. Hydrol.* **291** 1–27

Brockerhoff E G *et al* 2017 Forest biodiversity, ecosystem functioning and the provision of ecosystem services *Biodivers. Conserv.* **26** 3005–35

Brown T C, Froemke P, Mahat W and Ramirez J A 2016 *Mean Annual Renewable Water Supply of the Contiguous United States* 55 (available at: www.fs.fed.us/rmrs/documents-and-media/really-mean-annual-renewable-water-supply-contiguous-united-states)

Brown T C, Hobbins M T and Ramirez J A 2008 Spatial distribution of water supply in the coterminous United States 1 JAWRA *J. Am. Water Resour. Assoc.* **44** 1474–87

Brown T C, Mahat V and Ramirez J A 2019 Adaptation to future water shortages in the United States caused by population growth and climate change *Earth's Futur.* **7** 219–34

Brunette V and Germain R H 2003 *Forest management in the New York City Watershed. XII World Forest Congress* (http://www.fao.org/3/xii/0649-b3.htm)

Buytaert W, Iñiguez V, Celleri R, De Biévre B, Wyseure G and Deckers J 2006 Analysis of the water balance of small Páramo catchments in south Ecuador *Environmental Role of Wetlands in Headwaters* (Berlin: Springer) pp 271–81

Caldwell M C, Miniat C F, Cohen E, Krieger S, Sun G, McNulty S and Bolstad P V 2014 Quantifying the role of National Forest System lands in providing surface drinking water supply for the Southern United States Gen. Tech. Rep. SRS-197 Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station (https://doi.org/10.2737/SRS-GTR-197)

Cristan R, Aust W M, Bolding M C, Barrett S M, Munsell J F and Schilling E 2016 Effectiveness of forestry best management practices in the United States: literature review *For. Ecol. Manage.* **360** 133–51

D'Annunzio R, Sandker M, Finegold Y and Min Z 2015 Projecting global forest area towards 2030 *For. Ecol. Manage.* **352** 124–33

Dudley R W, Hirsch R M, Archfield S A, Blum A G and Renard B 2020 Low streamflow trends at human-impacted and reference basins in the United States *J. Hydrol.* **580** 124254

Ellison D *et al* 2017 Trees, forests and water: cool insights for a hot world *Glob. Environ. Change* **43** 51–61

Ellison D, Futter M N and Bishop K 2012 On the forest cover-water yield debate: from demand- to supply-side thinking *Glob. Change Biol.* **18** 806–20

Farley K A, Jobbágy E G and Jackson R B 2005 Effects of afforestation on water yield: a global synthesis with implications for policy *Glob. Change Biol.* **11** 1565–76

Filoso S, Bezerra M O, Weiss K C B and Palmer M A 2017 Impacts of forest restoration on water yield: a systematic review *PLoS One* **12** e0183210

Giri S and Qiu Z 2016 Understanding the relationship of land uses and water quality in twenty first century: a review *J. Environ. Manage.* **173** 41–48

Hewes J H, Butler B J and Liknes G C 2017 *Forest ownership in the conterminous United States circa 2014: distribution of seven ownership types - geospatial dataset. Forest Service Research Data Archive.* (https://www.fs.usda.gov/rds/archive/catalog/RDS-2017-0007)

Hoegh-Guldberg O, Jacob D, Taylor M, Bindi S, Brown I, Camilloni A, Diedhiou R and Djalante K L 2018 Impacts of 1.5 °C global warming on natural and human systems *Global Warming of 1.5 °C. An IPCC Special Report Glob. Warm. 1.5 °C. An IPCC Spec. Rep. impacts Glob. Warm. 1.5 °C above pre-industrial levels Relat. Glob. Greenh. gas Emiss. pathways, Context Strength. Glob. response to Threat Clim. Change* pp 175–311 (www.ipcc.ch/sr15)

Homer C *et al* 2020 Conterminous United States land cover change patterns 2001–2016 from the 2016 National Land Cover Database ISPRS *J. Photogramm. Remote Sens.* **162** 184–99

Immerzeel W W *et al* 2020 Importance and vulnerability of the world's water towers *Nature* **577** 364–9

Johnson T D, Belitz K and Lombard M A 2019 Estimating domestic well locations and populations served in the contiguous U.S. for years 2000 and 2010 *Sci. Total Environ.* **687** 1261–73

Li C, Sun G, Caldwell P V, Cohen E, Fang Y, Zhang Y, Oudin L, Sanchez G M and Meentemeyer R K 2020 Impacts of urbanization on watershed water balances across the conterminous United States *Water Resour. Res.* **56** e2019WR026574

Lopes A F, Macdonald J L, Quinteiro P, Arroja L, Carvalho-Santos C, Cunha-e-sá M A and Dias A C 2019 Surface vs. groundwater: the effect of forest cover on the costs of drinking water *Water Resour. Econ.* **28** 100123

Mapulanga A M and Naito H 2019 Effect of deforestation on access to clean drinking water *Proc. Natl Acad. Sci.* **116** 8249–54

Martinuzzi S, Januchowski-Hartley S R, Pracheil B M, McIntyre P B, Plantinga A J, Lewis D J and Radeloff V C 2014 Threats and opportunities for freshwater conservation under future land use change scenarios in the United States *Glob. Change Biol.* **20** 113–24

McDonald R I, Weber K F, Padowskic J, Boucher T and Shemie D 2016 Estimating watershed degradation over the last century and its impact on water-treatment costs for the world's large cities *Proc. Natl Acad. Sci. USA* **113** 9117–22

McGrane S J 2016 Impacts of urbanisation on hydrological and water quality dynamics, and urban water management: a review *Hydrol. Sci. J.* **61** 2295–311

McMahon G, Gregonis S M, Waltman S W, Omernik J M, Thorson T D, Freeouf J A, Rorick A H and Keys J E 2001 Developing a spatial framework of common ecological regions for the conterminous United States *Environ. Manage.* **28** 293–316

McNulty S, Myers J M, Caldwell P and Sun G 2013 Climate change summary vol 178 (available at: www.forestthreats.org/products/publications/gtr_srs178_027.pdf)

Mehaffey M H, Nash M S, Wade T G, Ebert D W, Jones K B and Rager A 2005 Linking land cover and water quality in New York City'S water supply watersheds *Environ. Monit. Assess.* **107** 29–44

Moore R D, Spittlehouse D L and Story A 2005 Riparian microclimate and stream temperature response to forest harvesting: a review *J. Am. Water Resour. Assoc.* **41** 813–34

Murphy J C 2020 Changing suspended sediment in United States rivers and streams: linking sediment trends to changes in land use/cover, hydrology and climate *Hydrol. Earth Syst. Sci.* **24** 991–1010

Naumann G, Alfieri L, Wyser K, Mentaschi L, Betts R A, Carrao H, Spinoni J, Vogt J and Feyen L 2018 Global changes in drought conditions under different levels of warming *Geophys. Res. Lett.* **45** 3285–96

NYCDEP 2017 *New York city 2017 drinking water supply and quality report* (https://www1.nyc.gov/assets/nyw/downloads/pdf/nyw-2017-dep-water-report.pdf)

Oswalt S, Thompson M and Smith W B 2014 U.S. Forest resource facts and historical trends *USDA For. Serv. FS-801* 60 (available at: www.fia.fs.fed.us/library/brochures/docs/2012/ForestFacts_1952-2012_English.pdf)

Radeloff V C, Hammer R B, Stewart S I, Fried J S, Holcomb S S and McKeefry J F 2005 The wildland-urban interface in the United States *Ecol. Appl.* 15 799–805

Renner M and Bernhofer C 2012 Applying simple water-energy balance frameworks to predict the climate sensitivity of streamflow over the continental United States *Hydrol. Earth Syst. Sci.* **16** 2531–46

Richter B D *et al* 2020 Water scarcity and fish imperilment driven by beef production *Nat. Sustain.* **3** 319–28

Ryan K C, Knapp E E and Varner J M 2013 Prescribed fire in North American forests and woodlands: history, current practice, and challenges *Front. Ecol. Environ.* **11** e15–e24

Seattle Public Utilities 2011 *South Fork Tolt Watershed Management Plan* (https://www.seattle.gov/Documents/Departments/SPU/EnvironmentConservation/SouthForkToltMunicipalWatershedManagementPlan.pdf)

Shi P, Zhang Y, Li Z, Li P and Xu G 2017 Influence of land use and land cover patterns on seasonal water quality at multi-spatial scales *Catena* **151** 182–90

Sun C P *et al* 2011 Upscaling key ecosystem functions across the conterminous United States by a water-centric ecosystem model *J. Geophys. Res.* **116** 1–16

Sun G, McLaughlin S B, Porter J H, Uddling J, Mulholland P J, Adams M B and Pederson N 2012 Interactive influences of ozone and climate on streamflow of forested watersheds *Glob. Change Biol.* **18** 3395–409

Suttles K M, Singh N K, Vose J M, Martin K L, Emanuel R E, Coulston J W, Saia S M and Crump M T 2018 Assessment of hydrologic vulnerability to urbanization and climate change in a rapidly changing watershed in the Southeast U.S *Sci. Total Environ.* **645** 806–16

Tew R D, Strake T J and Cushing T L 2015 Forest resource management planning: who prepares forest management plans and how do they differ by ownership type? 2007 6 (available at: www.clemson.edu/extension/natural_resources/forestry/publications/fnr_109.pdf)

Theobald D M 2005 Landscape patterns of exurban growth in the USA from 1980 to 2020 *Ecol. Soc.* 10 32

Tu J 2013 Spatial variations in the relationships between land use and water quality across an urbanization gradient in the watersheds of northern Georgia, USA *Environ. Manage.* **51** 1–17

U.S. EPA 2017 *United States Environmental Protection Agency: Safe Drinking Water Information System* (https://www.epa.gov/ground-water-and-drinking-water/safe-drinking-water-information-system-sdwis-federal-reporting)

U.S. EPA 2020 Integrated Climate and Land-Use Scenarios (ICLUS version 2.1) for the Fourth National Climate Assessment (www.epa.gov/gcx/about-gcx-iclus-tool)

U.S. Geological Survey and U.S. Department of Agriculture Natural Resources Conservation Service 2013 *Federal Standards and Procedures for the National Watershed Boundary Dataset (WBD)* (Reston, VA) (available at: http://pubs.usgs.gov/tm/11/a3/)

Vose J M, Martin K L and Barten P K 2016 Applications of forest hydrological science to watershed management in the 21st century *Forest Hydrology: Processes, Management and Assessment* (Wallingford: CABI) pp 240–53 (available at: www.cabi.org/cabebooks/ebook/20163299411)

Warziniack T, Sham C H, Morgan R and Feferholtz Y 2017 Effect of forest cover on water treatment costs *Water Econ. Policy* **3** 1750006

Zhang M and Wei X 2021 Deforestation, forestation, and water supply *Science* **371** 990–1

News Release

EMBARGOED UNTIL RELEASE AT 1:00 p.m. EST, Friday, November 17, 2023 BEA 23–54

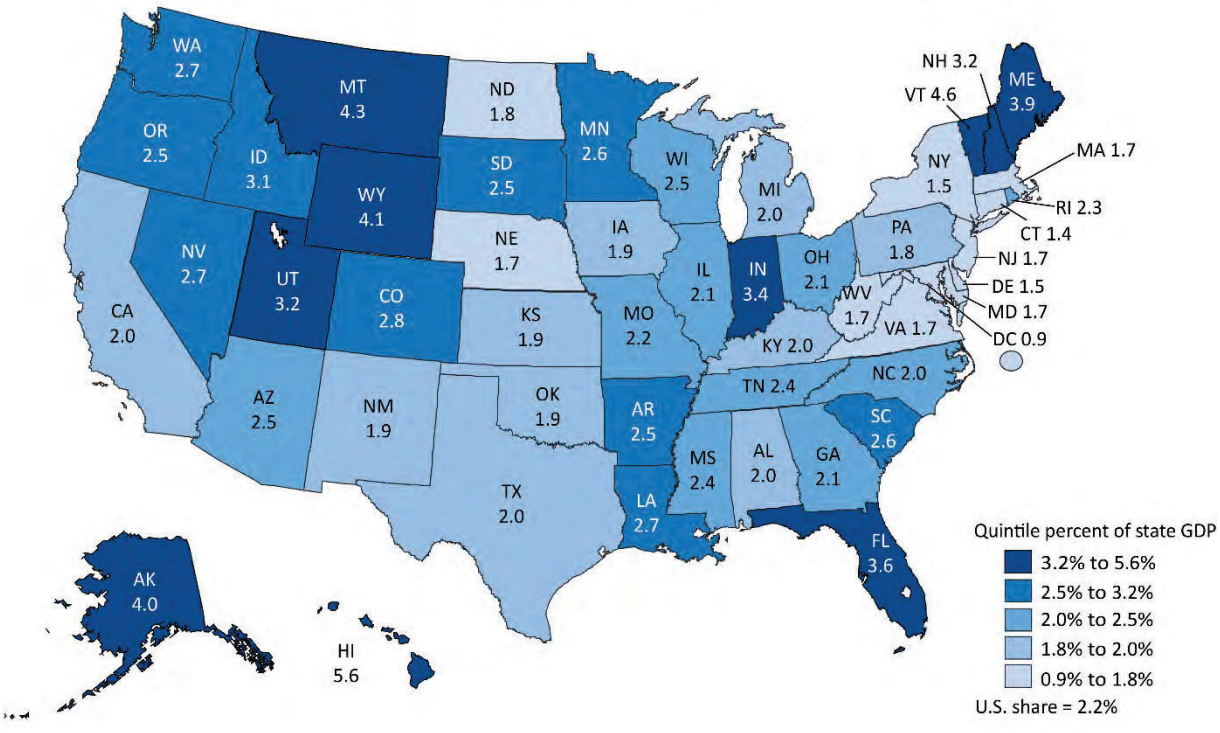
Technical:	Stanislaw Rzeznik (Regional)	301-278-9458	OutdoorRecreation@bea.gov
	Connor Franks (National)	301-278-9710	
Media:	Connie O'Connell	301-278-9003	Connie.OConnell@bea.gov

Outdoor Recreation Satellite Account, U.S. and States, 2022

New Statistics for 2022; Updates for 2017–2021

The U.S. Bureau of Economic Analysis (BEA) released statistics today measuring the outdoor recreation economy for the nation, all 50 states, and the District of Columbia. The new U.S. data show that the value added of the outdoor recreation economy accounted for 2.2 percent ($563.7 billion) of current-dollar gross domestic product (GDP) for the nation in 2022 (national table 1). At the state level, value added for outdoor recreation as a share of state GDP ranged from 5.6 percent in Hawaii to 1.4 percent in Connecticut. The share was 0.9 percent in the District of Columbia (state table 1).

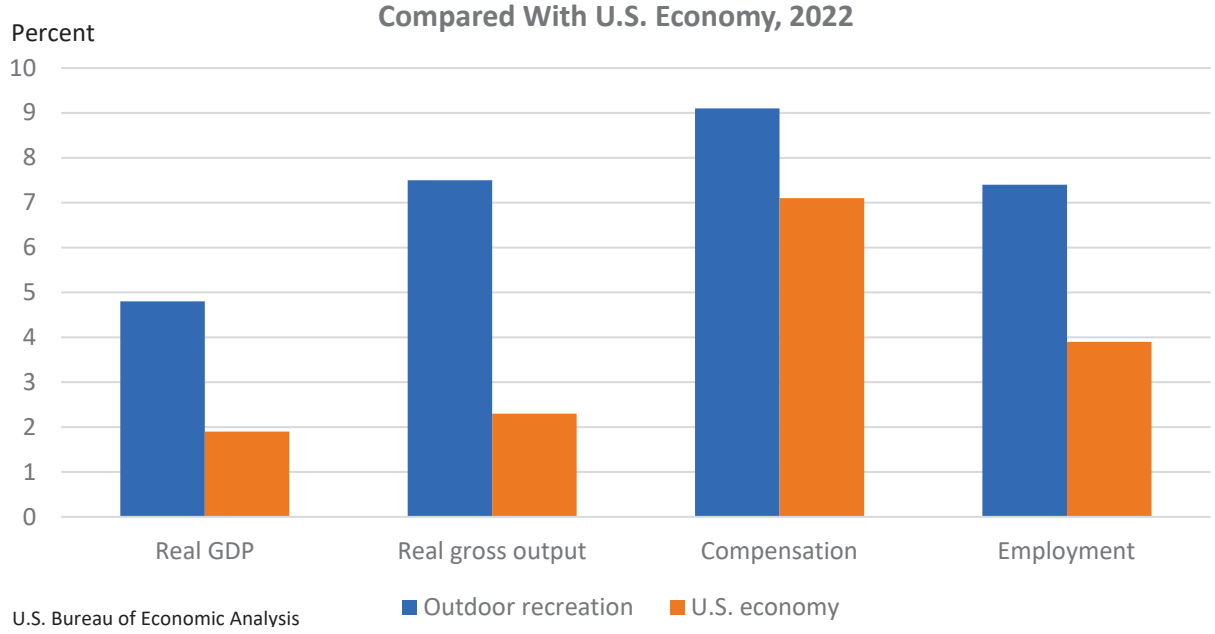
State Outdoor Recreation Value Added as a Percent of State GDP, 2022



U.S. Bureau of Economic Analysis

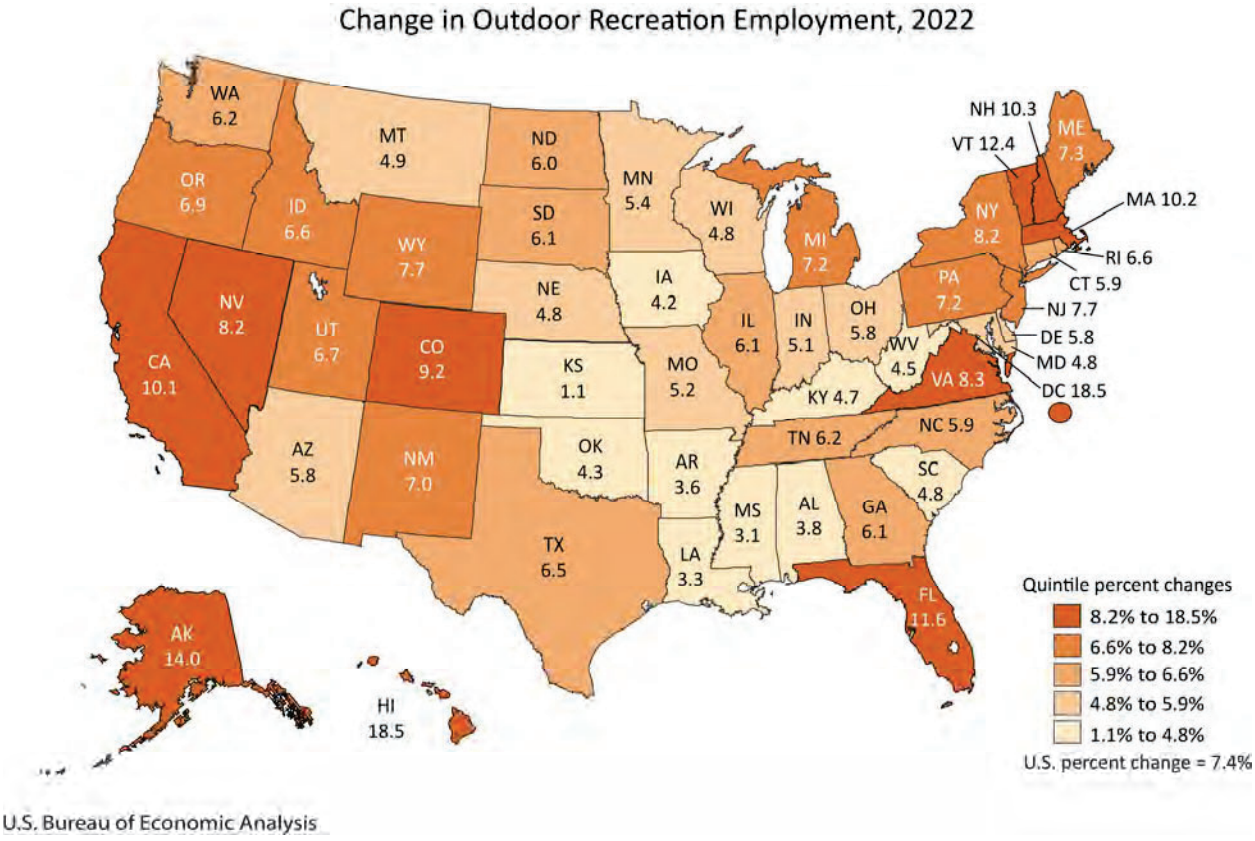
Inflation-adjusted ("real") GDP for the outdoor recreation economy increased 4.8 percent in 2022, compared with a 1.9 percent increase for the overall U.S. economy, reflecting a deceleration from the increase in outdoor recreation of 22.7 percent in 2021. Real gross output for the outdoor recreation economy increased 7.5 percent, while outdoor recreation compensation increased 9.1 percent, and employment increased 7.4 percent (national table 9).

Chart 1. Change in Outdoor Recreation, Compared With U.S. Economy, 2022



U.S. Bureau of Economic Analysis

Across all 50 states and the District of Columbia, outdoor recreation employment increased in 2022, ranging from 18.5 percent in Hawaii to 1.1 percent in Kansas. The percentage change was 18.5 percent in the District of Columbia (BEA interactive tables).

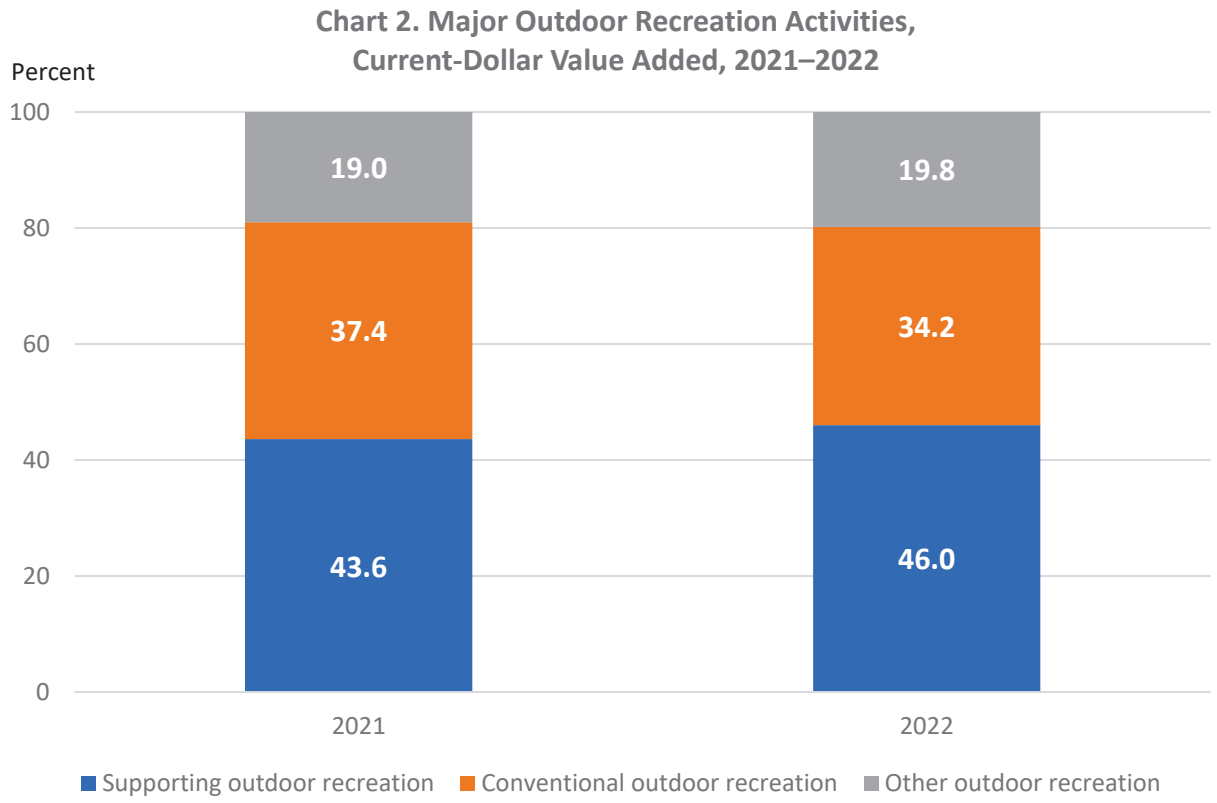


U.S. Bureau of Economic Analysis

Outdoor recreation by activity

Outdoor recreation activities fall into three general categories: (1) conventional activities such as bicycling, boating, hiking, and hunting, (2) other activities such as gardening and outdoor concerts, and (3) supporting activities such as construction, travel and tourism, local trips, and government expenditures.

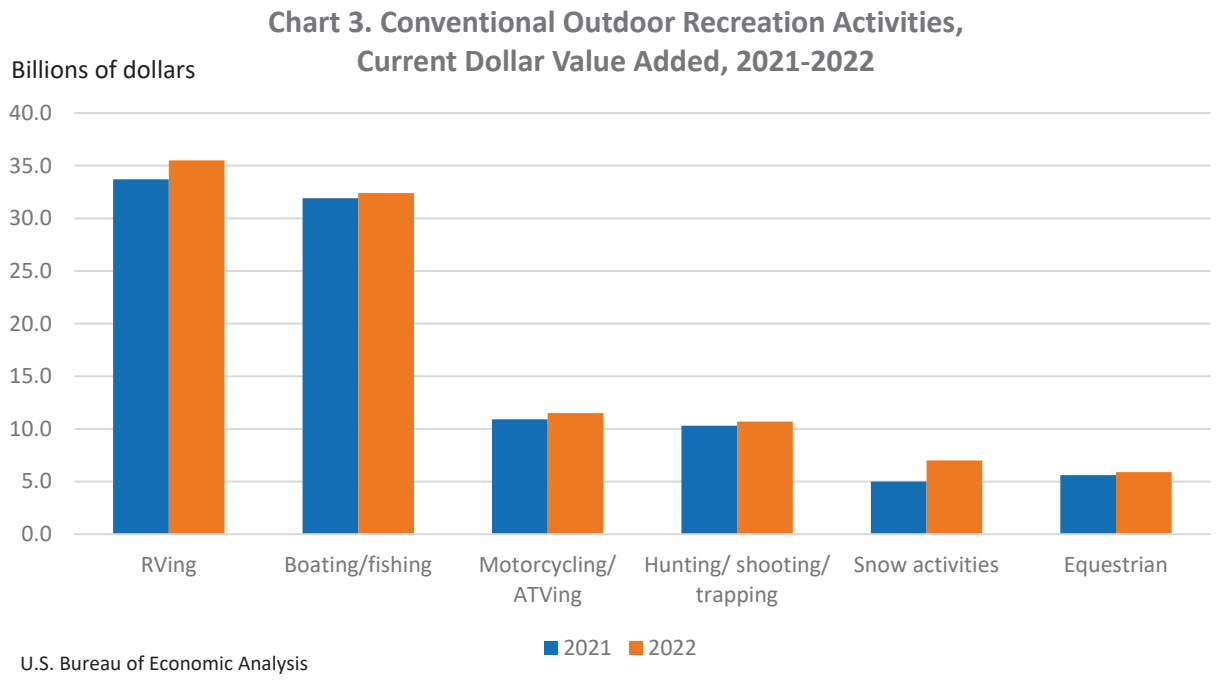
In 2022, conventional outdoor recreation accounted for 34.2 percent of U.S. outdoor recreation value added, compared with 37.4 percent in 2021 (chart 2). Other outdoor recreation accounted for 19.8 percent of value added in 2022, compared with 19.0 percent in 2021. Supporting activities accounted for the remaining 46.0 percent of value added in 2022, compared with 43.6 percent in 2021. Growth in supporting activities was led by travel and tourism, reflecting growth in spending on transportation, hotels, and restaurants (national table 4).



U.S. Bureau of Economic Analysis

Additional highlights for value added by activity for 2022 are as follows (chart 3 and state table 2):

- **RVing** was the largest conventional activity for the nation at $35.5 billion in current-dollar value added and was the largest conventional activity in 22 states. The states with the largest contributions were Indiana ($5.9 billion), Texas ($3.6 billion), and California ($3.4 billion).
- **Boating/fishing** was the second-largest conventional activity for the nation at $32.4 billion in current-dollar value added and was the largest conventional activity in 24 states and the District of Columbia. The states with the largest contributions were Florida ($4.4 billion), California ($2.4 billion), and Texas ($2.1 billion).
- **Motorcycling/ATVing** was the third-largest conventional activity for the nation at $11.5 billion in current-dollar value added and was the largest conventional activity in Wisconsin. The states with the largest contributions were Wisconsin ($1.1 billion), California ($1.0 billion), and Texas ($877.4 million).
- **Snow activities** for the nation was $7.0 billion in current-dollar value added and was the largest conventional activity in three states. The states with the largest contributions were Colorado ($1.4 billion), California ($688.2 million), and Utah ($601.8 million).



Outdoor recreation by industry

The outdoor recreation by industry data show the contributions of industries to the outdoor recreation economy, including their impact on value added, gross output, employment, and compensation.

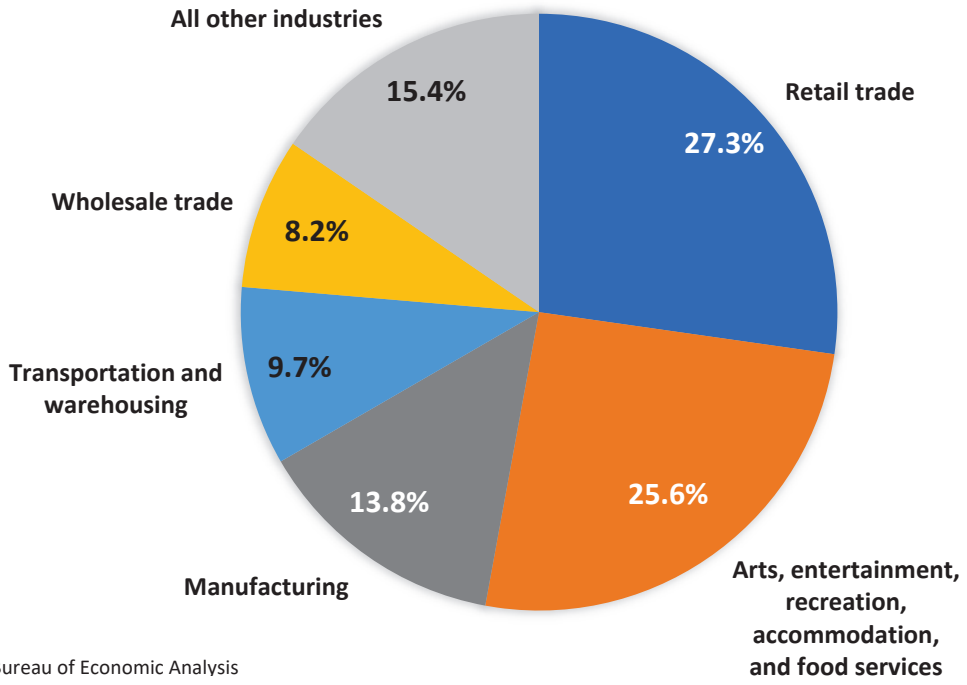
For the nation, the **retail trade** industry group was the largest contributor to U.S. outdoor recreation current-dollar value added in 2022, accounting for $153.6 billion, or 27.3 percent (chart 4). At the state level, retail trade was the largest contributor to outdoor recreation value added in 28 states. The states with the largest contributions were California ($19.1 billion), Texas ($13.4 billion), and Florida ($12.0 billion) (state table 3).

Arts, entertainment, recreation, accommodation, and food services was the second-largest industry group for the nation at $144.5 billion or 25.6 percent of value added and was the largest industry group in 18 states and the District of Columbia. The states with the largest contributions were California ($19.3 billion), Florida ($18.8 billion), and New York ($10.6 billion).

Manufacturing was the third-largest industry group for the nation at $77.6 billion or 13.8 percent of value added and was the largest industry group in two states. The states with the largest contributions were Texas ($10.3 billion), California ($9.8 billion), and Indiana ($9.2 billion).

Chart 4. Industry Share of Outdoor Recreation, Current Dollar Value Added, 2022

Outdoor recreation value added was $563.7B



U.S. Bureau of Economic Analysis

Annual update of outdoor recreation satellite account

At the national level, gross output, value added, employment, and compensation now incorporate the results of the 2023 comprehensive update of the National Economic Accounts, which includes the National Income and Product Accounts and the Industry Economic Accounts, and newly available and revised source data. The state statistics now reflect these updated national data as well as the 2023 comprehensive update of the Regional Economic Accounts and newly available and revised regional source data.

With the 2023 comprehensive update, the reference year for output and price measures changed from 2012 to 2017. Quantity and price indexes are expressed as 2017 equal to 100. Updating the reference year did not affect the percent changes in the price or quantity indexes (or in the chained-dollar estimates) because these changes are measured from chain-type indexes.

Estimates for 2012 to 2016 incorporating the comprehensive update were not prepared for this release and will be included in the 2024 release. Previously published estimates are available on BEA's archive page.

Additional Information

Resources

- Find the latest information on the Outdoor Recreation Satellite Account (ORSA) at BEA's outdoor recreation website.
- Stay informed about BEA developments by reading The BEA Wire, signing up for BEA's email subscription service, or following @BEA_News on X, formerly known as Twitter.
- Historical time series for these estimates can be accessed in BEA's Interactive Data Application.
- Access BEA data by registering for BEA's Data Application Programming Interface.
- For more on BEA's statistics, see our online journal, the *Survey of Current Business*.
- For upcoming economic indicators, see BEA's news release schedule.
- Details on the preparation of BEA's national statistics are in *NIPA Handbook: Concepts and Methods of the U.S. National Income and Product Accounts*.
- For complete information on the sources and methods used to estimate gross domestic product and personal income by state, see BEA's gross domestic product by state and state personal income and employment methodologies.

Definitions

Gross domestic product (GDP) or value added is the value of the goods and services produced by the nation's economy less the value of the goods and services used up in production. GDP is also equal to the sum of personal consumption expenditures, gross private domestic investment, net exports of goods and services, and government consumption expenditures and gross investment.

Gross output is the value of the goods and services produced by the nation's economy. It is principally measured using industry sales or receipts, including sales to final users (GDP) and sales to other industries.

Current-dollar estimates are valued in the prices of the period when the transactions occurred—that is, at "market value." Also referred to as "nominal estimates" or as "current-price estimates."

Chained-dollar estimates are calculated by taking the current-dollar level of a series in the base period and multiplying it by the change in the chained-type quantity index number for the series since the base period. Chained-dollar estimates correctly show growth rates for a series but are not additive in periods other than the base period.

ORSA employment consists of all full-time, part-time, and temporary wage-and-salary jobs in which the workers are engaged in the production of outdoor recreation goods and services. Self-employed individuals are excluded from employment totals.

ORSA compensation consists of the pay to employees (including wages and salaries and benefits such as employer contributions to pension and health funds) in return for their outdoor recreation-related work during a given year. Pay to the self-employed is excluded from compensation but included in value added.

ORSA value added (also referred to as GDP) consists of the value of outdoor recreation goods and services produced less the value of expenses incurred for their production. The activity of self-employed individuals is included in value added.

Geography of outdoor recreation

Outdoor recreation is measured by place of production, not residence of consumer. The value of manufactured goods, such as boats, is assigned to the state where they are produced, even if the goods are not ultimately used there. Services, such as sailing lessons, are assigned to the location where they are consumed. The value of services provided by retailers, such as boat dealers, is also assigned to the location of sale. The services of retailers (known as trade margins) are not measured by sales but are most akin to sales less the cost of goods sold. The production of imported goods is excluded from ORSA, but the value of the services of retailers selling the imported goods is included.

Outdoor recreation spending and production are allocated to states by applying state-level data to detailed, underlying national values. The underlying estimates are distributed to states before aggregation to publication levels to provide the most accurate state values possible. Statistics are primarily based on time-series data generated from the Economic Census and Quarterly Census of Employment and Wages. Additional government and nongovernment data sources are used to supplement the census data and to refine and evaluate the statistics.

National news release tables

Table 1. Real Outdoor Recreation Value Added by Activity
Table 2. Outdoor Recreation Value Added by Activity
Table 3. Outdoor Recreation Value Added by Activity as a Percentage of Gross Domestic Product
Table 4. Outdoor Recreation Value Added by Activity as a Percentage of Total Outdoor Recreation Value Added
Table 5. Real Outdoor Recreation Value Added by Industry
Table 6. Outdoor Recreation Value Added by Industry
Table 7. Real Outdoor Recreation Gross Output by Activity
Table 8. Outdoor Recreation Gross Output by Activity
Table 9. Real Outdoor Recreation Gross Output by Industry
Table 10. Outdoor Recreation Gross Output by Industry

State news release tables

Table 1. Outdoor Recreation Value Added, Employment, and Compensation as a Percent of Total, 2022
Table 2. Value-Added Outdoor Recreation, by State, Selected Activities, 2022
Table 3. Value-Added Outdoor Recreation, by State, Selected Industries, 2022
Table 4. Employment, Outdoor Recreation, by State, Selected Industries, 2022
Table 5. Compensation, Outdoor Recreation, by State, Selected Industries, 2022

Table 1. Real Outdoor Recreation Value Added by Activity

[Millions of chained (2017) dollars]

		2017	2018	2019	2020	2021	2022
1	**Total outdoor recreation**	**452,205**	**464,521**	**468,572**	**365,148**	**448,059**	**469,634**
2	**Total core outdoor recreation**	**235,308**	**238,807**	**238,577**	**217,086**	**247,026**	**255,711**
3	**Conventional outdoor recreation**	**147,048**	**147,519**	**146,834**	**152,344**	**166,065**	**162,585**
4	Bicycling	2,028	1,808	1,975	2,332	2,264	2,069
5	Boating and fishing	24,264	23,865	23,822	31,904	28,180	25,788
6	Canoeing	49	43	51	71	107	77
7	Kayaking	420	417	407	435	506	408
8	Fishing (excludes boating)	5,548	5,626	5,273	5,092	6,025	5,481
9	Sailing	1,219	1,202	1,284	870	1,133	1,240
10	Other boating	17,027	16,582	16,793	25,273	20,398	18,569
11	Climbing, hiking, and tent camping	3,685	3,408	3,467	4,884	4,613	4,873
12	Equestrian	5,108	5,181	5,138	5,565	4,876	4,473
13	Hunting, shooting, and trapping	8,490	8,082	8,015	8,930	9,673	9,667
14	Hunting and trapping	4,484	4,239	4,301	4,704	5,105	5,078
15	Shooting (includes archery)	4,006	3,843	3,716	4,226	4,569	4,588
16	Motorcycling and ATVing	8,174	7,713	7,480	7,904	10,888	10,946
17	Recreational flying	1,691	1,623	1,540	1,307	1,560	2,921
18	RVing	21,452	22,288	20,680	20,491	24,817	23,515
19	Snow activities	4,279	4,309	4,306	3,780	4,316	5,840
20	Skiing	1,670	1,673	1,695	1,142	1,382	1,628
21	Snowboarding	1,474	1,490	1,503	974	1,207	1,426
22	Other snow activities (includes snowmobiling)[1]	1,135	1,146	1,108	1,670	1,734	2,785
23	Other conventional outdoor recreation activities	10,726	11,031	12,109	13,891	14,526	12,278
24	Other conventional air and land activities[2]	6,964	6,996	7,230	7,151	7,890	7,578
25	Other conventional water activities[3]	3,762	4,032	4,863	6,625	6,582	4,810
26	Multi-use apparel and accessories (conventional)[4]	57,151	58,223	58,352	50,416	59,881	60,402
27	**Other outdoor recreation**	**88,261**	**91,272**	**91,716**	**65,743**	**81,658**	**93,658**
28	Amusement parks and water parks	12,961	14,397	14,461	8,462	13,608	15,045
29	Festivals, sporting events, and concerts	16,560	17,215	17,045	9,257	13,372	19,050
30	Field sports	3,398	3,523	3,727	3,481	3,860	4,188
31	Game areas (includes golfing and tennis)	19,440	19,529	19,857	13,940	16,821	19,368
32	Guided tours and outfitted travel	14,602	15,418	15,207	10,336	12,905	15,632
33	Air and land guided tours and outfitted travel	7,263	7,513	7,178	4,602	5,241	6,195
34	Water guided tours and outfitted travel (includes boating and fishing charters)	7,338	7,905	8,027	5,726	7,649	9,420
35	Productive activities (includes gardening)	8,285	8,631	8,676	9,911	9,799	9,257
36	Other outdoor recreation activities[5]	8,575	8,335	8,458	6,561	7,407	8,308
37	Multi-use apparel and accessories (other)[4]	4,441	4,220	4,281	3,987	4,158	4,056
38	**Supporting outdoor recreation**	**216,897**	**225,695**	**229,957**	**147,062**	**200,858**	**213,777**
39	Construction	7,803	8,015	8,195	7,617	6,785	6,334
40	Local trips and travel[6]	39,558	41,874	44,035	27,726	38,628	37,374
41	Trips and travel[7]	148,107	154,069	156,550	91,153	137,572	152,422
42	Food and beverages	24,757	24,563	23,377	11,706	21,446	22,683
43	Lodging	41,503	42,234	42,655	32,410	40,447	44,764
44	Shopping and souvenirs	20,517	20,957	20,900	21,585	22,576	21,877
45	Transportation	61,329	66,363	69,742	24,596	53,270	63,908
46	Government expenditures	21,430	21,740	21,197	19,798	18,751	19,052
47	Federal government	3,221	3,321	2,365	2,078	2,063	1,810
48	State and local government	18,209	18,419	18,841	17,726	16,701	17,234

1. Consists of dog mushing, sleighing, snowmobiling, snow shoeing, snow tubing.

2. Consists of air sports, driving for pleasure, geocaching/orienteering/rock hounding, ice skating, inline skating, land/sand sailing, races, running/walking/jogging, skateboarding, and wildlife watching/birding.

3. Consists of boardsailing/windsurfing, SCUBA diving, snorkeling, stand-up paddling, surfing, tubing, wakeboarding, water skiing, and whitewater rafting.

4. Consists of backpacks, bug spray, coolers, general outdoor clothing, GPS equipment, hydration equipment, lighting, sports racks, sunscreen, watches, and other miscellaneous gear and equipment.

5. Consists of agritourism, augmented reality games, beachgoing, disc golf, hot springs soaking, kite flying, model airplane/rocket/UAV, paintball, photography, stargazing/astronomy, swimming, therapeutic programs, water polo, yard sports.

6. Trip expenses less than 50 miles away from home, including food and beverages, lodging, shopping and souvenirs, and transportation.

7. Travel and tourism expenses in the Outdoor Recreation Satellite Account are consistent with the Travel and Tourism Satellite Account, which includes only expenses for travel at least 50 miles away from home.

U.S. Bureau of Economic Analysis

Table 2. Outdoor Recreation Value Added by Activity

[Millions of current dollars]

		2017	2018	2019	2020	2021	2022
1	**Total outdoor recreation**	**452,205**	**472,641**	**489,315**	**376,848**	**489,751**	**563,705**
2	**Total core outdoor recreation**	**235,308**	**241,386**	**248,875**	**229,097**	**276,441**	**304,334**
3	**Conventional outdoor recreation**	**147,048**	**148,103**	**151,663**	**156,026**	**183,228**	**192,684**
4	Bicycling	2,028	1,844	2,121	2,561	2,712	2,644
5	Boating and fishing	24,264	24,432	25,774	34,566	31,895	32,433
6	Canoeing	49	44	54	78	123	96
7	Kayaking	420	421	433	463	554	499
8	Fishing (excludes boating)	5,548	5,508	5,477	5,177	6,421	6,086
9	Sailing	1,219	1,246	1,393	998	1,324	1,531
10	Other boating	17,027	17,213	18,417	27,850	23,473	24,221
11	Climbing, hiking, and tent camping	3,685	3,454	3,615	4,970	4,923	5,663
12	Equestrian	5,108	5,266	5,412	6,040	5,617	5,910
13	Hunting, shooting, and trapping	8,490	8,147	8,484	9,460	10,320	10,686
14	Hunting and trapping	4,484	4,236	4,518	4,971	5,280	5,549
15	Shooting (includes archery)	4,006	3,911	3,966	4,489	5,040	5,137
16	Motorcycling and ATVing	8,174	7,768	7,678	8,147	10,864	11,471
17	Recreational flying	1,691	1,676	1,631	1,293	1,631	3,345
18	RVing	21,452	22,763	21,839	22,876	33,724	35,536
19	Snow activities	4,279	4,468	4,637	4,297	5,032	7,028
20	Skiing	1,670	1,733	1,825	1,295	1,607	1,936
21	Snowboarding	1,474	1,547	1,619	1,112	1,398	1,677
22	Other snow activities (includes snowmobiling)[1]	1,135	1,188	1,193	1,890	2,027	3,415
23	Other conventional outdoor recreation activities	10,726	11,095	12,417	14,382	16,734	15,466
24	Other conventional air and land activities[2]	6,964	6,984	7,307	6,989	8,269	8,843
25	Other conventional water activities[3]	3,762	4,111	5,110	7,393	8,465	6,623
26	Multi-use apparel and accessories (conventional)[4]	57,151	57,190	58,055	47,435	59,776	62,500
27	**Other outdoor recreation**	**88,261**	**93,283**	**97,212**	**73,071**	**93,213**	**111,650**
28	Amusement parks and water parks	12,961	14,835	15,942	9,917	15,892	18,863
29	Festivals, sporting events, and concerts	16,560	17,427	17,595	10,212	13,634	18,460
30	Field sports	3,398	3,534	3,860	3,607	4,113	4,601
31	Game areas (includes golfing and tennis)	19,440	20,027	21,157	15,449	19,115	22,558
32	Guided tours and outfitted travel	14,602	15,865	16,291	11,649	14,721	18,489
33	Air and land guided tours and outfitted travel	7,263	7,718	7,632	5,089	5,985	7,429
34	Water guided tours and outfitted travel (includes boating and fishing charters)	7,338	8,147	8,659	6,560	8,737	11,060
35	Productive activities (includes gardening)	8,285	8,799	9,119	10,888	12,523	14,096
36	Other outdoor recreation activities[5]	8,575	8,594	8,984	7,251	8,633	9,945
37	Multi-use apparel and accessories (other)[4]	4,441	4,203	4,264	4,099	4,582	4,638
38	**Supporting outdoor recreation**	**216,897**	**231,255**	**240,440**	**147,750**	**213,311**	**259,370**
39	Construction	7,803	8,368	9,000	8,681	7,993	8,347
40	Local trips and travel[6]	39,558	43,126	44,858	27,320	41,730	48,042
41	Trips and travel[7]	148,107	157,271	164,438	89,158	141,102	179,621
42	Food and beverages	24,757	25,352	24,987	13,279	25,358	28,869
43	Lodging	41,503	44,215	46,103	31,042	41,361	53,180
44	Shopping and souvenirs	20,517	21,277	21,753	22,793	24,724	26,378
45	Transportation	61,329	66,428	71,595	22,044	49,659	71,195
46	Government expenditures	21,430	22,490	22,144	22,592	22,486	23,360
47	Federal government	3,221	3,446	2,508	2,228	2,286	2,104
48	State and local government	18,209	19,045	19,636	20,364	20,199	21,256

1. Consists of dog mushing, sleighing, snowmobiling, snow shoeing, snow tubing.

2. Consists of air sports, driving for pleasure, geocaching/orienteering/rock hounding, ice skating, inline skating, land/sand sailing, races, running/walking/jogging, skateboarding, and wildlife watching/birding.

3. Consists of boardsailing/windsurfing, SCUBA diving, snorkeling, stand-up paddling, surfing, tubing, wakeboarding, water skiing, and whitewater rafting.

4. Consists of backpacks, bug spray, coolers, general outdoor clothing, GPS equipment, hydration equipment, lighting, sports racks, sunscreen, watches, and other miscellaneous gear and equipment.

5. Consists of agritourism, augmented reality games, beachgoing, disc golf, hot springs soaking, kite flying, model airplane/rocket/UAV, paintball, photography, stargazing/astronomy, swimming, therapeutic programs, water polo, yard sports.

6. Trip expenses less than 50 miles away from home, including food and beverages, lodging, shopping and souvenirs, and transportation.

7. Travel and tourism expenses in the Outdoor Recreation Satellite Account are consistent with the Travel and Tourism Satellite Account, which includes only expenses for travel at least 50 miles away from home.

U.S. Bureau of Economic Analysis

Table 3. Outdoor Recreation Value Added by Activity as a Percentage of Gross Domestic Product

[Percent]

		2017	2018	2019	2020	2021	2022
1	**Total outdoor recreation**	**2.3**	**2.3**	**2.3**	**1.8**	**2.1**	**2.2**
2	**Total core outdoor recreation**	**1.2**	**1.2**	**1.2**	**1.1**	**1.2**	**1.2**
3	**Conventional outdoor recreation**	**0.7**	**0.7**	**0.7**	**0.7**	**0.8**	**0.7**
4	Bicycling	0.0	0.0	0.0	0.0	0.0	0.0
5	Boating and fishing	0.1	0.1	0.1	0.2	0.1	0.1
6	Canoeing	0.0	0.0	0.0	0.0	0.0	0.0
7	Kayaking	0.0	0.0	0.0	0.0	0.0	0.0
8	Fishing (excludes boating)	0.0	0.0	0.0	0.0	0.0	0.0
9	Sailing	0.0	0.0	0.0	0.0	0.0	0.0
10	Other boating	0.1	0.1	0.1	0.1	0.1	0.1
11	Climbing, hiking, and tent camping	0.0	0.0	0.0	0.0	0.0	0.0
12	Equestrian	0.0	0.0	0.0	0.0	0.0	0.0
13	Hunting, shooting, and trapping	0.0	0.0	0.0	0.0	0.0	0.0
14	Hunting and trapping	0.0	0.0	0.0	0.0	0.0	0.0
15	Shooting (includes archery)	0.0	0.0	0.0	0.0	0.0	0.0
16	Motorcycling and ATVing	0.0	0.0	0.0	0.0	0.0	0.0
17	Recreational flying	0.0	0.0	0.0	0.0	0.0	0.0
18	RVing	0.1	0.1	0.1	0.1	0.1	0.1
19	Snow activities	0.0	0.0	0.0	0.0	0.0	0.0
20	Skiing	0.0	0.0	0.0	0.0	0.0	0.0
21	Snowboarding	0.0	0.0	0.0	0.0	0.0	0.0
22	Other snow activities (includes snowmobiling)[1]	0.0	0.0	0.0	0.0	0.0	0.0
23	Other conventional outdoor recreation activities	0.1	0.1	0.1	0.1	0.1	0.1
24	Other conventional air and land activities[2]	0.0	0.0	0.0	0.0	0.0	0.0
25	Other conventional water activities[3]	0.0	0.0	0.0	0.0	0.0	0.0
26	Multi-use apparel and accessories (conventional)[4]	0.3	0.3	0.3	0.2	0.3	0.2
27	**Other outdoor recreation**	**0.5**	**0.5**	**0.5**	**0.3**	**0.4**	**0.4**
28	Amusement parks and water parks	0.1	0.1	0.1	0.0	0.1	0.1
29	Festivals, sporting events, and concerts	0.1	0.1	0.1	0.0	0.1	0.1
30	Field sports	0.0	0.0	0.0	0.0	0.0	0.0
31	Game areas (includes golfing and tennis)	0.1	0.1	0.1	0.1	0.1	0.1
32	Guided tours and outfitted travel	0.1	0.1	0.1	0.1	0.1	0.1
33	Air and land guided tours and outfitted travel	0.0	0.0	0.0	0.0	0.0	0.0
34	Water guided tours and outfitted travel (includes boating and fishing charters)	0.0	0.0	0.0	0.0	0.0	0.0
35	Productive activities (includes gardening)	0.0	0.0	0.0	0.1	0.1	0.1
36	Other outdoor recreation activities[5]	0.0	0.0	0.0	0.0	0.0	0.0
37	Multi-use apparel and accessories (other)[4]	0.0	0.0	0.0	0.0	0.0	0.0
38	**Supporting outdoor recreation**	**1.1**	**1.1**	**1.1**	**0.7**	**0.9**	**1.0**
39	Construction	0.0	0.0	0.0	0.0	0.0	0.0
40	Local trips and travel[6]	0.2	0.2	0.2	0.1	0.2	0.2
41	Trips and travel[7]	0.8	0.8	0.8	0.4	0.6	0.7
42	Food and beverages	0.1	0.1	0.1	0.1	0.1	0.1
43	Lodging	0.2	0.2	0.2	0.1	0.2	0.2
44	Shopping and souvenirs	0.1	0.1	0.1	0.1	0.1	0.1
45	Transportation	0.3	0.3	0.3	0.1	0.2	0.3
46	Government expenditures	0.1	0.1	0.1	0.1	0.1	0.1
47	Federal government	0.0	0.0	0.0	0.0	0.0	0.0
48	State and local government	0.1	0.1	0.1	0.1	0.1	0.1

1. Consists of dog mushing, sleighing, snowmobiling, snow shoeing, snow tubing.

2. Consists of air sports, driving for pleasure, geocaching/orienteering/rock hounding, ice skating, inline skating, land/sand sailing, races, running/walking/jogging, skateboarding, and wildlife watching/birding.

3. Consists of boardsailing/windsurfing, SCUBA diving, snorkeling, stand-up paddling, surfing, tubing, wakeboarding, water skiing, and whitewater rafting.

4. Consists of backpacks, bug spray, coolers, general outdoor clothing, GPS equipment, hydration equipment, lighting, sports racks, sunscreen, watches, and other miscellaneous gear and equipment.

5. Consists of agritourism, augmented reality games, beachgoing, disc golf, hot springs soaking, kite flying, model airplane/rocket/UAV, paintball, photography, stargazing/astronomy, swimming, therapeutic programs, water polo, yard sports.

6. Trip expenses less than 50 miles away from home, including food and beverages, lodging, shopping and souvenirs, and transportation.

7. Travel and tourism expenses in the Outdoor Recreation Satellite Account are consistent with the Travel and Tourism Satellite Account, which includes only expenses for travel at least 50 miles away from home.

U.S. Bureau of Economic Analysis

Table 4. Outdoor Recreation Value Added by Activity as a Percentage of Total Outdoor Recreation Value Added

[Percent]

		2017	2018	2019	2020	2021	2022
1	**Total outdoor recreation**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
2	**Total core outdoor recreation**	**52.0**	**51.1**	**50.9**	**60.8**	**56.4**	**54.0**
3	**Conventional outdoor recreation**	**32.5**	**31.3**	**31.0**	**41.4**	**37.4**	**34.2**
4	Bicycling	0.4	0.4	0.4	0.7	0.6	0.5
5	Boating and fishing	5.4	5.2	5.3	9.2	6.5	5.8
6	Canoeing	0	0.0	0.0	0.0	0.0	0.0
7	Kayaking	0.1	0.1	0.1	0.1	0.1	0.1
8	Fishing (excludes boating)	1.2	1.2	1.1	1.4	1.3	1.1
9	Sailing	0.3	0.3	0.3	0.3	0.3	0.3
10	Other boating	3.8	3.6	3.8	7.4	4.8	4.3
11	Climbing, hiking, and tent camping	0.8	0.7	0.7	1.3	1.0	1.0
12	Equestrian	1.1	1.1	1.1	1.6	1.1	1.0
13	Hunting, shooting, and trapping	1.9	1.7	1.7	2.5	2.1	1.9
14	Hunting and trapping	1	0.9	0.9	1.3	1.1	1.0
15	Shooting (includes archery)	0.9	0.8	0.8	1.2	1.0	0.9
16	Motorcycling and ATVing	1.8	1.6	1.6	2.2	2.2	2.0
17	Recreational flying	0.4	0.4	0.3	0.3	0.3	0.6
18	RVing	4.7	4.8	4.5	6.1	6.9	6.3
19	Snow activities	0.9	0.9	0.9	1.1	1.0	1.2
20	Skiing	0.4	0.4	0.4	0.3	0.3	0.3
21	Snowboarding	0.3	0.3	0.3	0.3	0.3	0.3
22	Other snow activities (includes snowmobiling)[1]	0.3	0.3	0.2	0.5	0.4	0.6
23	Other conventional outdoor recreation activities	2.4	2.3	2.5	3.8	3.4	2.7
24	Other conventional air and land activities[2]	1.5	1.5	1.5	1.9	1.7	1.6
25	Other conventional water activities[3]	0.8	0.9	1.0	2.0	1.7	1.2
26	Multi-use apparel and accessories (conventional)[4]	12.6	12.1	11.9	12.6	12.2	11.1
27	**Other outdoor recreation**	**19.5**	**19.7**	**19.9**	**19.4**	**19.0**	**19.8**
28	Amusement parks and water parks	2.9	3.1	3.3	2.6	3.2	3.3
29	Festivals, sporting events, and concerts	3.7	3.7	3.6	2.7	2.8	3.3
30	Field sports	0.8	0.7	0.8	1.0	0.8	0.8
31	Game areas (includes golfing and tennis)	4.3	4.2	4.3	4.1	3.9	4.0
32	Guided tours and outfitted travel	3.2	3.4	3.3	3.1	3.0	3.3
33	Air and land guided tours and outfitted travel	1.6	1.6	1.6	1.4	1.2	1.3
34	Water guided tours and outfitted travel (includes boating and fishing charters)	1.6	1.7	1.8	1.7	1.8	2.0
35	Productive activities (includes gardening)	1.8	1.9	1.9	2.9	2.6	2.5
36	Other outdoor recreation activities[5]	1.9	1.8	1.8	1.9	1.8	1.8
37	Multi-use apparel and accessories (other)[4]	1	0.9	0.9	1.1	0.9	0.8
38	**Supporting outdoor recreation**	**48.0**	**48.9**	**49.1**	**39.2**	**43.6**	**46.0**
39	Construction	1.7	1.8	1.8	2.3	1.6	1.5
40	Local trips and travel[6]	8.7	9.1	9.2	7.2	8.5	8.5
41	Trips and travel[7]	32.8	33.3	33.6	23.7	28.8	31.9
42	Food and beverages	5.5	5.4	5.1	3.5	5.2	5.1
43	Lodging	9.2	9.4	9.4	8.2	8.4	9.4
44	Shopping and souvenirs	4.5	4.5	4.4	6.0	5.0	4.7
45	Transportation	13.6	14.1	14.6	5.8	10.1	12.6
46	Government expenditures	4.7	4.8	4.5	6.0	4.6	4.1
47	Federal government	0.7	0.7	0.5	0.6	0.5	0.4
48	State and local government	4	4.0	4.0	5.4	4.1	3.8

1. Consists of dog mushing, sleighing, snowmobiling, snow shoeing, snow tubing.

2. Consists of air sports, driving for pleasure, geocaching/orienteering/rock hounding, ice skating, inline skating, land/sand sailing, races, running/walking/jogging, skateboarding, and wildlife watching/birding.

3. Consists of boardsailing/windsurfing, SCUBA diving, snorkeling, stand-up paddling, surfing, tubing, wakeboarding, water skiing, and whitewater rafting.

4. Consists of backpacks, bug spray, coolers, general outdoor clothing, GPS equipment, hydration equipment, lighting, sports racks, sunscreen, watches, and other miscellaneous gear and equipment.

5. Consists of agritourism, augmented reality games, beachgoing, disc golf, hot springs soaking, kite flying, model airplane/rocket/UAV, paintball, photography, stargazing/astronomy, swimming, therapeutic programs, water polo, yard sports.

6. Trip expenses less than 50 miles away from home, including food and beverages, lodging, shopping and souvenirs, and transportation.

7. Travel and tourism expenses in the Outdoor Recreation Satellite Account are consistent with the Travel and Tourism Satellite Account, which includes only expenses for travel at least 50 miles away from home.

U.S. Bureau of Economic Analysis

Table 5. Real Outdoor Recreation Value Added by Industry

[Millions of chained (2017) dollars]

		2017	2018	2019	2020	2021	2022
1	All industries	452,205	464,521	468,572	365,148	448,059	469,634
2	Private industries	427,450	439,355	444,092	342,019	426,679	447,826
3	Agriculture, forestry, fishing, and hunting	7,768	7,811	7,796	8,194	8,283	8,068
4	Farms	4,937	5,325	5,195	5,806	5,556	5,282
5	Forestry, fishing, and related activities	2,831	2,485	2,598	2,396	2,766	2,871
6	Mining	298	310	437	420	329	329
7	Oil and gas extraction	197	168	318	343	224	226
8	Mining, except oil and gas	71	106	94	86	108	106
9	Support activities for mining	30	39	41	20	27	27
10	Utilities	38	41	42	40	38	33
11	Construction	6,906	7,100	7,238	6,719	6,015	5,627
12	Manufacturing	56,225	59,548	61,764	58,047	67,041	64,959
13	Durable goods	23,864	24,065	24,602	28,373	30,423	28,613
14	Wood products	1	2	1	2	12	11
15	Nonmetallic mineral products	47	42	43	52	56	53
16	Primary metals	5	3	4	3	3	4
17	Fabricated metal products	1,670	1,751	1,737	2,294	2,523	2,891
18	Machinery	1,387	1,623	1,634	1,718	1,642	1,655
19	Computer and electronic products	521	609	595	413	433	374
20	Electrical equipment, appliances, and components	622	608	551	492	482	403
21	Motor vehicles, bodies and trailers, and parts	7,702	7,858	7,449	9,141	9,553	8,008
22	Other transportation equipment	8,173	7,877	8,766	9,744	10,714	10,691
23	Furniture and related products	20	16	19	22	21	18
24	Miscellaneous manufacturing	3,715	3,679	3,793	4,495	5,006	4,811
25	Nondurable goods	32,361	35,456	37,133	28,782	36,078	35,901
26	Food and beverage and tobacco products	7,332	7,406	7,099	7,404	7,974	7,825
27	Textile mills and textile product mills	403	436	426	601	612	621
28	Apparel and leather and allied products	2,699	2,272	2,402	2,276	2,602	2,553
29	Paper products	293	320	319	393	366	331
30	Printing and related support activities	68	64	64	55	61	58
31	Petroleum and coal products	17,304	20,351	22,384	11,960	18,912	18,812
32	Chemical products	3,972	4,264	4,045	4,373	4,528	4,672
33	Plastics and rubber products	290	296	328	381	392	371
34	Wholesale trade	43,935	42,711	44,339	37,905	44,362	41,894
35	Retail trade	116,142	119,673	119,303	106,831	126,283	123,177
36	Motor vehicle and parts dealers	16,884	16,802	14,662	13,258	20,117	20,886
37	Food and beverage stores	5,842	5,756	5,804	5,942	6,490	6,009
38	General merchandise stores	18,293	18,922	18,215	17,274	19,162	16,932
39	Other retail	75,123	78,207	80,692	70,403	79,635	78,120
40	Transportation and warehousing	44,945	47,481	48,529	21,933	40,369	51,251
41	Air transportation	31,020	32,670	33,077	11,785	29,345	38,859
42	Rail transportation	765	788	780	502	612	720
43	Water transportation	3,441	4,446	4,868	2,768	2,201	4,315
44	Truck transportation	4,294	4,211	4,324	4,059	4,594	4,216
45	Transit and ground passenger transportation	2,406	2,393	2,511	1,551	1,826	2,478
46	Pipeline transportation	910	870	791	619	876	859
47	Other transportation and support activities	2,102	2,164	2,295	578	1,527	1,936
48	Warehousing and storage	7	7	7	7	8	7
49	Information	1,187	1,256	1,380	1,318	1,461	1,644
50	Publishing industries, except internet (includes software)	684	702	696	609	628	644
51	Motion picture and sound recording industries	29	28	28	12	24	18
52	Broadcasting and telecommunications	287	298	375	324	298	388
53	Data processing, internet publishing, and other information services	187	229	293	397	554	669
54	Finance, insurance, real estate, rental, and leasing	16,466	17,395	18,495	16,720	17,528	18,671
55	Finance and insurance	3,995	3,747	4,017	3,756	4,436	5,638
56	Federal Reserve banks, credit intermediation, and related activities	184	192	218	233	302	298
57	Securities, commodity contracts, and investments	...	...	...	...	...	...
58	Insurance carriers and related activities	3,810	3,555	3,798	3,522	4,132	5,338
59	Funds, trusts, and other financial vehicles	...	...	...	...	...	...
60	Real estate and rental and leasing	12,472	13,651	14,482	12,962	13,106	13,158
61	Real estate	8,786	9,436	9,266	9,124	9,511	9,463
62	Housing	8,769	9,419	9,249	9,106	9,490	9,445
63	Other real estate	17	16	17	19	21	19
64	Rental and leasing services and lessors of intangible assets	3,686	4,218	5,258	3,753	3,486	3,575
65	Professional and business services	7,525	7,856	7,485	2,892	3,746	5,395
66	Professional, scientific, and technical services	1,132	1,083	1,105	1,118	1,105	1,146
67	Legal services	...	...	...	...	...	...
68	Computer systems design and related services	60	71	89	109	104	136
69	Miscellaneous professional, scientific, and technical services	1,073	1,013	1,018	1,014	1,006	1,022
70	Management of companies and enterprises	...	...	...	...	...	...
71	Administrative and waste management services	6,393	6,773	6,381	1,767	2,649	4,285
72	Administrative and support services	6,392	6,772	6,379	1,765	2,647	4,285
73	Waste management and remediation services	1	1	1	2	2	1
74	Educational services, health care, and social assistance	3,511	3,753	3,807	2,715	3,575	4,383
75	Educational services	3,201	3,421	3,468	2,409	3,226	4,046
76	Health care and social assistance	310	333	339	311	353	350
77	Ambulatory health care services	168	180	191	211	204	207
78	Hospitals	106	114	112	78	113	109
79	Nursing and residential care facilities	33	36	34	22	33	33
80	Social assistance	3	3	3	4	4	3
81	Arts, entertainment, recreation, accommodation, and food services	117,342	119,382	118,607	74,292	105,206	122,023
82	Arts, entertainment, and recreation	55,237	57,200	56,790	33,440	46,778	58,198
83	Performing arts, spectator sports, museums, and related activities	16,399	17,032	16,908	8,913	13,051	18,660
84	Amusements, gambling, and recreation industries	38,838	40,168	39,882	24,470	33,696	39,915
85	Accommodation and food services	62,106	62,187	61,821	41,039	58,760	64,152
86	Accommodation	38,281	38,364	39,095	29,363	37,646	41,719
87	Food services and drinking places	23,824	23,823	22,713	12,047	20,820	22,190
88	Other services, except government	5,161	5,051	4,902	4,654	5,039	4,670
89	Government	24,756	25,167	24,484	22,937	21,717	22,182
90	Federal	3,483	3,563	2,592	2,273	2,278	2,080
91	General government	3,244	3,339	2,382	2,092	2,087	1,918
92	National defense	0	0	0	0	0	1
93	Nondefense	3,244	3,338	2,382	2,092	2,086	1,917
94	Government enterprises	238	224	211	182	193	164
95	State and local	21,273	21,605	21,904	20,671	19,454	20,108
96	General government	21,203	21,457	21,799	20,747	19,465	20,070
97	Government enterprises	70	20	21	125	80	68

U.S. Bureau of Economic Analysis

Table 6. Outdoor Recreation Value Added by Industry

[Millions of current dollars]

		2017	2018	2019	2020	2021	2022
1	All industries	452,205	472,641	489,315	376,848	489,751	563,705
2	Private industries	427,450	446,808	463,827	350,922	464,251	537,241
3	Agriculture, forestry, fishing, and hunting	7,768	7,845	7,978	8,592	10,074	11,687
4	Farms	4,937	5,358	5,247	6,033	7,249	8,491
5	Forestry, fishing, and related activities	2,831	2,487	2,731	2,559	2,825	3,196
6	Mining	298	358	345	286	497	641
7	Oil and gas extraction	197	212	211	193	354	397
8	Mining, except oil and gas	71	111	96	73	115	213
9	Support activities for mining	30	35	37	19	28	31
10	Utilities	38	43	45	47	55	54
11	Construction	6,906	7,408	7,962	7,667	7,065	7,377
12	Manufacturing	56,225	61,627	63,604	54,619	68,388	77,633
13	Durable goods	23,864	24,200	25,929	30,425	33,532	35,190
14	Wood products	1	2	2	2	13	14
15	Nonmetallic mineral products	47	42	43	54	54	52
16	Primary metals	5	4	4	4	5	6
17	Fabricated metal products	1,670	1,752	1,824	2,293	2,307	2,451
18	Machinery	1,387	1,598	1,683	1,830	1,633	1,721
19	Computer and electronic products	521	612	610	428	458	426
20	Electrical equipment, appliances, and components	622	598	575	539	491	414
21	Motor vehicles, bodies and trailers, and parts	7,702	7,979	7,769	9,828	11,487	11,947
22	Other transportation equipment	8,173	7,969	9,435	10,805	12,009	12,943
23	Furniture and related products	20	16	20	25	22	22
24	Miscellaneous manufacturing	3,715	3,629	3,965	4,617	5,053	5,194
25	Nondurable goods	32,361	37,427	37,675	24,194	34,856	42,442
26	Food and beverage and tobacco products	7,332	7,473	7,485	8,208	8,620	8,606
27	Textile mills and textile product mills	403	435	430	615	615	668
28	Apparel and leather and allied products	2,699	2,308	2,447	2,274	2,510	2,566
29	Paper products	293	297	305	389	338	341
30	Printing and related support activities	68	64	66	58	63	68
31	Petroleum and coal products	17,304	22,254	22,404	7,670	17,585	24,558
32	Chemical products	3,972	4,304	4,205	4,582	4,727	5,202
33	Plastics and rubber products	290	292	333	398	398	434
34	Wholesale trade	43,935	43,316	46,024	38,168	45,719	46,260
35	Retail trade	116,142	118,589	120,809	111,710	145,812	153,627
36	Motor vehicle and parts dealers	16,884	16,981	15,310	15,528	28,321	30,869
37	Food and beverage stores	5,842	5,955	6,122	6,558	7,135	7,634
38	General merchandise stores	18,293	18,543	18,188	16,732	20,041	20,374
39	Other retail	75,123	77,109	81,188	72,893	90,315	94,751
40	Transportation and warehousing	44,945	47,301	51,032	20,351	36,194	54,626
41	Air transportation	31,020	32,535	35,636	10,589	23,879	39,209
42	Rail transportation	765	802	839	560	688	845
43	Water transportation	3,441	3,957	3,991	1,863	1,577	2,483
44	Truck transportation	4,294	4,540	4,827	4,571	5,675	6,630
45	Transit and ground passenger transportation	2,406	2,350	2,451	1,449	1,763	2,323
46	Pipeline transportation	910	879	823	670	927	919
47	Other transportation and support activities	2,102	2,231	2,458	642	1,676	2,207
48	Warehousing and storage	7	7	8	8	9	11
49	Information	1,187	1,251	1,335	1,399	1,576	1,670
50	Publishing industries, except internet (includes software)	684	715	737	714	763	777
51	Motion picture and sound recording industries	29	28	28	14	29	22
52	Broadcasting and telecommunications	287	295	296	306	297	318
53	Data processing, internet publishing, and other information services	187	212	274	365	487	553
54	Finance, insurance, real estate, rental, and leasing	16,466	17,976	19,539	17,694	19,776	22,271
55	Finance and insurance	3,995	3,931	4,345	4,141	4,521	6,097
56	Federal Reserve banks, credit intermediation, and related activities	184	212	243	256	311	319
57	Securities, commodity contracts, and investments	...	...	...	...	...	...
58	Insurance carriers and related activities	3,810	3,719	4,102	3,884	4,210	5,778
59	Funds, trusts, and other financial vehicles	...	...	...	...	...	...
60	Real estate and rental and leasing	12,472	14,045	15,194	13,554	15,255	16,173
61	Real estate	8,786	9,779	9,967	10,127	10,764	11,337
62	Housing	8,769	9,762	9,949	10,109	10,743	11,315
63	Other real estate	17	17	18	18	21	22
64	Rental and leasing services and lessors of intangible assets	3,686	4,266	5,227	3,427	4,491	4,837
65	Professional and business services	7,525	8,065	7,976	3,078	4,066	6,324
66	Professional, scientific, and technical services	1,132	1,106	1,159	1,218	1,247	1,389
67	Legal services	...	...	...	...	...	...
68	Computer systems design and related services	60	69	76	100	101	115
69	Miscellaneous professional, scientific, and technical services	1,073	1,037	1,083	1,118	1,146	1,274
70	Management of companies and enterprises	...	...	...	...	...	...
71	Administrative and waste management services	6,393	6,959	6,817	1,860	2,820	4,934
72	Administrative and support services	6,392	6,957	6,816	1,858	2,817	4,932
73	Waste management and remediation services	1	1	2	2	2	2
74	Educational services, health care, and social assistance	3,511	3,857	3,982	2,950	3,736	4,419
75	Educational services	3,201	3,530	3,641	2,637	3,355	4,018
76	Health care and social assistance	310	328	341	313	381	401
77	Ambulatory health care services	168	171	183	199	210	227
78	Hospitals	106	117	119	86	128	130
79	Nursing and residential care facilities	33	37	36	24	38	40
80	Social assistance	3	3	3	4	5	4
81	Arts, entertainment, recreation, accommodation, and food services	117,342	123,874	127,760	79,051	115,236	144,485
82	Arts, entertainment, and recreation	55,237	59,042	61,153	38,582	53,179	66,847
83	Performing arts, spectator sports, museums, and related activities	16,399	17,252	17,468	9,838	13,338	18,205
84	Amusements, gambling, and recreation industries	38,838	41,790	43,686	28,744	39,841	48,641
85	Accommodation and food services	62,106	64,832	66,607	40,469	62,057	77,638
86	Accommodation	38,281	40,227	42,293	26,730	37,210	49,229
87	Food services and drinking places	23,824	24,605	24,314	13,739	24,847	28,409
88	Other services, except government	5,161	5,298	5,437	5,309	6,056	6,169
89	Government	24,756	25,833	25,489	25,926	25,501	26,464
90	Federal	3,483	3,685	2,744	2,426	2,513	2,434
91	General government	3,244	3,463	2,525	2,244	2,314	2,226
92	National defense	0	0	0	0	0	1
93	Nondefense	3,244	3,463	2,525	2,243	2,313	2,225
94	Government enterprises	238	222	219	182	199	208
95	State and local	21,273	22,148	22,744	23,500	22,988	24,030
96	General government	21,203	22,152	22,740	23,604	23,225	24,566
97	Government enterprises	70	-4	5	-104	-237	-536

U.S. Bureau of Economic Analysis

Table 7. Real Outdoor Recreation Gross Output by Activity

[Millions of chained (2017) dollars]

		2017	2018	2019	2020	2021	2022
1	**Total outdoor recreation**	**819,950**	**840,890**	**850,220**	**650,560**	**817,169**	**878,276**
2	**Total core outdoor recreation**	**427,304**	**435,444**	**434,125**	**394,760**	**462,126**	**485,917**
3	**Conventional outdoor recreation**	**268,279**	**270,612**	**267,051**	**270,198**	**307,086**	**309,209**
4	Bicycling	3,174	2,893	3,049	3,432	3,668	3,482
5	Boating and fishing	46,910	46,322	46,213	61,455	51,329	48,527
6	Canoeing	84	73	86	117	184	133
7	Kayaking	786	785	760	743	896	748
8	Fishing (excludes boating)	10,235	10,417	9,870	9,098	11,818	10,959
9	Sailing	2,259	2,231	2,417	1,635	2,085	2,343
10	Other boating	33,546	32,823	33,070	49,688	36,481	34,460
11	Climbing, hiking, and tent camping	6,618	6,093	6,171	8,223	8,084	8,637
12	Equestrian	8,679	8,858	8,801	9,478	8,304	7,822
13	Hunting, shooting, and trapping	13,711	13,205	13,057	14,836	16,379	16,151
14	Hunting and trapping	6,612	6,314	6,320	7,194	7,924	7,719
15	Shooting (includes archery)	7,099	6,890	6,738	7,643	8,455	8,428
16	Motorcycling and ATVing	14,205	13,808	12,510	12,225	16,444	16,712
17	Recreational flying	3,234	3,039	2,831	2,539	2,837	5,177
18	RVing	42,195	44,631	42,256	40,694	51,397	52,243
19	Snow activities	7,997	8,130	8,179	7,286	8,356	11,094
20	Skiing	3,077	3,110	3,190	2,217	2,676	3,148
21	Snowboarding	2,770	2,817	2,884	1,952	2,383	2,785
22	Other snow activities (includes snowmobiling)[1]	2,149	2,203	2,106	3,123	3,304	5,168
23	Other conventional outdoor recreation activities	19,627	19,864	21,367	23,928	27,031	24,242
24	Other conventional air and land activities[2]	13,899	13,711	14,010	13,476	15,908	15,956
25	Other conventional water activities[3]	5,728	6,156	7,363	10,327	11,050	8,338
26	Multi-use apparel and accessories (conventional)[4]	101,931	103,778	102,623	85,042	113,402	115,529
27	**Other outdoor recreation**	**159,024**	**164,825**	**167,045**	**125,334**	**155,694**	**177,408**
28	Amusement parks and water parks	20,150	22,255	22,572	14,098	21,847	24,322
29	Festivals, sporting events, and concerts	28,908	29,873	29,757	17,401	25,358	33,106
30	Field sports	6,501	6,729	7,028	6,583	7,696	8,246
31	Game areas (includes golfing and tennis)	36,144	36,573	37,714	26,940	32,809	37,749
32	Guided tours and outfitted travel	31,282	33,573	33,616	25,573	30,471	36,296
33	Air and land guided tours and outfitted travel	15,497	16,405	15,667	11,455	12,635	14,716
34	Water guided tours and outfitted travel (includes boating and fishing charters)	15,785	17,168	17,945	14,110	17,817	21,558
35	Productive activities (includes gardening)	13,138	13,704	13,917	16,270	16,636	16,087
36	Other outdoor recreation activities[5]	15,373	15,075	15,430	12,090	13,872	15,663
37	Multi-use apparel and accessories (other)[4]	7,529	7,040	6,998	6,571	7,330	7,173
38	**Supporting outdoor recreation**	**392,647**	**405,406**	**415,933**	**254,159**	**354,070**	**390,989**
39	Construction	10,425	10,634	10,914	10,363	9,251	8,809
40	Local trips and travel[6]	80,532	82,930	85,933	52,627	75,831	78,361
41	Trips and travel[7]	263,977	273,722	280,510	151,314	230,771	266,818
42	Food and beverages	41,911	41,877	40,153	21,347	38,970	41,720
43	Lodging	60,097	60,927	60,830	40,543	51,627	59,527
44	Shopping and souvenirs	37,450	38,164	38,317	39,198	41,453	41,086
45	Transportation	124,519	132,715	141,127	49,174	97,986	123,796
46	Government expenditures	37,713	38,124	38,567	38,823	38,689	38,376
47	Federal government	4,313	4,504	3,206	3,006	3,196	2,752
48	State and local government	33,400	33,621	35,364	35,819	35,503	35,605

1. Consists of dog mushing, sleighing, snowmobiling, snow shoeing, snow tubing.

2. Consists of air sports, driving for pleasure, geocaching/orienteering/rock hounding, ice skating, inline skating, land/sand sailing, races, running/walking/jogging, skateboarding, and wildlife watching/birding.

3. Consists of boardsailing/windsurfing, SCUBA diving, snorkeling, stand-up paddling, surfing, tubing, wakeboarding, water skiing, and whitewater rafting.

4. Consists of backpacks, bug spray, coolers, general outdoor clothing, GPS equipment, hydration equipment, lighting, sports racks, sunscreen, watches, and other miscellaneous gear and equipment.

5. Consists of agritourism, augmented reality games, beachgoing, disc golf, hot springs soaking, kite flying, model airplane/rocket/UAV, paintball, photography, stargazing/astronomy, swimming, therapeutic programs, water polo, yard sports.

6. Trip expenses less than 50 miles away from home, including food and beverages, lodging, shopping and souvenirs, and transportation.

7. Travel and tourism expenses in the Outdoor Recreation Satellite Account are consistent with the Travel and Tourism Satellite Account, which includes only expenses for travel at least 50 miles away from home.

U.S. Bureau of Economic Analysis

Table 8. Outdoor Recreation Gross Output by Activity

[Millions of current dollars]

		2017	2018	2019	2020	2021	2022
1	**Total outdoor recreation**	**819,950**	**869,079**	**890,389**	**668,903**	**908,197**	**1,078,521**
2	**Total core outdoor recreation**	**427,304**	**443,627**	**452,542**	**413,592**	**516,584**	**578,997**
3	**Conventional outdoor recreation**	**268,279**	**275,168**	**277,202**	**278,092**	**341,620**	**369,572**
4	Bicycling	3,174	2,958	3,244	3,718	4,283	4,322
5	Boating and fishing	46,910	47,654	49,163	64,321	58,475	60,860
6	Canoeing	84	75	91	127	210	164
7	Kayaking	786	800	801	786	989	908
8	Fishing (excludes boating)	10,235	10,411	10,258	9,377	12,794	12,453
9	Sailing	2,259	2,301	2,573	1,801	2,383	2,848
10	Other boating	33,546	34,067	35,440	52,231	42,099	44,487
11	Climbing, hiking, and tent camping	6,618	6,203	6,431	8,460	8,790	10,171
12	Equestrian	8,679	9,049	9,237	10,127	9,565	10,161
13	Hunting, shooting, and trapping	13,711	13,424	13,733	15,634	17,922	18,780
14	Hunting and trapping	6,612	6,379	6,619	7,570	8,486	8,904
15	Shooting (includes archery)	7,099	7,046	7,114	8,064	9,435	9,875
16	Motorcycling and ATVing	14,205	14,106	12,958	12,645	17,144	18,460
17	Recreational flying	3,234	3,208	2,996	2,494	3,155	6,474
18	RVing	42,195	45,863	44,427	44,219	63,774	70,759
19	Snow activities	7,997	8,382	8,667	7,978	9,505	13,201
20	Skiing	3,077	3,205	3,381	2,425	3,049	3,745
21	Snowboarding	2,770	2,904	3,056	2,141	2,709	3,294
22	Other snow activities (includes snowmobiling)[1]	2,149	2,272	2,231	3,411	3,747	6,163
23	Other conventional outdoor recreation activities	19,627	20,569	22,227	24,541	31,077	30,870
24	Other conventional air and land activities[2]	13,899	14,277	14,511	13,248	17,582	19,988
25	Other conventional water activities[3]	5,728	6,292	7,716	11,293	13,495	10,882
26	Multi-use apparel and accessories (conventional)[4]	101,931	103,751	104,120	83,955	117,932	125,514
27	**Other outdoor recreation**	**159,024**	**168,459**	**175,340**	**135,500**	**174,964**	**209,426**
28	Amusement parks and water parks	20,150	22,838	24,376	15,875	25,061	29,870
29	Festivals, sporting events, and concerts	28,908	30,355	30,827	18,901	26,476	33,733
30	Field sports	6,501	6,797	7,267	6,833	8,336	9,328
31	Game areas (includes golfing and tennis)	36,144	37,467	39,704	29,068	36,918	44,352
32	Guided tours and outfitted travel	31,282	34,356	35,258	27,504	33,852	42,248
33	Air and land guided tours and outfitted travel	15,497	16,772	16,367	12,200	14,026	17,210
34	Water guided tours and outfitted travel (includes boating and fishing charters)	15,785	17,584	18,891	15,304	19,827	25,038
35	Productive activities (includes gardening)	13,138	14,029	14,591	17,490	20,332	22,798
36	Other outdoor recreation activities[5]	15,373	15,509	16,219	13,025	15,878	18,758
37	Multi-use apparel and accessories (other)[4]	7,529	7,109	7,098	6,804	8,110	8,338
38	**Supporting outdoor recreation**	**392,647**	**425,452**	**437,847**	**255,311**	**391,613**	**499,523**
39	Construction	10,425	11,127	11,897	11,634	11,003	11,803
40	Local trips and travel[6]	80,532	89,376	89,891	51,113	87,040	108,906
41	Trips and travel[7]	263,977	285,241	295,688	150,452	248,539	330,414
42	Food and beverages	41,911	42,997	42,315	23,433	44,902	51,404
43	Lodging	60,097	63,465	65,098	39,794	54,007	71,051
44	Shopping and souvenirs	37,450	39,025	39,789	40,804	46,113	50,627
45	Transportation	124,519	139,753	148,487	46,421	103,517	157,333
46	Government expenditures	37,713	39,708	40,371	42,112	45,030	48,400
47	Federal government	4,313	4,661	3,391	3,207	3,528	3,207
48	State and local government	33,400	35,047	36,981	38,905	41,502	45,193

1. Consists of dog mushing, sleighing, snowmobiling, snow shoeing, snow tubing.

2. Consists of air sports, driving for pleasure, geocaching/orienteering/rock hounding, ice skating, inline skating, land/sand sailing, races, running/walking/jogging, skateboarding, and wildlife watching/birding.

3. Consists of boardsailing/windsurfing, SCUBA diving, snorkeling, stand-up paddling, surfing, tubing, wakeboarding, water skiing, and whitewater rafting.

4. Consists of backpacks, bug spray, coolers, general outdoor clothing, GPS equipment, hydration equipment, lighting, sports racks, sunscreen, watches, and other miscellaneous gear and equipment.

5. Consists of agritourism, augmented reality games, beachgoing, disc golf, hot springs soaking, kite flying, model airplane/rocket/UAV, paintball, photography, stargazing/astronomy, swimming, therapeutic programs, water polo, yard sports.

6. Trip expenses less than 50 miles away from home, including food and beverages, lodging, shopping and souvenirs, and transportation.

7. Travel and tourism expenses in the Outdoor Recreation Satellite Account are consistent with the Travel and Tourism Satellite Account, which includes only expenses for travel at least 50 miles away from home.

U.S. Bureau of Economic Analysis

Table 9. Real Outdoor Recreation Gross Output by Industry

[Millions of chained (2017) dollars]

		2017	2018	2019	2020	2021	2022
1	All industries	819,950	840,890	850,220	650,560	817,169	878,276
2	Private industries	775,297	795,787	804,810	604,938	772,296	833,418
3	Agriculture, forestry, fishing, and hunting	11,606	11,713	11,826	12,811	12,608	11,783
4	Farms	8,188	8,813	8,873	10,089	9,308	8,454
5	Forestry, fishing, and related activities	3,418	2,898	2,950	2,734	3,354	3,443
6	Mining	511	635	734	698	766	889
7	Oil and gas extraction	331	363	490	546	559	643
8	Mining, except oil and gas	148	233	207	154	205	248
9	Support activities for mining	32	41	43	21	30	30
10	Utilities	52	57	56	54	56	51
11	Construction	9,485	9,684	9,917	9,428	8,447	8,064
12	Manufacturing	146,331	148,221	151,113	132,571	151,087	152,349
13	Durable goods	55,704	57,235	57,252	61,606	67,436	68,155
14	Wood products	2	2	2	2	21	19
15	Nonmetallic mineral products	88	76	76	94	94	85
16	Primary metals	10	7	7	6	6	7
17	Fabricated metal products	3,289	3,372	3,462	4,629	4,649	4,628
18	Machinery	3,773	4,190	4,231	4,190	3,854	3,633
19	Computer and electronic products	730	821	760	545	549	539
20	Electrical equipment, appliances, and components	1,171	1,099	1,055	966	921	705
21	Motor vehicles, bodies and trailers, and parts	21,294	22,718	22,222	25,109	30,145	31,276
22	Other transportation equipment	18,506	18,251	18,235	17,813	18,559	19,240
23	Furniture and related products	38	30	39	47	40	36
24	Miscellaneous manufacturing	6,804	6,666	7,164	8,246	8,537	7,814
25	Nondurable goods	90,627	91,025	93,844	69,749	82,466	83,009
26	Food and beverage and tobacco products	17,440	17,655	17,517	18,597	18,356	17,215
27	Textile mills and textile product mills	727	818	791	1,147	1,136	1,145
28	Apparel and leather and allied products	3,902	3,474	3,777	3,850	4,143	3,871
29	Paper products	690	672	659	782	707	615
30	Printing and related support activities	120	109	107	97	102	99
31	Petroleum and coal products	60,147	60,654	63,293	35,790	48,994	50,666
32	Chemical products	6,919	6,935	6,852	7,052	6,973	7,041
33	Plastics and rubber products	682	690	758	895	912	868
34	Wholesale trade	73,873	73,988	74,632	62,341	78,674	77,584
35	Retail trade	191,470	197,543	195,164	171,924	221,599	224,703
36	Motor vehicle and parts dealers	25,250	25,300	21,314	18,812	28,564	29,729
37	Food and beverage stores	8,732	8,640	8,833	8,976	9,757	9,314
38	General merchandise stores	26,299	27,359	25,933	24,760	27,904	26,001
39	Other retail	131,189	136,255	139,142	119,439	154,698	158,796
40	Transportation and warehousing	86,400	91,718	96,844	42,470	68,022	90,984
41	Air transportation	55,397	58,748	62,123	21,807	47,133	66,677
42	Rail transportation	1,295	1,338	1,351	863	1,039	1,195
43	Water transportation	12,433	13,866	15,097	6,086	3,687	6,520
44	Truck transportation	8,005	8,132	8,414	8,003	8,951	9,124
45	Transit and ground passenger transportation	4,083	4,404	4,442	2,423	3,051	4,127
46	Pipeline transportation	1,049	1,064	1,218	938	1,137	1,076
47	Other transportation and support activities	4,130	4,172	4,223	1,942	3,355	3,691
48	Warehousing and storage	8	8	8	8	9	9
49	Information	1,762	1,883	1,990	2,018	2,251	2,449
50	Publishing industries, except internet (includes software)	1,065	1,059	1,024	976	1,004	1,033
51	Motion picture and sound recording industries	57	61	62	24	75	42
52	Broadcasting and telecommunications	288	298	376	324	298	388
53	Data processing, internet publishing, and other information services	352	466	541	712	903	1,042
54	Finance, insurance, real estate, rental, and leasing	23,207	24,563	26,187	23,597	26,039	27,698
55	Finance and insurance	7,420	7,058	7,428	7,113	8,441	9,920
56	Federal Reserve banks, credit intermediation, and related activities	276	293	312	329	403	402
57	Securities, commodity contracts, and investments	...	...	...	...	...	...
58	Insurance carriers and related activities	7,144	6,764	7,115	6,782	8,035	9,516
59	Funds, trusts, and other financial vehicles	...	...	...	...	...	...
60	Real estate and rental and leasing	15,787	17,508	18,763	16,479	17,612	17,891
61	Real estate	9,291	9,992	9,734	9,715	10,182	10,108
62	Housing	9,274	9,975	9,718	9,696	10,162	10,090
63	Other real estate	17	16	17	19	21	19
64	Rental and leasing services and lessors of intangible assets	6,496	7,519	9,065	6,687	7,353	7,693
65	Professional and business services	16,025	17,460	17,993	9,012	11,364	16,389
66	Professional, scientific, and technical services	1,505	1,485	1,473	1,444	1,421	1,491
67	Legal services	...	...	...	...	...	...
68	Computer systems design and related services	61	73	92	113	107	139
69	Miscellaneous professional, scientific, and technical services	1,444	1,412	1,384	1,338	1,319	1,363
70	Management of companies and enterprises	...	...	...	...	...	...
71	Administrative and waste management services	14,520	15,975	16,521	7,548	9,941	14,938
72	Administrative and support services	14,519	15,974	16,519	7,546	9,939	14,938
73	Waste management and remediation services	1	1	2	2	2	1
74	Educational services, health care, and social assistance	7,920	8,177	8,063	6,499	7,991	9,058
75	Educational services	7,528	7,769	7,644	6,127	7,554	8,614
76	Health care and social assistance	391	408	419	374	439	448
77	Ambulatory health care services	223	238	253	264	277	288
78	Hospitals	130	129	127	87	125	124
79	Nursing and residential care facilities	35	38	36	23	34	35
80	Social assistance	3	3	3	4	4	3
81	Arts, entertainment, recreation, accommodation, and food services	198,570	202,236	202,097	124,479	176,281	207,020
82	Arts, entertainment, and recreation	95,843	99,005	100,062	61,892	84,648	104,493
83	Performing arts, spectator sports, museums, and related activities	27,769	28,697	28,607	16,115	24,012	31,568
84	Amusements, gambling, and recreation industries	68,074	70,308	71,445	45,725	60,677	73,211
85	Accommodation and food services	102,727	103,236	102,045	62,581	91,837	102,764
86	Accommodation	61,412	61,331	61,838	39,848	51,274	59,647
87	Food services and drinking places	41,314	41,908	40,194	22,839	39,875	42,509
88	Other services, except government	8,086	7,968	8,081	7,666	8,544	8,268
89	Government	44,653	45,104	45,413	45,324	45,041	45,133
90	Federal	4,644	4,822	3,504	3,247	3,475	3,086
91	General government	4,337	4,521	3,223	3,020	3,220	2,860
92	National defense	0	0	0	0	0	1
93	Nondefense	4,337	4,521	3,223	3,020	3,219	2,859
94	Government enterprises	307	301	282	226	256	227
95	State and local	40,009	40,283	41,911	42,079	41,576	42,034
96	General government	38,443	38,753	40,418	41,024	40,397	40,720
97	Government enterprises	1,566	1,530	1,490	1,035	1,170	1,324

U.S. Bureau of Economic Analysis

NMED Exhibit 9

Table 10. Outdoor Recreation Gross Output by Industry

[Millions of current dollars]

		2017	2018	2019	2020	2021	2022
1	All industries	819,950	869,079	890,389	668,903	908,197	1,078,521
2	Private industries	775,297	822,201	842,879	620,011	856,256	1,022,141
3	Agriculture, forestry, fishing, and hunting	11,606	11,883	12,170	13,273	15,057	16,775
4	Farms	8,188	8,965	9,069	10,358	11,572	12,844
5	Forestry, fishing, and related activities	3,418	2,917	3,100	2,915	3,486	3,931
6	Mining	511	701	660	571	1,162	1,626
7	Oil and gas extraction	331	420	404	405	901	1,187
8	Mining, except oil and gas	148	244	216	146	230	405
9	Support activities for mining	32	37	39	20	31	34
10	Utilities	52	59	60	63	76	77
11	Construction	9,485	10,129	10,815	10,580	10,028	10,772
12	Manufacturing	146,331	160,846	159,061	126,250	170,886	207,406
13	Durable goods	55,704	58,523	60,005	65,334	75,704	84,191
14	Wood products	2	2	2	2	24	25
15	Nonmetallic mineral products	88	78	78	98	99	94
16	Primary metals	10	8	8	7	9	12
17	Fabricated metal products	3,289	3,436	3,616	4,709	4,857	5,030
18	Machinery	3,773	4,244	4,379	4,421	4,159	4,236
19	Computer and electronic products	730	826	778	562	581	611
20	Electrical equipment, appliances, and components	1,171	1,114	1,105	1,032	1,001	828
21	Motor vehicles, bodies and trailers, and parts	21,294	23,402	23,255	26,757	34,958	40,782
22	Other transportation equipment	18,506	18,670	19,287	19,188	20,834	23,499
23	Furniture and related products	38	30	41	50	45	46
24	Miscellaneous manufacturing	6,804	6,715	7,457	8,510	9,138	9,028
25	Nondurable goods	90,627	102,322	99,056	60,916	95,181	123,215
26	Food and beverage and tobacco products	17,440	17,839	18,069	19,490	20,584	21,339
27	Textile mills and textile product mills	727	829	812	1,187	1,220	1,337
28	Apparel and leather and allied products	3,902	3,533	3,863	3,904	4,228	4,152
29	Paper products	690	672	667	796	740	724
30	Printing and related support activities	120	110	111	102	110	120
31	Petroleum and coal products	60,147	71,523	67,656	27,217	59,768	86,262
32	Chemical products	6,919	7,112	7,100	7,298	7,507	8,192
33	Plastics and rubber products	682	704	779	924	1,024	1,089
34	Wholesale trade	73,873	75,375	77,637	63,948	83,460	87,721
35	Retail trade	191,470	198,193	199,865	180,271	250,809	271,982
36	Motor vehicle and parts dealers	25,250	25,680	22,258	21,374	37,598	41,160
37	Food and beverage stores	8,732	8,915	9,291	9,761	10,795	11,596
38	General merchandise stores	26,299	27,186	26,240	24,592	29,645	30,933
39	Other retail	131,189	136,412	142,075	124,544	172,771	188,294
40	Transportation and warehousing	86,400	94,791	102,669	41,348	68,903	108,519
41	Air transportation	55,397	60,956	66,937	20,620	45,086	77,726
42	Rail transportation	1,295	1,396	1,449	941	1,184	1,459
43	Water transportation	12,433	13,967	14,891	5,607	3,643	6,247
44	Truck transportation	8,005	8,664	9,183	8,693	10,973	13,415
45	Transit and ground passenger transportation	4,083	4,447	4,496	2,396	3,131	4,290
46	Pipeline transportation	1,049	1,083	1,280	1,017	1,251	1,233
47	Other transportation and support activities	4,130	4,270	4,423	2,066	3,624	4,135
48	Warehousing and storage	8	8	9	9	11	13
49	Information	1,762	1,889	1,965	2,123	2,424	2,581
50	Publishing industries, except internet (includes software)	1,065	1,079	1,075	1,100	1,172	1,222
51	Motion picture and sound recording industries	57	62	64	26	82	47
52	Broadcasting and telecommunications	288	295	297	306	298	319
53	Data processing, internet publishing, and other information services	352	453	529	692	873	993
54	Finance, insurance, real estate, rental, and leasing	23,207	25,343	27,593	24,982	29,131	32,661
55	Finance and insurance	7,420	7,317	7,891	7,679	8,804	10,755
56	Federal Reserve banks, credit intermediation, and related activities	276	317	341	359	423	438
57	Securities, commodity contracts, and investments	...	...	...	...	...	...
58	Insurance carriers and related activities	7,144	6,999	7,549	7,320	8,381	10,318
59	Funds, trusts, and other financial vehicles	...	...	...	...	...	...
60	Real estate and rental and leasing	15,787	18,026	19,703	17,303	20,327	21,906
61	Real estate	9,291	10,354	10,460	10,763	11,536	12,144
62	Housing	9,274	10,337	10,443	10,745	11,515	12,122
63	Other real estate	17	17	18	18	21	22
64	Rental and leasing services and lessors of intangible assets	6,496	7,673	9,242	6,540	8,791	9,762
65	Professional and business services	16,025	17,750	18,728	9,395	12,071	18,230
66	Professional, scientific, and technical services	1,505	1,517	1,544	1,565	1,592	1,788
67	Legal services	...	...	...	...	...	...
68	Computer systems design and related services	61	72	78	104	105	120
69	Miscellaneous professional, scientific, and technical services	1,444	1,445	1,465	1,461	1,487	1,668
70	Management of companies and enterprises	...	...	...	...	...	...
71	Administrative and waste management services	14,520	16,234	17,185	7,830	10,480	16,442
72	Administrative and support services	14,519	16,232	17,183	7,828	10,477	16,440
73	Waste management and remediation services	1	1	2	2	3	2
74	Educational services, health care, and social assistance	7,920	8,338	8,336	6,883	8,556	9,764
75	Educational services	7,528	7,933	7,911	6,501	8,080	9,253
76	Health care and social assistance	391	405	424	381	476	512
77	Ambulatory health care services	223	230	249	257	290	318
78	Hospitals	130	133	135	95	141	147
79	Nursing and residential care facilities	35	39	38	25	40	42
80	Social assistance	3	3	3	4	5	5
81	Arts, entertainment, recreation, accommodation, and food services	198,570	208,637	214,577	131,862	193,826	243,703
82	Arts, entertainment, and recreation	95,843	101,747	106,184	68,720	94,944	120,224
83	Performing arts, spectator sports, museums, and related activities	27,769	29,161	29,640	17,516	25,105	32,288
84	Amusements, gambling, and recreation industries	68,074	72,586	76,543	51,205	69,838	87,936
85	Accommodation and food services	102,727	106,889	108,393	63,142	98,882	123,479
86	Accommodation	61,412	63,860	66,024	38,096	52,883	71,006
87	Food services and drinking places	41,314	43,029	42,369	25,047	45,999	52,473
88	Other services, except government	8,086	8,269	8,744	8,461	9,866	10,322
89	Government	44,653	46,878	47,510	48,892	51,941	56,380
90	Federal	4,644	4,979	3,701	3,451	3,823	3,610
91	General government	4,337	4,678	3,408	3,223	3,556	3,329
92	National defense	0	0	0	0	0	1
93	Nondefense	4,337	4,678	3,408	3,222	3,555	3,329
94	Government enterprises	307	301	293	229	268	281
95	State and local	40,009	41,899	43,809	45,440	48,118	52,770
96	General government	38,443	40,341	42,277	44,383	46,895	51,367
97	Government enterprises	1,566	1,558	1,532	1,057	1,223	1,404

U.S. Bureau of Economic Analysis

NMED Exhibit 9

Table 1. Outdoor Recreation Value Added, Employment, and Compensation as a Percent of Total, 2022

	Total outdoor recreation value added (thousands of dollars)	Percent of total value added[1]	Total outdoor recreation employment	Percent of total wage and salary employment[1]	Total outdoor recreation compensation (thousands of dollars)	Percent of total compensation[1]
United States	**563,704,657**	**2.2**	**4,978,516**	**3.2**	**262,151,347**	**2.0**
Alabama	5,516,856	2.0	65,114	3.0	2,560,455	1.7
Alaska	2,610,538	4.0	20,515	5.9	1,207,018	3.9
Arizona	11,703,617	2.5	106,571	3.3	5,706,854	2.3
Arkansas	4,114,256	2.5	43,422	3.3	1,871,552	2.1
California	73,827,997	2.0	567,636	3.0	35,158,574	1.8
Colorado	13,859,200	2.8	129,773	4.3	6,926,246	2.6
Connecticut	4,581,621	1.4	45,776	2.6	2,107,861	1.3
Delaware	1,335,933	1.5	15,401	3.2	618,667	1.5
District of Columbia	1,436,765	0.9	11,933	1.5	847,431	0.8
Florida	52,357,522	3.6	465,853	4.8	26,468,410	3.5
Georgia	15,746,093	2.1	160,871	3.2	7,892,036	2.0
Hawaii	5,679,081	5.6	46,610	6.8	2,618,023	4.8
Idaho	3,440,090	3.1	35,530	4.1	1,553,101	2.7
Illinois	21,887,358	2.1	177,120	2.9	10,219,444	1.8
Indiana	16,026,854	3.4	111,982	3.4	7,500,957	3.2
Iowa	4,583,470	1.9	43,902	2.7	1,959,657	1.7
Kansas	3,875,517	1.9	36,663	2.4	1,494,894	1.4
Kentucky	5,094,427	2.0	51,975	2.5	2,241,217	1.6
Louisiana	7,900,277	2.7	57,580	2.9	2,697,779	1.9
Maine	3,323,442	3.9	32,274	5.0	1,457,138	3.1
Maryland	8,263,326	1.7	80,391	2.8	3,850,847	1.5
Massachusetts	11,765,249	1.7	102,687	2.7	5,959,434	1.5
Michigan	12,358,949	2.0	118,993	2.7	5,627,997	1.6
Minnesota	11,687,145	2.6	93,733	3.1	4,987,191	2.0
Mississippi	3,370,053	2.4	33,731	2.8	1,328,748	1.8
Missouri	8,823,128	2.2	89,866	3.0	4,165,873	1.9
Montana	2,885,878	4.3	29,453	5.6	1,383,838	3.9
Nebraska	2,752,586	1.7	27,921	2.7	1,220,256	1.6
Nevada	6,114,014	2.7	53,835	3.5	2,764,661	2.4
New Hampshire	3,314,514	3.2	30,852	4.4	1,482,831	2.5
New Jersey	12,636,284	1.7	122,048	2.8	6,600,430	1.6
New Mexico	2,400,955	1.9	27,977	3.2	1,133,258	1.8
New York	31,187,570	1.5	256,975	2.7	16,515,959	1.6
North Carolina	14,598,689	2.0	146,507	2.9	6,879,745	1.8
North Dakota	1,342,513	1.8	13,615	3.0	564,941	1.8
Ohio	17,173,254	2.1	154,668	2.7	7,261,876	1.7
Oklahoma	4,493,155	1.9	48,852	2.8	2,100,389	1.8
Oregon	7,502,130	2.5	72,737	3.6	3,760,711	2.3
Pennsylvania	16,863,190	1.8	164,344	2.7	7,706,323	1.5
Rhode Island	1,675,479	2.3	18,213	3.6	836,517	2.0
South Carolina	7,591,555	2.6	85,245	3.7	3,715,374	2.3
South Dakota	1,709,205	2.5	18,134	3.8	674,795	2.2
Tennessee	11,886,104	2.4	109,657	3.3	4,925,634	2.0
Texas	47,632,419	2.0	387,951	2.8	19,331,434	1.7
Utah	8,138,538	3.2	71,677	4.1	3,634,610	2.8
Vermont	1,859,515	4.6	15,340	4.8	712,848	3.1
Virginia	11,349,154	1.7	124,908	2.9	5,580,895	1.5
Washington	20,009,099	2.7	121,446	3.2	8,263,614	2.2
West Virginia	1,646,988	1.7	20,018	2.8	695,560	1.5
Wisconsin	9,752,298	2.5	94,042	3.1	4,659,255	2.1
Wyoming	2,020,807	4.1	16,202	5.6	718,190	3.5

1. Based on state-level data from gross domestic product, compensation, and employment estimates published September 29, 2023, on BEA's website, www.bea.gov.

U.S. Bureau of Economic Analysis

Table 2. Value-Added Outdoor Recreation, by State, Selected Activities, 2022

[Thousands of dollars]

	Total outdoor recreation activities[1]	Conventional outdoor recreation activities	Boating / fishing	RVing	Snow activities	Other outdoor recreation activities	Amusement parks / water parks	Festivals / sporting events / concerts	Game areas (including golf and tennis)	All other supporting outdoor recreation	Government expenditures
United States	**563,704,657**	**192,684,201**	**32,433,370**	**35,536,363**	**7,028,096**	**111,650,213**	**18,863,332**	**18,460,417**	**22,557,693**	**236,010,362**	**23,359,881**
Alabama	5,516,856	2,254,158	404,424	490,057	21,078	880,178	89,166	35,562	245,325	2,252,297	130,224
Alaska	2,610,538	417,107	101,653	97,544	26,818	336,722	17,488	9,227	14,120	1,822,592	34,117
Arizona	11,703,617	3,724,990	372,793	947,008	54,855	2,063,966	157,317	339,302	587,171	5,604,789	309,871
Arkansas	4,114,256	1,770,538	452,703	278,564	21,363	608,988	82,012	39,701	170,397	1,660,381	74,349
California	73,827,997	22,012,853	2,414,941	3,401,786	688,228	15,883,873	4,349,424	2,600,585	2,670,339	30,823,356	5,107,914
Colorado	13,859,200	4,819,340	526,353	743,593	1,442,972	2,330,459	216,417	362,588	498,649	6,115,891	593,511
Connecticut	4,581,621	1,804,429	323,719	177,615	63,766	943,898	80,591	109,966	253,163	1,753,545	79,748
Delaware	1,335,933	357,798	63,519	56,709	5,212	180,891	20,816	9,336	49,146	791,430	5,813
District of Columbia	1,436,765	143,598	20,335	10,562	2,860	292,958	12,749	171,303	11,572	892,768	107,442
Florida	52,357,522	14,181,725	4,448,803	2,298,710	156,030	12,583,234	5,827,275	1,321,576	2,186,108	22,920,999	2,671,564
Georgia	15,746,093	5,694,241	1,130,615	684,396	195,929	2,757,421	314,010	427,472	626,584	6,769,968	524,464
Hawaii	5,679,081	658,298	120,923	31,290	2,602	907,880	41,972	29,928	183,559	4,052,338	60,565
Idaho	3,440,090	1,455,395	199,153	444,929	81,634	516,317	94,098	26,815	119,641	1,425,762	42,618
Illinois	21,887,358	6,117,810	825,735	565,892	61,936	4,849,924	548,456	731,591	917,470	9,074,817	1,844,807
Indiana	16,026,854	9,950,169	1,423,251	5,860,716	237,212	2,208,635	169,593	332,575	357,867	3,721,899	146,151
Iowa	4,583,470	1,959,947	232,785	548,516	31,276	1,121,862	110,227	51,175	224,895	1,439,259	62,403
Kansas	3,875,517	1,381,940	196,410	155,109	14,445	631,511	58,766	26,430	153,809	1,789,003	73,063
Kentucky	5,094,427	1,779,296	209,852	253,316	11,940	931,855	88,661	124,490	173,127	2,311,684	71,591
Louisiana	7,900,277	2,130,879	413,766	348,856	8,965	1,066,423	108,545	256,706	177,568	4,573,890	129,085
Maine	3,323,442	1,210,056	412,405	326,023	68,102	324,206	35,052	24,895	73,480	1,759,292	29,888
Maryland	8,263,326	2,482,799	552,376	270,224	44,538	1,860,536	262,180	270,374	409,839	3,375,037	544,955
Massachusetts	11,765,249	3,665,396	727,954	293,284	135,315	2,860,642	211,710	651,176	781,982	4,952,277	286,934
Michigan	12,358,949	5,134,219	1,133,133	1,139,429	130,041	2,758,422	164,090	354,585	566,689	4,199,339	266,969
Minnesota	11,687,145	5,022,771	1,220,963	670,838	410,972	2,427,483	193,909	469,896	532,102	3,928,095	308,797
Mississippi	3,370,053	1,263,668	181,965	226,283	5,959	531,000	51,845	9,924	130,414	1,504,468	70,917
Missouri	8,823,128	3,382,061	667,379	481,166	30,975	2,146,738	302,684	437,995	369,335	3,082,230	212,097
Montana	2,885,878	1,046,014	140,306	290,625	62,698	405,193	18,080	12,335	90,663	1,392,311	42,358
Nebraska	2,752,586	1,133,183	176,204	139,037	44,280	536,653	41,471	25,552	143,455	1,052,323	30,428
Nevada	6,114,014	1,596,111	221,126	318,453	63,525	1,452,656	113,557	427,384	281,071	2,943,285	121,962
New Hampshire	3,314,514	1,420,205	158,571	285,655	199,798	557,506	101,770	41,559	147,789	1,327,555	9,247
New Jersey	12,636,284	4,162,160	733,523	350,044	121,205	2,935,348	444,136	454,241	673,434	4,992,164	546,611
New Mexico	2,400,955	722,669	64,438	213,151	60,543	321,919	50,430	34,099	70,031	1,281,206	75,162
New York	31,187,570	8,912,940	1,110,270	1,109,521	208,798	6,548,639	361,302	2,552,501	975,519	13,562,381	2,163,610
North Carolina	14,598,689	5,198,358	1,504,179	681,291	89,335	2,967,151	289,011	687,231	687,483	5,778,313	654,868
North Dakota	1,342,513	494,801	78,737	134,747	6,280	199,053	11,020	9,748	33,846	633,971	14,688
Ohio	17,173,254	6,004,841	788,061	1,011,319	94,403	3,907,617	647,364	583,116	875,637	6,452,243	808,553
Oklahoma	4,493,155	1,729,229	220,410	478,660	18,714	664,489	74,080	104,518	147,649	2,025,968	73,469
Oregon	7,502,130	3,006,647	422,010	934,018	149,819	1,352,140	124,908	205,773	286,983	2,874,017	269,325
Pennsylvania	16,863,190	6,076,247	575,541	863,745	207,804	3,826,581	483,443	732,860	827,539	6,505,860	454,502
Rhode Island	1,675,479	474,501	183,733	39,958	8,092	260,410	18,247	20,491	75,902	934,890	5,677
South Carolina	7,591,555	3,047,760	818,996	627,483	56,279	1,278,237	136,559	76,515	441,727	3,086,187	179,370
South Dakota	1,709,205	703,053	86,530	169,805	14,209	238,457	22,029	10,839	45,140	731,996	35,698
Tennessee	11,886,104	4,064,674	1,104,248	600,439	43,930	2,954,811	382,886	1,102,362	370,530	4,584,143	282,476
Texas	47,632,419	16,233,011	2,065,463	3,633,169	165,074	7,521,182	1,122,416	930,380	1,653,293	21,899,565	1,978,660
Utah	8,138,538	3,290,578	437,800	573,979	601,767	1,362,978	166,044	151,708	362,387	3,283,238	201,744
Vermont	1,859,515	682,287	52,949	109,462	243,933	191,976	8,769	16,615	69,530	981,885	3,367
Virginia	11,349,154	3,724,828	554,632	454,437	41,839	2,124,940	316,151	248,408	518,458	4,865,431	633,956
Washington	20,009,099	8,458,269	1,326,671	959,086	367,474	3,663,269	160,913	446,404	737,234	7,171,351	716,211
West Virginia	1,646,988	575,082	59,895	84,348	17,598	240,454	26,397	20,421	54,272	803,635	27,817
Wisconsin	9,752,298	4,569,058	709,804	552,826	83,642	1,910,362	122,968	335,130	447,632	3,108,454	164,423
Wyoming	2,020,807	582,216	61,364	118,690	102,037	222,169	10,328	5,054	56,140	1,140,579	75,843

1. Total outdoor recreation activities includes core activities, supporting activities, and activities with secondary production that are designated as outdoor recreation.

U.S. Bureau of Economic Analysis

Table 3. Value-Added Outdoor Recreation, by State, Selected Industries, 2022

[Thousands of dollars]

	Total outdoor recreation industries	Private industries	Manufacturing	Retail trade	Finance, insurance, real estate, rental, and leasing	Arts, entertainment, and recreation	Accommodation and food services	All other private industries	Government
United States	**563,704,657**	**537,240,845**	**77,632,580**	**153,627,258**	**22,270,840**	**66,846,560**	**77,638,198**	**139,225,406**	**26,463,812**
Alabama	5,516,856	5,367,411	704,022	2,047,166	243,367	303,684	788,016	1,281,157	149,444
Alaska	2,610,538	2,400,584	90,895	370,945	92,401	164,654	456,129	1,225,561	209,954
Arizona	11,703,617	11,359,875	688,103	3,710,863	657,594	1,146,666	1,925,556	3,231,092	343,742
Arkansas	4,114,256	4,025,020	695,119	1,294,013	158,879	287,357	543,605	1,046,047	89,236
California	73,827,997	67,794,200	9,801,531	19,133,187	1,694,547	9,447,234	9,834,462	17,883,239	6,033,797
Colorado	13,859,200	13,166,064	748,470	3,231,694	636,580	2,492,818	2,497,811	3,558,689	693,136
Connecticut	4,581,621	4,489,332	483,593	1,431,670	313,204	567,179	680,117	1,013,569	92,288
Delaware	1,335,933	1,324,030	139,805	389,386	149,531	81,572	328,514	235,222	11,903
District of Columbia	1,436,765	1,321,497	4,937	200,775	21,265	220,418	692,671	181,432	115,268
Florida	52,357,522	49,491,186	2,388,734	12,038,626	2,673,772	9,801,638	9,037,764	13,550,650	2,866,336
Georgia	15,746,093	15,171,163	1,992,611	4,230,002	484,772	1,437,297	2,118,409	4,908,072	574,930
Hawaii	5,679,081	5,597,373	94,386	874,036	161,529	470,971	1,491,161	2,505,288	81,708
Idaho	3,440,090	3,390,957	379,835	1,083,457	159,381	339,884	592,188	836,209	49,134
Illinois	21,887,358	19,958,085	2,750,285	4,641,640	742,617	2,383,512	2,717,517	6,722,514	1,929,273
Indiana	16,026,854	15,855,983	9,193,219	2,628,400	288,771	884,666	877,680	1,983,248	170,871
Iowa	4,583,470	4,505,868	779,694	1,375,235	247,066	444,628	332,107	1,327,137	77,602
Kansas	3,875,517	3,789,091	1,005,871	1,049,308	214,201	229,159	368,749	921,801	86,427
Kentucky	5,094,427	5,005,211	857,123	1,579,205	144,962	378,207	650,660	1,395,053	89,216
Louisiana	7,900,277	7,738,324	2,702,271	1,871,839	206,385	624,109	645,822	1,687,897	161,953
Maine	3,323,442	3,284,634	352,202	849,632	310,532	217,191	1,094,495	460,581	38,809
Maryland	8,263,326	7,668,877	362,221	2,206,428	390,447	1,402,893	1,396,001	1,910,887	594,449
Massachusetts	11,765,249	11,435,672	1,019,691	2,953,398	588,471	1,714,731	2,010,251	3,149,130	329,577
Michigan	12,358,949	12,058,080	1,932,015	4,114,851	851,201	1,263,617	1,170,074	2,726,323	300,869
Minnesota	11,687,145	11,338,398	2,584,664	2,890,449	452,801	1,230,672	951,633	3,228,177	348,748
Mississippi	3,370,053	3,287,820	882,051	1,102,405	111,243	207,957	323,203	660,962	82,233
Missouri	8,823,128	8,586,877	1,323,095	2,671,983	384,686	1,126,160	956,033	2,124,920	236,251
Montana	2,885,878	2,838,963	353,455	664,085	114,129	291,158	660,222	755,914	46,915
Nebraska	2,752,586	2,710,301	490,125	765,426	161,957	213,342	274,871	804,582	42,285
Nevada	6,114,014	5,967,914	164,576	1,628,497	189,784	1,141,096	906,043	1,937,918	146,101
New Hampshire	3,314,514	3,300,919	278,293	855,375	297,067	458,764	849,125	562,295	13,594
New Jersey	12,636,284	12,043,699	1,272,294	3,715,338	634,512	1,901,656	1,129,432	3,390,468	592,585
New Mexico	2,400,955	2,301,511	115,551	733,362	115,114	198,267	578,157	561,060	99,444
New York	31,187,570	28,900,592	1,330,209	8,641,259	1,557,099	4,156,080	6,476,627	6,739,319	2,286,978
North Carolina	14,598,689	13,882,620	2,386,492	4,065,296	623,709	1,732,528	1,749,138	3,325,458	716,069
North Dakota	1,342,513	1,321,411	99,103	442,737	43,600	102,038	202,385	431,548	21,102
Ohio	17,173,254	16,275,434	3,217,646	4,868,110	802,879	2,359,047	1,376,211	3,651,542	897,820
Oklahoma	4,493,155	4,383,309	475,874	1,554,876	164,117	308,110	381,417	1,498,916	109,846
Oregon	7,502,130	7,208,267	709,002	2,377,710	225,344	833,418	1,275,361	1,787,430	293,862
Pennsylvania	16,863,190	16,355,539	2,307,568	5,304,088	693,520	2,241,578	1,810,226	3,998,558	507,651
Rhode Island	1,675,479	1,666,617	136,696	408,435	85,001	148,474	531,483	356,528	8,861
South Carolina	7,591,555	7,385,106	1,063,817	2,190,524	359,788	697,971	1,587,218	1,485,789	206,449
South Dakota	1,709,205	1,667,001	139,337	546,499	53,857	117,082	390,546	419,681	42,204
Tennessee	11,886,104	11,578,240	1,673,123	3,348,851	265,539	2,080,865	1,834,934	2,374,929	307,864
Texas	47,632,419	45,355,140	10,328,302	13,378,006	1,384,889	3,972,530	4,422,105	11,869,309	2,277,279
Utah	8,138,538	7,903,134	1,357,481	2,410,801	277,317	944,218	925,209	1,988,109	235,404
Vermont	1,859,515	1,850,038	105,870	396,647	169,985	193,721	666,036	317,778	9,477
Virginia	11,349,154	10,638,686	917,452	3,292,737	368,902	1,158,914	1,717,063	3,183,619	710,467
Washington	20,009,099	19,185,813	2,271,704	8,454,462	529,599	1,382,788	1,749,247	4,798,012	823,286
West Virginia	1,646,988	1,614,042	84,043	599,125	96,068	125,475	229,737	479,595	32,945
Wisconsin	9,752,298	9,561,630	1,975,920	2,695,419	631,603	966,054	928,408	2,364,228	190,668
Wyoming	2,020,807	1,933,302	422,202	318,999	45,259	252,511	506,370	387,963	87,504

Note. The estimates are based on the 2017 North American Industry Classification System.

U.S. Bureau of Economic Analysis

Table 4. Employment, Outdoor Recreation, by State, Selected Industries, 2022

	Total outdoor recreation industries	Private industries	Manufacturing	Retail trade	Finance, insurance, real estate, rental, and leasing	Arts, entertainment, and recreation	Accommodation and food services	All other private industries	Government
United States	**4,978,516**	**4,700,918**	**271,452**	**1,686,777**	**53,801**	**961,309**	**943,175**	**784,404**	**277,599**
Alabama	65,114	62,456	4,533	26,601	601	9,214	12,633	8,874	2,659
Alaska	20,515	19,525	289	4,673	186	3,223	5,564	5,590	990
Arizona	106,571	102,563	3,059	36,497	1,578	19,167	25,822	16,442	4,007
Arkansas	43,422	42,230	5,077	15,323	346	6,409	8,991	6,084	1,192
California	567,636	517,536	22,876	180,330	5,381	106,915	110,091	91,942	50,099
Colorado	129,773	121,303	3,165	34,698	1,981	32,288	28,028	21,143	8,470
Connecticut	45,776	44,698	1,503	19,149	595	10,015	7,639	5,795	1,078
Delaware	15,401	15,275	321	5,757	163	2,392	5,026	1,613	126
District of Columbia	11,933	11,220	(D)	2,657	55	1,281	5,526	(D)	713
Florida	465,853	444,377	16,648	127,319	5,555	120,542	101,396	72,917	21,475
Georgia	160,871	151,419	10,106	54,233	1,699	28,280	30,038	27,064	9,451
Hawaii	46,610	45,817	468	12,638	632	7,009	13,987	11,084	793
Idaho	35,530	34,994	2,824	11,423	341	7,528	8,062	4,816	537
Illinois	177,120	157,492	7,911	61,268	2,094	27,524	26,028	32,667	19,628
Indiana	111,982	108,787	39,523	29,496	845	13,130	14,128	11,665	3,195
Iowa	43,902	42,779	5,382	16,747	483	7,553	6,182	6,433	1,122
Kansas	36,663	34,792	3,043	14,055	321	5,854	6,024	5,493	1,871
Kentucky	51,975	50,668	2,723	19,926	413	9,196	10,150	8,261	1,307
Louisiana	57,580	55,113	2,540	22,431	486	8,253	10,766	10,635	2,467
Maine	32,274	31,870	2,534	9,012	369	5,581	11,311	3,063	404
Maryland	80,391	74,969	1,536	31,306	796	14,639	15,147	11,544	5,423
Massachusetts	102,687	100,230	4,127	36,365	1,195	21,846	18,421	18,276	2,458
Michigan	118,993	114,424	8,028	46,571	1,731	24,021	17,504	16,569	4,569
Minnesota	93,733	89,407	7,624	31,519	909	19,985	12,867	16,503	4,325
Mississippi	33,731	32,773	3,070	14,353	249	3,567	6,543	4,989	958
Missouri	89,866	85,134	7,894	32,082	938	15,396	15,455	13,369	4,732
Montana	29,453	29,086	997	8,121	319	5,587	9,490	4,572	368
Nebraska	27,921	27,349	2,347	9,874	257	5,481	4,359	5,032	573
Nevada	53,835	52,285	922	17,739	566	12,566	10,786	9,707	1,550
New Hampshire	30,852	30,666	1,280	9,710	468	7,693	7,725	3,789	186
New Jersey	122,048	116,249	4,532	48,226	1,486	26,835	15,223	19,946	5,799
New Mexico	27,977	26,812	428	9,470	235	4,272	8,501	3,907	1,165
New York	256,975	234,057	6,369	93,360	2,525	42,820	50,322	38,660	22,918
North Carolina	146,507	136,714	7,687	51,744	1,398	29,379	27,221	19,287	9,792
North Dakota	13,615	13,257	279	5,230	85	2,717	2,848	2,098	358
Ohio	154,668	142,294	8,555	54,414	2,190	32,120	22,265	22,751	12,375
Oklahoma	48,852	47,295	2,162	19,039	615	7,495	7,544	10,441	1,557
Oregon	72,737	69,801	4,877	24,722	517	12,564	16,049	11,072	2,936
Pennsylvania	164,344	158,765	8,043	58,718	1,790	39,936	25,956	24,321	5,578
Rhode Island	18,213	18,140	864	5,415	214	2,995	6,436	2,216	73
South Carolina	85,245	81,889	6,985	27,158	754	15,856	21,186	9,948	3,356
South Dakota	18,134	17,732	665	6,544	112	3,141	4,920	2,350	402
Tennessee	109,657	105,402	8,513	37,104	918	20,626	22,628	15,611	4,256
Texas	387,951	362,375	15,878	148,038	4,580	70,918	59,253	63,708	25,576
Utah	71,677	67,811	4,408	20,472	908	15,703	12,956	13,366	3,866
Vermont	15,340	15,281	694	4,585	254	1,849	5,940	1,961	59
Virginia	124,908	113,832	2,824	42,865	1,156	24,237	23,446	19,303	11,076
Washington	121,446	115,593	6,452	43,712	1,053	20,452	17,873	26,051	5,852
West Virginia	20,018	19,534	294	8,404	163	3,206	4,148	3,318	484
Wisconsin	94,042	91,298	8,311	31,705	1,170	19,198	16,353	14,561	2,745
Wyoming	16,202	15,552	(D)	3,980	125	2,857	6,419	(D)	650

(D) Data are suppressed to avoid disclosure of confidential information.

Note. The estimates are based on the 2017 North American Industry Classification System.

U.S. Bureau of Economic Analysis

Table 5. Compensation, Outdoor Recreation, by State, Selected Industries, 2022

[Thousands of dollars]

	Total outdoor recreation industries	Private industries	Manufacturing	Retail trade	Finance, insurance, real estate, rental, and leasing	Arts, entertainment, and recreation	Accommodation and food services	All other private industries	Government
United States	**262,151,347**	**240,308,469**	**26,053,285**	**68,618,929**	**4,545,357**	**43,623,829**	**36,896,237**	**60,570,832**	**21,842,878**
Alabama	2,560,455	2,442,025	327,743	964,891	39,661	233,949	368,529	507,252	118,430
Alaska	1,207,018	1,104,013	24,810	196,991	11,081	120,879	242,494	507,757	103,004
Arizona	5,706,854	5,448,513	311,861	1,656,225	114,290	935,045	1,056,011	1,375,082	258,341
Arkansas	1,871,552	1,806,532	332,768	592,340	17,287	193,839	248,005	422,292	65,020
California	35,158,574	30,569,573	2,860,671	7,956,571	441,784	6,274,812	5,178,111	7,857,624	4,589,001
Colorado	6,926,246	6,379,138	274,894	1,511,166	180,535	1,532,451	1,240,635	1,639,457	547,108
Connecticut	2,107,861	2,031,989	171,168	703,271	87,465	344,704	290,739	434,642	75,871
Delaware	618,667	609,277	33,225	210,333	10,902	73,631	173,475	107,711	9,390
District of Columbia	847,431	768,175	(D)	109,311	4,357	205,279	333,021	(D)	79,256
Florida	26,468,410	24,629,992	1,266,997	5,584,577	391,738	7,048,701	4,332,001	6,005,980	1,838,418
Georgia	7,892,036	7,425,212	807,473	1,998,200	133,727	1,097,448	1,017,748	2,370,617	466,824
Hawaii	2,618,023	2,557,837	27,498	433,900	33,496	294,264	758,035	1,010,647	60,187
Idaho	1,553,101	1,518,980	205,132	503,476	21,136	224,029	253,525	311,682	34,121
Illinois	10,219,444	8,733,111	909,684	2,193,937	249,170	1,357,091	1,051,093	2,972,135	1,486,333
Indiana	7,500,957	7,364,540	4,367,804	1,174,231	65,053	512,280	439,643	805,527	136,417
Iowa	1,959,657	1,897,424	443,675	629,355	44,049	182,318	171,855	426,173	62,233
Kansas	1,494,894	1,424,321	245,202	478,018	25,110	152,487	168,033	355,470	70,573
Kentucky	2,241,217	2,171,242	264,135	739,409	27,511	343,505	303,094	493,587	69,975
Louisiana	2,697,779	2,568,754	336,144	836,969	30,691	356,752	333,384	674,815	129,025
Maine	1,457,138	1,429,988	202,111	369,679	24,857	170,050	484,459	178,833	27,150
Maryland	3,850,847	3,371,309	133,206	1,056,503	76,754	628,462	616,201	860,185	479,538
Massachusetts	5,959,434	5,703,889	464,036	1,509,004	144,036	1,135,404	897,267	1,554,143	255,545
Michigan	5,627,997	5,384,821	763,668	1,856,095	127,855	854,654	566,161	1,216,391	243,176
Minnesota	4,987,191	4,706,948	756,027	1,265,471	78,277	827,807	424,389	1,354,978	280,243
Mississippi	1,328,748	1,273,235	247,583	503,246	14,130	76,812	168,715	262,749	55,513
Missouri	4,165,873	3,976,022	608,708	1,226,225	67,575	682,721	528,150	862,643	189,851
Montana	1,383,838	1,354,392	84,487	338,078	16,713	224,101	386,082	304,932	29,445
Nebraska	1,220,256	1,187,647	210,966	372,630	19,628	143,840	128,020	312,563	32,609
Nevada	2,764,661	2,660,150	72,160	734,301	36,345	562,307	494,399	760,640	104,510
New Hampshire	1,482,831	1,472,640	141,796	426,818	54,101	239,900	293,073	316,952	10,191
New Jersey	6,600,430	6,081,356	465,031	1,802,773	169,036	1,375,931	635,997	1,632,589	519,074
New Mexico	1,133,258	1,060,651	32,409	375,180	14,898	127,034	286,963	224,166	72,607
New York	16,515,959	13,319,631	668,892	3,889,115	243,129	2,604,585	2,583,458	3,330,451	3,196,329
North Carolina	6,879,745	6,314,635	602,944	2,028,842	104,713	1,277,670	892,689	1,407,777	565,110
North Dakota	564,941	549,439	27,051	206,481	5,439	73,284	83,696	153,487	15,502
Ohio	7,261,876	6,523,997	793,162	2,054,279	225,594	1,303,206	661,811	1,485,944	737,879
Oklahoma	2,100,389	2,018,483	179,892	732,425	47,560	259,834	210,038	588,735	81,906
Oregon	3,760,711	3,526,812	393,726	1,206,346	36,047	449,418	590,775	850,500	233,899
Pennsylvania	7,706,323	7,286,650	743,941	2,150,482	171,012	1,533,328	892,453	1,795,432	419,673
Rhode Island	836,517	829,760	78,986	207,061	23,513	103,004	253,860	163,335	6,757
South Carolina	3,715,374	3,551,493	650,030	1,044,088	47,849	468,070	736,025	605,431	163,882
South Dakota	674,795	647,820	56,152	241,190	6,822	73,926	135,144	134,585	26,975
Tennessee	4,925,634	4,699,170	718,760	1,303,774	66,078	876,117	807,797	926,643	226,464
Texas	19,331,434	17,305,325	1,484,846	5,869,584	404,931	2,778,195	2,058,463	4,709,306	2,026,109
Utah	3,634,610	3,468,821	397,101	1,002,513	67,755	621,092	452,573	927,788	165,789
Vermont	712,848	708,598	58,290	190,103	24,223	53,429	245,720	136,835	4,250
Virginia	5,580,895	5,005,674	223,981	1,557,513	93,032	877,257	834,140	1,419,751	575,221
Washington	8,263,614	7,595,217	616,468	2,987,229	84,760	843,761	723,969	2,339,029	668,397
West Virginia	695,560	673,282	21,664	283,950	10,869	81,721	115,341	159,736	22,278
Wisconsin	4,659,255	4,504,865	905,827	1,208,529	100,928	722,348	481,002	1,086,229	154,390
Wyoming	718,190	665,098	(D)	146,252	7,855	91,096	267,974	(D)	53,092

(D) Data are suppressed to avoid disclosure of confidential information.

Note. The estimates are based on the 2017 North American Industry Classification System.

U.S. Bureau of Economic Analysis

National Park Service
U.S. Department of the Interior

Science Report NPS/SR—2024/174
https://doi.org/10.36967/2305351

2023 National Park Visitor Spending Effects

Economic Contributions to Local Communities, States, and the Nation

Two visitors walk among a field of desert gold during a rare spring super bloom at Death Valley National Park.
NPS / KURT MOSES

2023 national park visitor spending effects: Economic contributions to local communities, states, and the nation

Science Report NPS/SR—2024/174

Matthew Flyr, Lynne Koontz

National Park Service
Environmental Quality Division
Fort Collins, Colorado

Please cite this publication as:

Flyr, M., and L. Koontz. 2024. 2023 national park visitor spending effects: Economic contributions to local communities, states, and the nation. Science Report NPS/SR—2024/174. National Park Service, Fort Collins, Colorado. https://doi.org/10.36967/2305351

NPS 999/194564, August 2024

The National Park Service Science Report Series disseminates information, analysis, and results of scientific studies and related topics concerning resources and lands managed by the National Park Service. The series supports the advancement of science, informed decisions, and the achievement of the National Park Service mission.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible and technically accurate.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, US Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the US Government.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

This report is available in digital format from the National Park Service DataStore and the Natural Resource Publications Management website. If you have difficulty accessing information in this publication, particularly if using assistive technology, please email irma@nps.gov.

Contents

Figures

Page

Tables

Page

Abstract

The National Park Service (NPS) manages the Nation's most iconic destinations that attract millions of visitors from across the Nation and around the world. Trip-related spending by NPS visitors generates and supports economic activity within park gateway communities. This report summarizes the annual economic contribution analysis that measures how NPS visitor spending cycles through local economies, generating business sales and supporting jobs and income.

In 2023, the National Park System received 325.5 million recreation visits (up 4% from 2022). Visitors to national parks spent an estimated $26.4 billion in local gateway regions (up 10% from 2022). The estimated contribution of this spending to the national economy was 415,400 jobs, $19.4 billion in labor income, $32 billion in value added, and $55.6 billion in economic output. The lodging sector saw the highest direct effects, with $9.9 billion in economic output directly contributed to this sector nationally. The restaurants sector saw the next greatest effects, with $5.2 billion in economic output directly contributed to this sector nationally.

Results from the Visitor Spending Effects report series are available online via an interactive tool. Users can view year-by-year trend data and explore current year visitor spending, jobs, labor income, value added, and economic output effects by sector for national, state, and local economies. The interactive tool is available at https://www.nps.gov/subjects/socialscience/vse.htm.

Acknowledgments

The authors would like to acknowledge and thank Kyle Enns with the U.S. Geological Survey Information Science Branch for his help with the VSE model and website this year, and Evan Stockmoe and Kate Phillips with Colorado State University's Department of Agricultural and Resource Economics for assistance with developing the new VSE profiles.

Introduction

The National Park System includes 429 areas covering more than 85 million acres. Park units can be found in every state, the District of Columbia, American Samoa, Guam, Puerto Rico, and the U.S. Virgin Islands. Lands managed by the National Park Service (NPS) serve as recreation destinations for visitors from across the Nation and around the world. On vacations or on day trips, NPS visitors spend time and money in the communities surrounding NPS sites. Spending by NPS visitors generates and supports economic activity within these gateway economies. The NPS has been measuring and reporting visitor spending and economic effects for more than 30 years. Early analyses estimated economic contributions at individual units using the Money Generation Model; beginning in 2005, the first NPS system-wide estimates were developed using the Money Generation Model version 2 (MGM2); since 2012, annual system-wide analyses have been developed using the Visitor Spending Effects (VSE) model (Koontz et al., 2017). This report summarizes VSE estimates associated with 2023 NPS visitation.

In 2023, the National Park Service received 325,498,646 recreation visits, up 13 million visits (4%) from 2022. In addition to the rise in visitation, NPS data shows that off-season visitation in the spring and fall increased at many parks compared to previous years. Of the 429 parks in the National Park System, 400 parks counted visitors in 2023. For the first time, there are now parks reporting their visitation numbers from all 50 states, the District of Columbia, and four US territories.

This report begins with an overview of economic effects analyses, the VSE methodology, and data sources. Estimates of 2023 NPS system-wide visitor spending and resulting economic effects at the national level are then summarized. The report concludes with a description of current data limitations. Park and state-level spending and economic effects estimates are included in the appendix.

Results from the Visitor Spending Effects report series are also available online via an interactive tool. Users can view year-by-year trend data and explore current year visitor spending, jobs, labor income, value added, and economic output effects by sector for national, state, and local economies. The interactive tool is available at https://www.nps.gov/subjects/socialscience/vse.htm.

New this year – In 2022, the NPS Social Science Program began implementing Socioeconomic Monitoring (SEM) of park visitors to help the public, individual parks, NPS leadership, and other decision makers to better understand socioeconomic trends over time. Central to the effort is sampling via visitor surveys at 24 park units per year. This year's VSE analysis incorporates new visitor survey data for the 24 SEM parks surveyed in 2023.

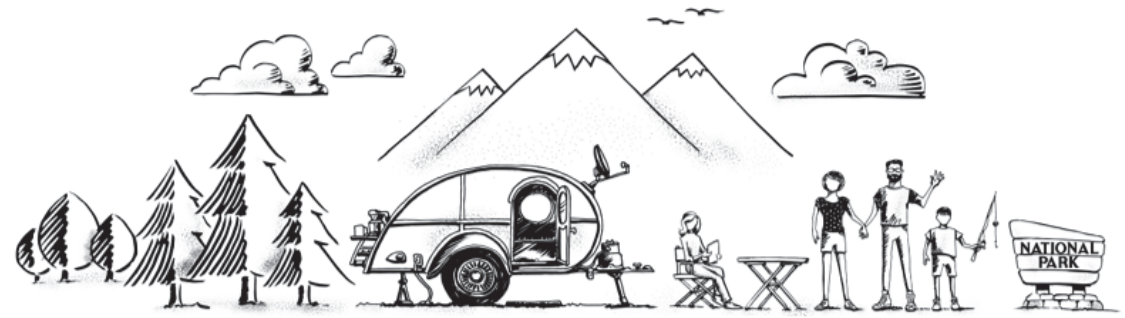
The 2023 VSE analysis incorporates five parks that began reporting official visitor statistics in 2023: First State National Historical Park in Delaware and Pennsylvania, Harriet Tubman Underground Railroad National Historical Park in Maryland, Mill Springs Battlefield National Monument in Kentucky, Pullman National Historical Park in Illinois, and Tule Lake National Monument in California.

Overview of Economic Effects Analyses

Visitors to NPS sites spend money in local gateway regions, and these expenditures generate and support economic activity within these local economies. Economies are complex webs of interacting consumers and producers in which goods produced by one sector become inputs to other sectors, and the goods produced by those sectors can become inputs to yet other sectors. Thus, a change in the final demand for a good or service can generate a ripple effect throughout an economy as businesses purchase inputs from one another. For example, when visitors come to an area to visit a park or historic site, these visitors spend money to purchase various goods and services. The business activity resulting from these direct purchases from local businesses represent the *direct* effects of visitor spending within an economy. To provide supplies to local businesses to produce their goods and services, suppliers must purchase inputs from other industries, thus creating additional *indirect* effects of visitor spending within the economy. Additionally, employees of directly affected businesses and input suppliers use their income to purchase goods and services in the local economy, generating further *induced* effects of visitor spending. The sums of the indirect and induced effects give the *secondary* effects of visitor spending; and the sums of the direct and secondary effects give the total economic effect of visitor spending in a local economy. Economic input-output models capture these complex interactions between producers and consumers within a defined regional economy and describe the secondary effects of visitor spending through regional economic multipliers. Figure 1 illustrates how NPS visitor spending supports jobs and business activity in local economies.

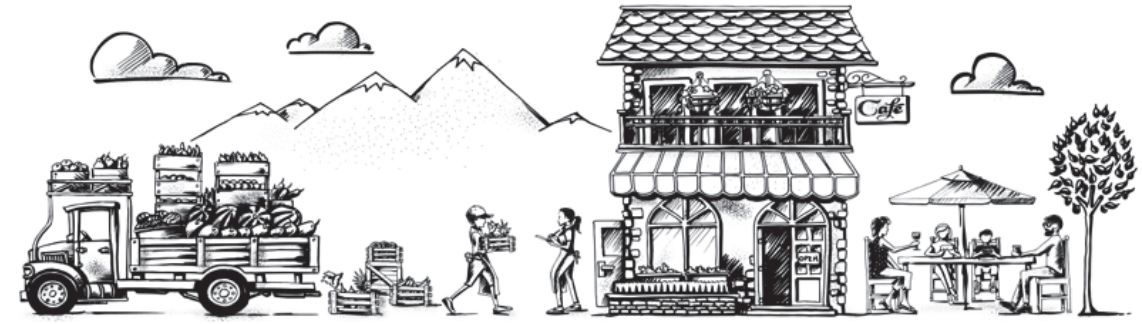
Economic contribution analyses describe the gross economic activity associated with NPS visitor spending in a regional economy. Results can be interpreted as the relative magnitude and importance of the economic activity generated through NPS visitor spending in the regional economy. Economic contributions are estimated by multiplying total visitor spending by regional economic multipliers. Total visitor spending includes spending by both local visitors who live in gateway regions and non-local visitors who travel to NPS sites from outside gateway regions.

An economic contributions analysis should not be confused with an economic impact analysis. Economic impact analyses estimate the net changes to the economic base of a regional economy that can be attributed to the inflow of new money to the economy solely from non-local visitors. Economic impact analyses are commonly used to examine how local economies are affected by changes in visitation, whereas economic contribution analyses examine the importance of the park to the economy “as is”. The economic contributions of NPS visitor spending are provided in this report. Table 6 in the appendix provides estimates of the percent of visitor spending for each park that are made by non-local visitors.

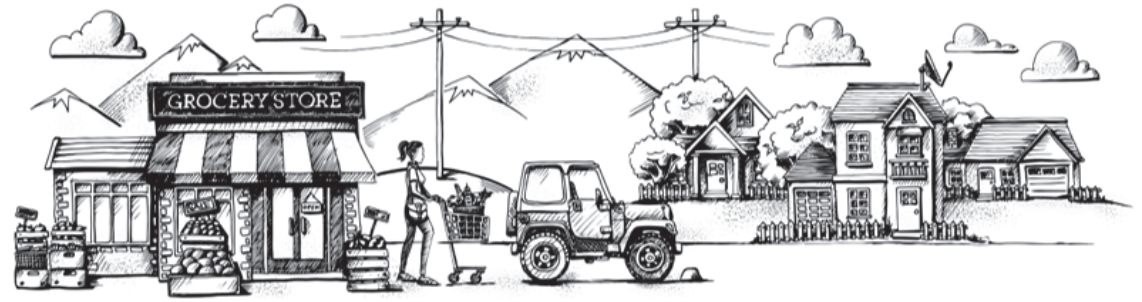


Millions of visitors visit NPS sites each year.

NPS visitors spend money in local communities. The locally retained sales, income and jobs resulting from these purchases represent the direct effects of visitor spending.



Additional jobs and economic activity are supported when businesses purchase supplies and services from other local businesses, thus creating indirect effects of visitor spending.



Employees use their income to purchase goods and services in the local economy, generating further induced effects of visitor spending.

Figure 1. How NPS visitor spending supports jobs and business activity in local economies. (Illustrations by Shepherd Wolfe).

Four types of regional economic effects are described in this report:

- **Jobs** measure annualized full and part time jobs that are supported by NPS visitor spending.
- **Labor Income** includes employee wages, salaries and payroll benefits, as well as the incomes of proprietors that are supported by NPS visitor spending.
- **Value Added** measures the contribution of NPS visitor spending to the Gross Domestic Product (GDP) of a regional economy. Value added is equal to the difference between the amount an industry sells a product for and the production cost of the product.
- **Economic Output** is a measure of the total estimated value of the production of goods and services supported by NPS visitor spending. Economic output is the sum of all intermediate sales (business to business) and final demand (sales to consumers and exports).

Note that these effects, and this report, describe only the economic contribution of visitor spending to local economies. This is only one piece of the overall economic benefit of national parks, which also includes net economic value, or consumer surplus, commonly categorized as use values (benefits derived from direct or indirect use of NPS sites) and passive use values (benefits derived from knowing NPS sites exist and will be preserved) (Richardson et al., 2018).

Data Sources and Methods

Three key pieces of information are required to estimate the economic effects of NPS visitor spending: spending patterns and trip characteristics derived from visitor survey data (VSE profiles), park visitation data, and regional economic multipliers that describe the economic effects of visitor spending in local economies (Figure 2). Steps for visitor spending estimation include segmenting visitors into distinct lodging-based segments that describe differences in spending patterns (e.g., day-trips, staying overnight in local lodging, or camping); transforming visitor count data and spending data into common units of measure; and determining the portion of time and trip expenditures spent in local gateway areas that can be attributed to national park visitation (see Cullinane Thomas et al., 2019 for additional details).

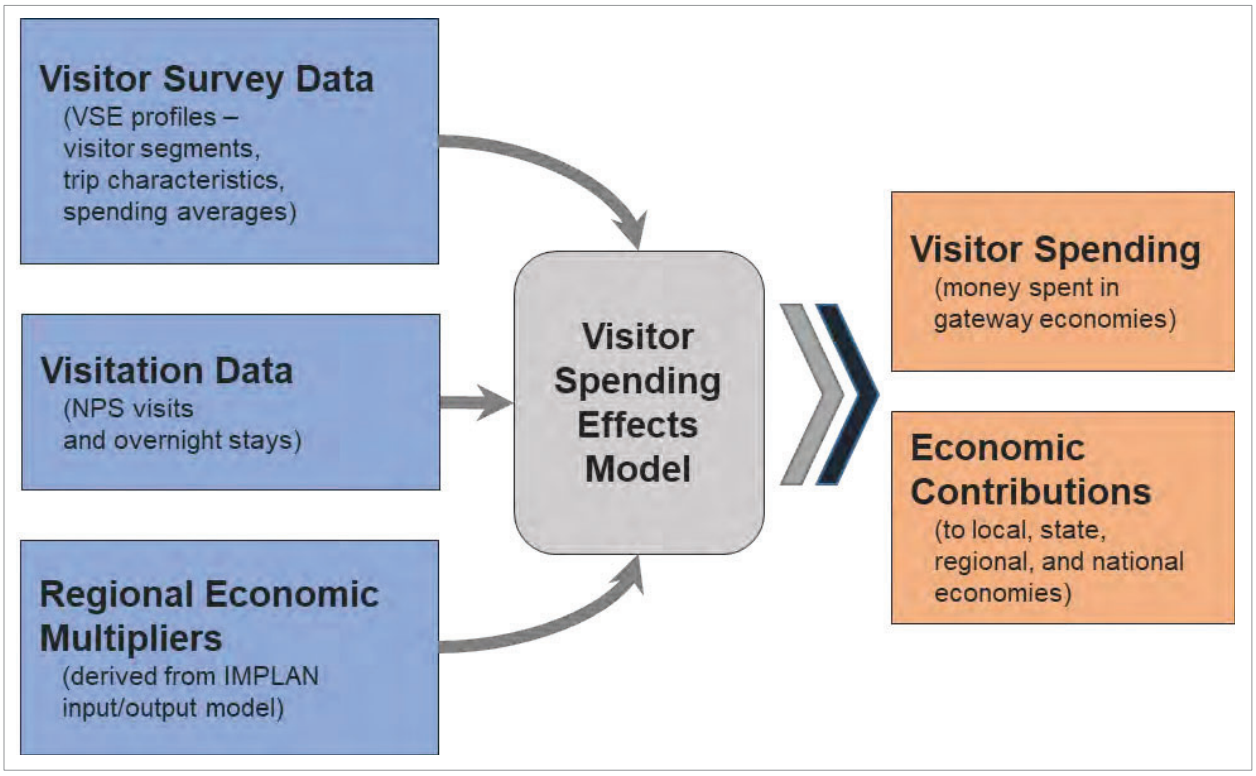


Figure 2. Schematic of the Visitor Spending Effects Model used to estimate the economic contributions of NPS visitor spending.

Visitor Survey Data

Visitor survey data are used to derive VSE profiles that describe visitor spending patterns and trip characteristics (see Cullinane Thomas et al., 2019 for additional details). VSE profiles are developed for lodging-based visitor segments to help account for differences in spending across trip types. NPS recreation visits are split into the following seven visitor segments:

- *Local Day Trip*: local visitors who visit the park for a single day and return home,
- *Non-Local Day Trip*: non-local visitors who visit the park for a single day and leave the area or return home,
- *NPS Lodge*: local or non-local visitors who stay at a lodge or motel within the park,
- *NPS Campground*: local or non-local visitors who stay at campgrounds or at backcountry camping sites within the park,
- *Lodge Outside Park*: local or non-local visitors who stay at motels, hotels, bed and breakfasts, glamping sites, or other specialty lodging located outside of the park,
- *Camp Outside Park*: local or non-local visitors who camp outside of the park, including developed campsites and dispersed camping on public land, and
- *Other*: visitors who stay overnight in the local region but do not have any lodging expenses. This segment includes visitors staying in private homes, with friends or relatives, or in other unpaid lodging.

Visitor spending profiles describe average expenditures made by national park visitors within local gateway regions surrounding parks and are expressed in terms of spending per party per day for visitors on day trips and spending per party per night for visitors on overnight trips. Spending profiles are reported for the following eight spending categories[1]:

- Lodging (hotels, motels, and specialty lodging),
- Camping fees (NPS and non-NPS campgrounds),
- Restaurants,
- Groceries,
- Gas,
- Transportation (local transportation only),
- Recreation Industries (e.g., equipment rental, amusement activities, and guide/tour fees), and
- Retail (e.g., souvenirs, sporting goods, and other retail purchases).

[1] Individual park profiles may include additional spending categories to account for unique spending opportunities in the local area. Annual NPS entrance passes can cover NPS park entrance fees at multiple parks throughout the year; therefore, NPS entrance fees are excluded from individual park profiles.

NPS Socioeconomic Monitoring (SEM) surveys are increasing the availability of park-specific VSE profiles (see https://www.nps.gov/subjects/socialscience/socioeconomic-monitoring.htm for more information about SEM). This VSE analysis incorporates new spending data for the 24 SEM parks surveyed in 2023 (Table 1). For more information on VSE profile development, see Cullinane Thomas et al. (2019)[2]. As of 2023, VSE estimates for 118 park units utilize primary survey data (see Table 5 in the appendix).

Table 1. Park units with new profiles in 2023.

Park Unit	Previous Profile
Aztec Ruins NM	No Stay
Badlands NP	Camp Only
Canyon De Chelly NM	Camp Only
Cuyahoga Valley NP	Primary data: Cuyahoga Valley SEM Pilot survey, 2015
Delaware Water Gap NRA	Primary data: Delaware Water Gap VSP survey, 2010
Dinosaur NM	Camp Only
Everglades NP	Modified version of Camp & Lodge profile
Federal Hall NMEM	No Stay
Fort Donelson NB	Camp Only
Franklin Delano Roosevelt MEM	D.C. Area (modified version of No Stay profile)
Gauley River NRA	Recreation Area
Golden Gate NRA	Primary data: Golden Gate SEM Pilot survey, 2016
Great Basin NP	Camp Only
Greenbelt P	Camp Only
Grant-Kohrs Ranch NHS	No Stay
George Washington MEM PKWY	Custom Parkway profile
Klondike Gold Rush NHP	Primary data: Klondike Gold Rush SEM Pilot survey, 2016
Lassen Volcanic NP	Camp Only
Mary McLeod Bethune Council House NHS	D.C. Area (modified version of No Stay profile)
National Capital Parks East	D.C. Area (modified version of No Stay profile)
Prince William Forest P	Camp Only
San Juan NHS	No Stay
Stones River NB	No Stay
Tuskegee Airmen NHS	No Stay

[2] The methods outlined in Cullinane Thomas et al. (2019) were updated in the 2022 analysis to respond to best available science and information (see Flyr and Koontz, 2023 for more details). For the 2023 analysis, the outlier identification process was adjusted further—total local spending is now also plotted and examined to identify potential outliers, and no observations are automatically dropped based on spending totals.

For VSE analyses prior to 2018, VSE profiles were derived from survey data collected through the NPS Visitor Services Project (VSP; see Pettebone and Meldrum, 2018 for a history of NPS visitor survey efforts). Spending data from VSP surveys administered between 2003 and 2015 were used to develop park-specific spending patterns for the surveyed park units. Generic profiles were developed from the VSP surveys to estimate visitor spending for non-surveyed park units. Generic profiles represent four park types: parks that have both camping and lodging available within the park (Camp & Lodge), parks that have only camping available within the park (Camp Only), parks with no overnight stays (No Stay), and parks with high day use, including National Recreation Areas, National Seashores and National Lakeshores (Recreation Areas). For almost all parks in this analysis without primary survey data, generic profiles are used to estimate visitor spending. However, some NPS units are not well represented by the generic profiles; for these parks, profiles were constructed using the best available data (refer to the Limitations section for more information). These units include parks in Alaska, parks in the Washington, D.C. area, and parkways with recreation visitation. The five parks new to this year's VSE analysis utilize generic profiles. Annual SEM surveys are increasing the availability of park-specific VSE profiles and thus reducing the VSE reliance on generic profiles.

Visitation Data

The NPS Visitor Use Statistics Office[3] compiles detailed park-level visitation data for National Park units and publishes these data in an annual Statistical Abstract (Ziesler and Spalding, 2024). The abstract reports total recreation visits and the number of overnight camping and lodging stays within the parks. The VSE analysis estimates visitor spending and associated economic effects for the 400 NPS units that collected visitation data in the 2023 Statistical Abstract.

For each park, visitation is measured as *visits*[4]. Visitor spending profiles are in terms of spending per party per day (for visitors on day trips) and spending per party per night (for visitors on overnight trips). To estimate visitor spending, it is necessary to convert visit data to party days and party nights. Party days are the combined number of days that parties on day trips spend in the local area surrounding the park. Party nights are the combined number of nights that parties on overnight trips spend in the local area surrounding the park. A party is defined as a group that is traveling together and sharing expenses (e.g., a party could be a family, a couple, or an individual on a solo trip).

To estimate total party days/nights, park visit data from the NPS Statistical Abstract are combined with trip characteristic information derived from visitor surveys. VSE profiles describe trip

[3] https://irma.nps.gov/Stats/

[4] Parks count visits as the number of individuals who enter the park each day. For example, a family of 4 taking a week-long vacation to Yellowstone National Park and staying at a lodge outside of the park would be counted as 28 visits (4 individuals who enter the park on 7 different days). A different family of 4, also taking a week-long vacation to Yellowstone National Park but lodging within the park, would be counted as 4 visits (4 individuals who enter the park on a single day and then stay within the park for the remainder of their trip). These differences are a result of the realities of the limitations in the methods available to count park visits.

characteristics by visitor segment, and include average party size, re-entry rate (i.e., the average number of days parties enter the park over the course of a trip), and length of stay (i.e., the average number of days or nights that parties spend in the local area). Visitation data are converted to total party days/nights using the following conversion:

For day-trip segments, **party days** = (visits ÷ party size);

For overnight segments, **party nights** = (visits ÷ re-entry rate ÷ party size) × nights in local area.

Regional Economic Multipliers

The multipliers used in this analysis are derived from the IMPLAN software and data system (IMPLAN Group LLC). The underlying IMPLAN data are derived from multiple Federal and state data sources, including the Bureau of Economic Analysis, Bureau of Labor Statistics, and the U.S. Census Bureau. This analysis uses IMPLAN Pro version 3.0 software with 2019 county, state, and national-level data. Economic effects are reported on an annual basis in 2023 dollars ($2023). For park profiles relying on data collected prior to 2023, dollar values have been adjusted to $2023 using IMPLAN output deflators. This adjustment varies by IMPLAN sector and does not account for the actual rate of inflation experienced across the nation in 2023. Therefore, the inflation rates incorporated in this analysis are likely conservative. Table 10 in the appendix shows how spending categories are bridged to IMPLAN sectors.

To assess the economic effects of NPS visitor spending, appropriate local regions need to be defined for each park unit. Only direct spending that takes place within the regional area is included as supporting economic activity. Local gateway regions have been updated for NPS units with VSE profiles developed from SEM visitor survey data (including the 24 parks with new survey data this year). For these parks, the local gateway region was identified through conversations with park staff who were asked to identify the nearby towns and cities where visitors typically stop and make purchases or spend the night while visiting the park. The local gateway region was then defined as the set of counties that include the identified towns and cities visited by park visitors. For the remaining NPS units in this analysis, local gateway regions contain all counties within or intersecting a 60-mile radius around each park boundary.[5]

This analysis reports economic contributions at the park-level, state-level, and national level. Park-level contributions use county-level IMPLAN models comprised of all counties contained within the local gateway regions; state-level contributions use state-level IMPLAN models; and the national-

[5] The 60-mile radius was established in the previous MGM2 methodology (Stynes, 2011). For parks with the 60-mile local area radius, geographic information systems (GIS) data were used to determine the local gateway region by spatially identifying all counties partially or completely contained within a 60-mile radius around each park boundary. Economic regions for parks in Hawaii and for some parks in Alaska are defined as the State of Hawaii and the State of Alaska, respectively. Due to data limitations, the island economy of the State of Hawaii is used as a surrogate economic region for the U.S. territories of America Samoa, Guam, Puerto Rico, and the Virgin Islands.

level contributions use a national IMPLAN model. The size of the region included in an IMPLAN model influences the magnitude of the economic multiplier effects. As the economic region expands, the amount of secondary spending that stays within that region increases, which typically results in larger economic multipliers. Thus, contributions at the national level are larger than those at the state and local levels. Local, state, and national contribution estimates should not be summed.

Results

Visitation

A total of 325,498,646 NPS recreation visits were reported in the 2023 NPS Statistical Abstract (Ziesler and Spalding, 2024). This is up 13 million visits (4%) from 2022 visitation.

Total party days/nights are estimated for each park unit and for each visitor segment (as described in the *visitation data* section). In 2023, visitor parties accounted for an estimated 126.4 million party days/nights. Lodging outside the park accounted for the largest portion of party days/nights (38.5%), followed by local day trips (20.6%) and non-local day trips (16.9%); camping and lodging inside NPS units accounted for 3.2% of total party days/nights spent in local gateway regions (Figure 3).

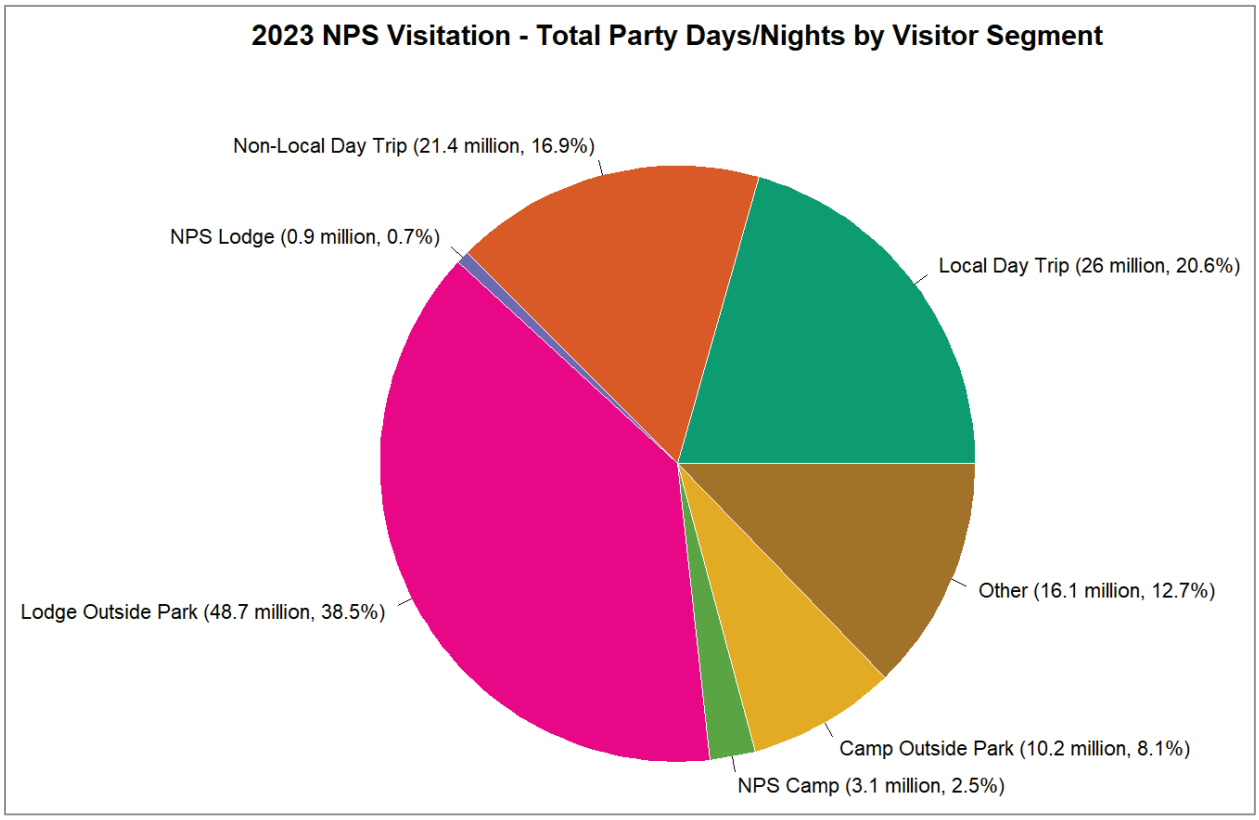


Figure 3. Distribution of total party days/nights by visitor segment. Total party days/nights measure the number of days (for day trips) and nights (for overnight trips) that visitor groups spend in gateway regions while visiting NPS sites. In 2023, visitor groups accounted for 126.4 million party days/nights.

Visitor Spending

In 2023, park visitors spent an estimated $26.4 billion in local gateway regions while visiting NPS sites (Figure 4, Table 2). Visitor spending was estimated for each park unit and for each visitor segment based on park and segment specific spending profiles (as described in the *visitor survey data* section). Total visitor spending is equal to total party days/nights multiplied by spending per party per day/night. Lodging expenses account for the largest share of visitor spending. In 2023, park

visitors spent an estimated $9.9 billion on lodging in hotels, motels, bed and breakfasts, and other specialty lodging, and an additional $0.6 billion on camping fees. Food expenses account for the next largest share of expenditures. In 2023, park visitors spent an estimated $5.2 billion dining at restaurants and bars and an additional $1.7 billion purchasing food at grocery and convenience stores.

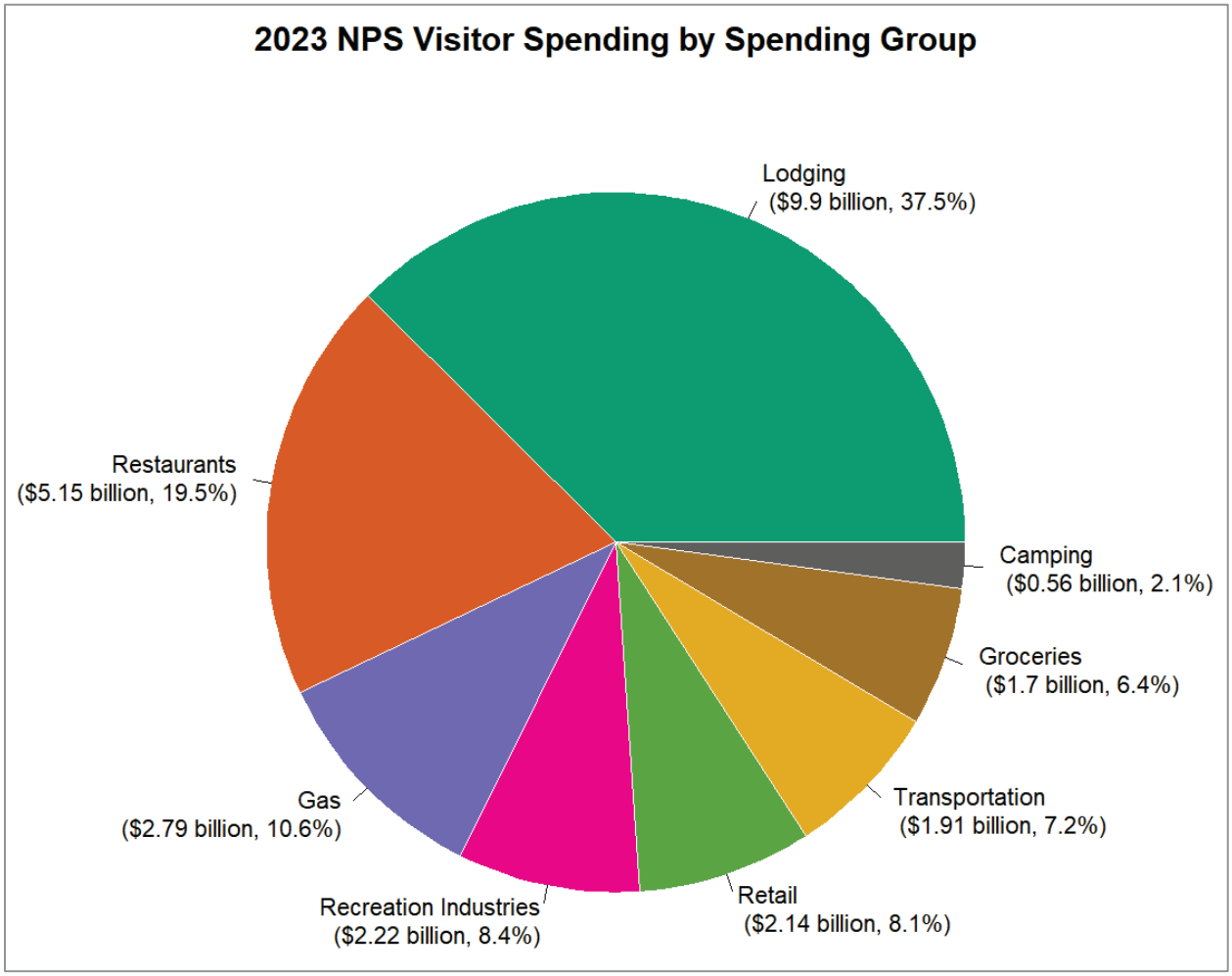


Figure 4. System-wide visitor spending by spending group. In 2023, NPS visitors spent an estimated total of $26.4 billion dollars in local gateway economies.

Total visitor spending estimates increased by 10.4% in 2023 compared to 2022 estimates. VSE profile improvements for parks with new survey data, an additional 13 million visits (compared to 2022), and the annual IMPLAN inflation adjustment contributed to this increase. Table 3 shows the effect of the profile changes on visitor spending estimates for parks with new survey data, holding visitation and multipliers constant at 2022 levels.

Table 2. Total NPS Visitor Spending by Segment.

Visitor Segment	Total Spending ($Billions, $2023)	Percent of Total Spending	Avg Spending per Party per Day/Night ($2023)
Local Day Trip	$1.17	4.5%	$45.08
Non-Local Day Trip	$2.13	8.1%	$99.14
NPS Lodge	$0.45	1.7%	$516.42
Lodge Outside Park	$19.67	74.6%	$403.56
NPS Camp	$0.49	1.9%	$157.50
Camp Outside Park	$1.59	6.0%	$155.98
Other	$0.87	3.3%	$53.74
Total	**$26.36**	**100.0%**	**$208.41**

Table 3. Effect of new spending profiles on visitor spending estimates for parks with new survey data (holding visitation and multipliers constant at 2022 levels).

Park Unit	Percent Change in Visitor Spending: Old to New Profile
Aztec Ruins NM	-3%
Badlands NP	73%
Canyon De Chelly NM	64%
Cuyahoga Valley NP	149%
Delaware Water Gap NRA	2%
Dinosaur NM	7%
Everglades NP	38%
Federal Hall NMEM	−7%
Fort Donelson NB	−56%
Franklin Delano Roosevelt MEM	−63%
Gauley River NRA	−0.4%
Golden Gate NRA	54%
Great Basin NP	65%
Greenbelt P	-81%
Grant-Kohrs Ranch NHS	-62%
George Washington MEM PKWY	336%

Table 3 (continued). Effect of new spending profiles on visitor spending estimates for parks with new survey data (holding visitation and multipliers constant at 2022 levels).

Park Unit	Percent Change in Visitor Spending: Old to New Profile
Klondike Gold Rush NHP	-4%
Lassen Volcanic NP	40%
Mary McLeod Bethune Council House NHS	246%
National Capital Parks East	32%
Prince William Forest P	-52%
San Juan NHS	71%
Stones River NB	-44%
Tuskegee Airmen NHS	-27%

Economic Contributions

In 2023, NPS visitor spending directly supported an estimated 247,300 jobs, $8.8 billion in labor income, $13.9 billion in value added, and $22.1 billion in economic output in the national economy. The secondary effects of visitor spending supported an estimated additional 168,100 jobs, $10.5 billion in labor income, $18.1 billion in value added, and $33.5 billion in economic output in the national economy. Combined, NPS visitor spending supported an estimated total of 415,400 jobs, $19.4 billion in labor income, $32 billion in value added, and $55.6 billion in economic output in the national economy (Table 4).

Table 4. Economic contributions to the national economy from NPS visitor spending – 2023.

Sector	Jobs	Labor Income ($Billions, $2023)	Value Added ($Billions, $2023)	Output ($Billions, $2023)
Lodging	89,200	$4.00	$6.78	$9.9
Restaurants	68,600	$1.74	$2.68	$5.15
Recreation Industries	34,400	$1.09	$1.26	$2.22
Transportation	15,500	$0.60	$1.33	$1.9
Retail	21,300	$0.61	$0.75	$1.19
Gas	5,200	$0.22	$0.35	$0.61
Camping	6,100	$0.32	$0.44	$0.56
Groceries	7,000	$0.26	$0.35	$0.56
Total Direct Effects	247,300	$8.84	$13.94	$22.09
Secondary Effects	168,100	$10.52	$18.09	$33.48
Total Effects	**415,400**	**$19.36**	**$32.03**	**$55.57**

Contributions to local gateway economies are provided in Table 5 in the appendix. Economic contributions are estimated by multiplying total (local and non-local) visitor spending by park-level (local gateway region) economic multipliers. Table 6 in the appendix provides estimates of the percent of visitor spending for each park that is made by non-local visitors. Park unit type abbreviations are included in Table 8 in the appendix.

Contributions to state economies are provided in Table 7 in the appendix. For parks that fall within multiple states, park spending is proportionally allocated to each state based on the share of park visits that occur within each state. Visit shares for multi-state parks are listed in Table 9 in the appendix.

Limitations

The accuracy of spending and contribution estimates rests largely on the input data, namely (1) VSE profile data which include party size, length of stay, park re-entry conversion factors, visitor segment shares, and spending averages; (2) public use recreation visit and overnight stay data; and (3) regional economic multipliers.

VSE profiles and visitor survey data

Accurate estimation of visitor spending requires quality survey data that are representative of the variety of visitor uses and demographics from across the park system. There has been a great need for increased sampling rigor across park types and geographic regions to address the lack of data for non-surveyed parks and thus improve the accuracy of visitor spending analyses. With the annual implementation of SEM, more parks will now have primary survey data updated regularly, and the SEM sampling design will ensure that sampled parks are statistically representative of the system. The 2023 VSE analysis incorporates new spending data for the 24 surveyed SEM parks in 2023. Continued SEM implementation will allow the NPS to address several limitations associated with the older VSP data related to visitor segmenting, trip purpose, and generic profiles.

Segmenting Visitors

Visitor segment splits defined in VSE profiles determine how many visits are attributed to each visitor segment (local day trip, non-local day trip, NPS lodge, NPS campground, lodge outside park, camp outside park, and other), and can have a substantial effect on visitor spending estimates. There are two main limitations with the segment split data currently available for VSE estimation:

- Segment splits tend to vary substantially from park to park. Therefore, it is difficult to transfer segment split data from one park to another. We currently have primary segment split data for 118 of 400 park units that collect visitation data. Segment splits for the other park units are based on survey data from similar parks and are reflected in the generic profiles (Camp & Lodge, Camp Only, No Stay, and Recreation Area profiles); these averages may or may not be good representations of actual segment splits at non-surveyed park units (refer to the Visitor Survey Data section for more information on the construction of the generic profiles).
- Visitor segment splits derived from VSP data, which were used to develop the generic profiles, overestimate the percent of visits that fall into the “Other” segment. The “Other” segment is defined as visitors who stay overnight in the local area but do not have any lodging expenses; this segment includes visitors staying in private homes, with friends or relatives, or in other unpaid lodging, but may also include some visitors who failed to answer the spending question for VSP surveys. VSE profiles derived from the newer SEM visitor survey data more accurately describe the share of visitors who fall into the “Other” category.

Accounting for Trip Purpose

The older VSE profiles derived from VSP data do not account for visitors' trip purpose. Many visitors come to local gateway regions primarily to visit NPS sites. However, some visitors are primarily in the area for business, visiting friends and relatives, or for some other reason, and visiting the NPS unit is not the primary purpose for their trip. Likewise, visiting a single NPS unit might not be the primary purpose of a trip to an area with more than one NPS unit. For these visitors, it may not be appropriate to attribute all trip expenditures to the presence of the NPS unit. To address this issue, the SEM visitor surveys ask visitors about the purpose of their trip away from home. These data are used to allocate only a portion of time and spending in the local area to the park for visitors for whom the NPS site was not the primary purpose of their trip. The methods used to attribute a portion of overall time and expenditures in a park's local area are described in Cullinane Thomas et al. (2019).

Generic Profiles

The generic profiles derived from VSP data are likely reasonably representative for many park units; however, some parks are not well represented by these profiles. For these parks, profiles were constructed using the best available data. These units include non-surveyed parks in Alaska, non-surveyed parks in the Washington, D.C. area, and non-surveyed parkways with recreation visits. Park unit specific data will be more prevalent through annual SEM surveying.

Parks in Alaska – Visitor characteristics and spending at Alaska parks are unique. Spending opportunities near Alaska parks are limited, and for many visitors, a park visit is part of a cruise or guided tour that is frequently purchased as a package. Many park visitors are on extended trips to Alaska, making it difficult to allocate expenses to a specific park visit. Lodging, vehicle rentals, and air expenses frequently occur in Anchorage, many miles from the visited park. Also, many Alaska parks are only accessible by air or boat, and thus, spending profiles estimated from visitor surveys at parks in the lower 48 states do not provide good approximations for Alaska parks. Visitor trip characteristics and spending profiles for non-surveyed Alaska parks were adopted from two reports on visitor spending and impacts in Alaska: a 2010 report on visitor spending and economic significance of visitation to Katmai National Park and Preserve (Fay and Christensen, 2010), and a 2010 report on the economic impacts of visitors to southeast Alaska (McDowell Group, 2010).

Parks in the Washington, D.C. area – The many monuments and parks in the Washington, D.C. area each count visits separately. To avoid overcounting of spending across many national capital parks, we must know how many times a single visitor has been counted as a visit at park units during their trip to the area. For parks in Washington, D.C. without SEM survey data, we assume an average of 1.7 park visits are counted for day trips by local visitors, 3.4 park visits for day trips by non-local visitors, and 5.1 park visits for visitors on overnight trips (Stynes, 2011). For Washington, D.C. parks with SEM survey data, multi-park visitation is accounted for with trip purpose adjustments[6].

[6] If a visitor indicated the park was the primary reason they came to the local area, all local area time and spending was attributed to the park. For equal-purpose visitors, attribution was reduced to reflect the portion of the day or trip that was spent in the park. For incidental visitors, no spending was attributed to the park.

Parkways – Parkways with recreation visits present special difficulties for economic contribution analyses. These units have some of the highest numbers of visits while posing the most difficult problems for estimating recreation visits, spending, and economic contributions. NPS visitor statistics parse out the potentially high number of non-recreation visits on parkways (e.g., commuters using the George Washington Memorial Parkway are not counted as recreation visits). The VSE analysis only includes visitors driving on parkways for recreation purposes, but even so, individual visits to urban or primarily commuting parkways are not likely to account for a substantial amount of visitor spending in the local area. For this reason, only a small amount of spending per party for day trip segments ($14.26, $2023) is counted for the one remaining non-surveyed parkway (John D. Rockefeller, Jr. Memorial Parkway). The other three parkways (George Washington Memorial Parkway, Blue Ridge Parkway, and Natchez Trace Parkway) have profiles developed from SEM survey data.

Visitation data

Public use data provide estimates of visitor entries for most parks. Various counting instructions consider different travel modes within the context of each park unit to derive recreation and non-recreation visitation at both a monthly and annual resolution (procedures for counting visits are developed collaboratively between park leadership and the NPS Social Science Program). Re-entry rates, vehicle occupancy rates, and other corrections are collected using travel surveys that increase the accuracy of these estimates. While the methods are well established in the visitor use estimation literature, these are still estimates.

Regional multipliers

The economic effects of visitor spending are estimated by multiplying visitor spending estimates by regional economic multipliers. Regional multipliers for park level estimates are derived using county-level IMPLAN models comprised of all counties contained within the local gateway regions. The original VSE setting for local gateway regions contained all counties within or intersecting a 60-mile radius around each park boundary. This method results in some relatively large local gateway regions. As a result, there is potential for including some areas that are not intrinsically linked to the local economies surrounding each park. For park units with newer SEM visitor surveys, local gateway region definitions have been improved by working directly with staff at each park to identify the nearby towns and cities (and counties) where visitors typically stop and make purchases or spend the night while visiting the park (Cullinane Thomas et al. 2019). The new local area definitions can result in smaller secondary effects due to increased leakages from a smaller local area (spending that does not stay in the local economy).

Literature Cited

Cullinane Thomas, C., Cornachione, E., Koontz, L., and Keyes, C. 2019. National Park Service Socioeconomic Pilot Survey – Visitor Spending Analysis. Natural Resource Report NPS/NRSS/EQD/NRR—2019/1924. National Park Service, Fort Collins, Colorado.

Fay, G. and Christensen, J. 2010. Katmai National Park and Preserve Economic Significance Analysis and Model Documentation. Prepared for: National Park Conservation Association and National Park Service, Katmai National Park and Preserve, 60 pp.

Flyr, M., and L. Koontz. 2023. 2022 national park visitor spending effects: Economic contributions to local communities, states, and the nation. Natural Resource Report NPS/NRSS/EQD/NRR—2023/2551. National Park Service, Fort Collins, Colorado. https://doi.org/10.36967/2299764

IMPLAN Group LLC, IMPLAN System (data and software), 16740 Birkdale Commons Parkway Suite 206, Huntersville, NC 28078, www.implan.com.

Koontz, L., C. Cullinane Thomas, P. Ziesler, J. Olson, and B. Meldrum. 2017. "Visitor Spending Effects: Assessing and Showcasing America's Investment in National Parks." *Journal of Sustainable Tourism*, September, 1–12. https://doi.org/10.1080/09669582.2017.1374600

McDowell Group. 2010. Economic Impact of Visitors to Southeast Alaska, 2010–11. Prepared for: Alaska Wilderness League, 33 pp.

Pettebone, D. and B. Meldrum. 2018. The Need for a Comprehensive Socioeconomic Research Program for the National Park Service. The George Wright Forum, vol. 35, no. 1, pp. 22–31.

Richardson, L., L. Koontz, and B. Peacock. 2018. For the Benefit and Enjoyment of the People: An Exploration of the Economic Benefits of National Parks. The George Wright Forum, vol. 35, no. 1, pp. 42-52.

Stynes, D. J. 2011. Economic Benefits to Local Communities from National Park Visitation and Payroll, 2010. Natural Resource Report NPS/NRSS/EQD/NRR—2011/481. National Park Service, Fort Collins, Colorado.

Ziesler, P. S., and C. M. Spalding. 2024. Statistical abstract: 2023. Science Report NPS/SR—2024/139. National Park Service, Fort Collins, Colorado. https://doi.org/10.36967/2304344

Appendix

Table 5. NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Abraham Lincoln Birthplace NHP	239,950	$16,070	242	$8,000	$12,523	$23,391
Acadia NP [A]	3,879,890	$475,175	6,603	$229,830	$390,600	$685,376
Adams NHP	25,229	$1,691	21	$1,017	$1,586	$2,569
African Burial Ground NM	40,817	$2,733	30	$1,625	$2,643	$4,012
Agate Fossil Beds NM [A]	15,562	$1,329	17	$412	$716	$1,425
Alagnak WR [C]	231	$13	0	$6	$9	$16
Alibates Flint Quarries NM [C]	6,006	$402	6	$167	$264	$516
Allegheny Portage Railroad NHS	199,612	$13,368	191	$7,143	$11,058	$19,603
Amistad NRA	836,733	$42,327	531	$14,667	$23,289	$45,745
Andersonville NHS	77,740	$5,206	80	$1,977	$3,386	$6,701
Andrew Johnson NHS	61,086	$4,091	57	$1,900	$3,111	$5,667
Aniakchak NM&PRES	199	$270	4	$148	$239	$407
Antietam NB	153,560	$10,280	127	$5,815	$9,451	$15,261
Apostle Islands NL [A]	247,167	$44,444	608	$17,190	$29,409	$55,695
Appomattox Court House NHP	91,963	$6,159	88	$2,633	$4,393	$8,162
Arches NP [A]	1,482,045	$282,826	3,654	$115,764	$194,441	$345,830
Arkansas Post NMEM	25,032	$1,676	23	$686	$1,173	$2,146
Arlington House, The Robert E. Lee Memorial NMEM	419,225	$28,076	343	$15,846	$25,894	$41,570

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Assateague Island NS	2,351,874	$118,609	1,431	$48,489	$79,369	$141,202
Aztec Ruins NM [A,B]	47,554	$3,072	42	$1,276	$2,216	$4,058
Badlands NP [A,B]	1,046,400	$134,579	1,916	$62,407	$107,624	$193,285
Bandelier NM	199,501	$14,257	188	$5,882	$10,165	$18,607
Belmont-Paul Women's Equality NM [C]	2,034	$44	1	$25	$42	$67
Bent's Old Fort NHS	19,718	$1,320	17	$554	$954	$1,709
Bering Land Bridge NPRES	2,642	$4,420	62	$2,418	$3,859	$6,615
Big Bend NP	509,129	$48,513	657	$18,723	$29,810	$56,205
Big Cypress NPRES	1,846,562	$167,855	2,169	$85,498	$146,590	$248,903
Big Hole NB [A]	55,206	$4,465	57	$1,651	$2,466	$4,952
Big South Fork NRRA [A]	766,000	$27,487	323	$10,701	$17,391	$31,816
Big Thicket NPRES	262,791	$19,364	251	$9,762	$15,329	$26,448
Bighorn Canyon NRA	217,731	$10,976	147	$4,502	$6,882	$13,417
Biscayne NP	571,242	$42,063	540	$21,267	$35,950	$61,171
Black Canyon of the Gunnison NP	357,069	$25,557	295	$11,051	$18,492	$31,901
Blue Ridge PKWY [A]	16,757,635	$1,390,803	19,159	$571,979	$971,164	$1,810,286
Bluestone NSR	21,592	$1,093	14	$424	$708	$1,317
Booker T Washington NM	28,713	$1,922	29	$843	$1,414	$2,659
Boston African American NHS	389,863	$26,110	324	$15,752	$24,560	$39,770
Boston Harbor Islands NRA [C]	27,986	$1,417	16	$795	$1,236	$2,009
Boston NHP	2,517,296	$168,589	2,092	$101,725	$158,579	$256,767

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Brown v. Board of Education NHP	18,826	$1,261	19	$663	$1,098	$1,977
Bryce Canyon NP [A]	2,461,269	$231,942	3,190	$73,488	$125,354	$249,380
Buck Island Reef NM	46,207	$3,317	32	$1,472	$2,712	$4,145
Buffalo NR	1,549,467	$78,159	1,033	$29,368	$49,972	$94,549
Cabrillo NM	810,147	$54,257	678	$29,651	$46,624	$76,162
Camp Nelson NM	16,397	$1,098	17	$509	$799	$1,517
Canaveral NS [A]	2,019,073	$84,226	1,079	$40,717	$69,197	$119,767
Cane River Creole NHP	11,701	$783	11	$304	$530	$987
Canyon De Chelly NM [A,B]	333,349	$42,089	574	$15,297	$27,931	$53,029
Canyonlands NP [A]	800,322	$106,090	1,373	$42,757	$72,406	$129,549
Cape Cod NS [A]	3,808,404	$533,656	6,467	$268,107	$437,341	$730,144
Cape Hatteras NS [A]	2,826,169	$644,036	10,220	$349,798	$536,350	$863,670
Cape Krusenstern NM	17,820	$29,809	416	$16,302	$26,021	$44,608
Cape Lookout NS	529,995	$26,553	338	$9,506	$15,480	$29,406
Capitol Reef NP [A]	1,268,861	$110,571	1,526	$33,710	$65,043	$127,124
Capulin Volcano NM [A]	88,514	$3,070	38	$1,002	$1,681	$3,204
Carl Sandburg Home NHS	149,043	$9,982	139	$4,316	$7,267	$13,205
Carlsbad Caverns NP	394,121	$29,087	359	$10,044	$17,246	$31,869
Carter G. Woodson Home NHS [C]	0	$0	0	$0	$0	$0
Casa Grande Ruins NM	111,392	$7,460	102	$4,001	$6,676	$11,527
Castillo De San Marcos NM	646,703	$43,311	617	$20,133	$34,350	$61,696

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Castle Clinton NM	3,929,749	$113,945	1,113	$57,752	$91,814	$143,765
Catoctin Mountain P [A]	432,492	$13,119	142	$6,362	$10,078	$16,065
Cedar Breaks NM	614,292	$45,233	587	$17,534	$30,057	$56,233
Cesar E. Chavez NM	12,007	$804	10	$464	$727	$1,175
Chaco Culture NHP	40,198	$2,532	33	$999	$1,734	$3,185
Chamizal NMEM	8,324	$557	8	$233	$370	$723
Channel Islands NP	328,746	$22,588	266	$13,111	$20,685	$33,094
Charles Pinckney NHS	32,109	$2,151	28	$934	$1,616	$2,795
Charles Young Buffalo Soldiers NM [C]	3,302	$221	3	$107	$169	$307
Chattahoochee River NRA	3,183,081	$161,166	2,149	$81,617	$136,168	$236,780
Chesapeake & Ohio Canal NHP	4,470,592	$96,011	1,236	$54,746	$90,338	$147,816
Chickamauga & Chattanooga NMP	1,021,822	$68,402	967	$28,314	$46,534	$87,476
Chickasaw NRA [A]	2,082,326	$40,556	370	$10,330	$16,813	$34,005
Chiricahua NM	62,582	$4,229	51	$1,467	$2,493	$4,561
Christiansted NHS	107,171	$7,178	73	$3,333	$5,986	$9,251
City of Rocks NRES	92,059	$6,165	81	$2,327	$3,958	$7,333
Clara Barton NHS	4,223	$283	3	$160	$262	$421
Colonial NHP [A]	2,691,931	$299,705	4,433	$127,185	$217,247	$402,914
Colorado NM	486,179	$34,997	448	$13,686	$23,682	$43,714
Congaree NP [A]	250,114	$14,881	173	$5,713	$10,182	$17,955
Coronado NMEM	140,089	$9,381	123	$4,180	$6,948	$12,311

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Cowpens NB	226,369	$16,706	229	$8,375	$13,891	$24,299
Crater Lake NP	559,976	$55,235	780	$29,848	$45,883	$80,551
Craters of the Moon NM&PRES [A]	257,598	$10,301	136	$3,780	$6,346	$12,135
Cumberland Gap NHP [A]	797,346	$25,634	312	$8,823	$15,023	$27,833
Cumberland Island NS	73,812	$3,609	47	$1,617	$2,691	$4,780
Curecanti NRA	957,635	$48,137	539	$19,415	$32,221	$56,415
Cuyahoga Valley NP [A,B]	2,860,059	$138,684	2,136	$83,701	$130,956	$224,751
Dayton Aviation Heritage NHP [A]	89,976	$6,023	95	$3,501	$5,604	$9,941
De Soto NMEM	231,892	$15,530	220	$7,913	$13,250	$23,350
Death Valley NP [C]	1,099,632	$103,270	1,203	$50,595	$85,582	$137,280
Delaware Water Gap NRA [A,B]	4,207,541	$166,324	2,236	$96,175	$144,630	$235,598
Denali NP&PRES	498,722	$559,409	7,785	$306,273	$491,620	$840,346
Devils Postpile NM	86,132	$6,357	76	$2,874	$4,601	$7,937
Devils Tower NM	511,205	$37,603	492	$14,889	$26,326	$48,944
Dinosaur NM [A,B]	326,529	$24,120	336	$7,995	$14,632	$28,403
Dry Tortugas NP	84,285	$5,885	62	$2,364	$4,010	$6,671
Dwight D. Eisenhower MEM	667,492	$14,428	179	$8,328	$13,782	$22,108
Edgar Allan Poe NHS	15,473	$1,036	14	$634	$985	$1,644
Effigy Mounds NM [A]	61,795	$4,502	68	$1,826	$3,003	$5,809
Eisenhower NHS	98,837	$6,620	81	$3,733	$5,993	$9,681
El Malpais NM	167,107	$11,191	158	$4,682	$8,031	$14,995

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
El Morro NM	54,836	$3,987	52	$1,205	$2,191	$4,319
Eleanor Roosevelt NHS	17,190	$1,151	13	$626	$1,009	$1,613
Eugene O'Neill NHS	15,537	$1,041	11	$616	$948	$1,459
Everglades NP [A,B]	810,189	$120,646	1,749	$72,267	$120,342	$198,231
Federal Hall NMEM [A,B]	76,750	$4,777	51	$3,060	$4,933	$6,897
Fire Island NS	298,958	$15,084	147	$8,246	$13,403	$20,248
First Ladies NHS	11,187	$749	11	$413	$651	$1,152
First State NHP	143,045	$9,580	127	$5,873	$9,103	$14,882
Flight 93 NMEM	377,810	$25,303	360	$13,515	$21,008	$37,178
Florissant Fossil Beds NM	63,739	$4,269	55	$2,312	$3,808	$6,444
Ford's Theatre NHS	393,214	$8,500	106	$4,906	$8,119	$13,024
Fort Bowie NHS [A]	8,333	$358	4	$131	$219	$382
Fort Caroline NMEM	324,004	$21,699	309	$10,515	$17,856	$31,683
Fort Davis NHS	40,189	$2,692	34	$1,017	$1,571	$2,894
Fort Donelson NB [A,B]	179,950	$5,906	77	$2,145	$3,406	$6,290
Fort Frederica NM	286,017	$19,156	266	$9,063	$15,128	$26,654
Fort Laramie NHS [A]	47,155	$1,471	18	$478	$791	$1,559
Fort Larned NHS [A]	26,113	$1,828	24	$580	$1,062	$2,060
Fort Matanzas NM	711,543	$47,654	680	$22,270	$38,079	$68,331
Fort McHenry NM&SHRINE	429,967	$28,796	358	$16,222	$26,439	$42,716
Fort Necessity NB	248,948	$16,663	240	$9,106	$14,245	$25,200

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Fort Point NHS	903,685	$60,522	641	$35,825	$55,090	$84,828
Fort Pulaski NM	448,047	$33,066	411	$13,893	$24,205	$41,774
Fort Raleigh NHS	263,571	$17,652	255	$7,448	$12,599	$23,658
Fort Scott NHS [A]	25,493	$529	7	$163	$273	$554
Fort Smith NHS	135,128	$9,050	132	$3,565	$6,176	$11,882
Fort Stanwix NM [A]	83,401	$5,290	59	$2,224	$4,044	$6,661
Fort Sumter NM	411,744	$27,574	355	$11,952	$20,729	$35,938
Fort Union NM [A]	9,570	$748	9	$280	$477	$858
Fort Union Trading Post NHS [A]	12,942	$1,205	12	$416	$657	$1,148
Fort Vancouver NHS	967,602	$64,803	882	$36,279	$57,887	$99,139
Fort Washington P	448,220	$30,018	361	$16,839	$27,557	$43,985
Fossil Butte NM [A]	19,377	$1,110	13	$411	$688	$1,237
Franklin Delano Roosevelt MEM [A,B]	3,298,788	$26,757	371	$16,371	$25,523	$40,276
Frederick Douglass NHS [C]	12,904	$279	3	$161	$266	$427
Frederick Law Olmsted NHS	11,904	$797	10	$480	$748	$1,213
Fredericksburg & Spotsylvania NMP	844,890	$56,585	695	$30,924	$50,445	$81,647
Friendship Hill NHS	19,258	$1,289	18	$699	$1,095	$1,935
Gates of the Arctic NP&PRES [C]	11,045	$18,471	258	$10,102	$16,124	$27,642
Gateway Arch NP [A]	2,422,836	$170,178	2,687	$108,417	$173,054	$297,769
Gateway NRA [A]	8,705,329	$262,453	2,867	$115,237	$193,663	$318,425
Gauley River NRA [A,B]	187,223	$9,388	124	$3,852	$6,196	$11,156

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
General Grant NMEM [A]	84,153	$3,668	40	$2,245	$3,646	$5,311
George Rogers Clark NHP	145,597	$9,751	135	$3,861	$6,767	$12,532
George Washington Birthplace NM [A]	98,843	$5,183	61	$2,767	$4,498	$7,214
George Washington Carver NM [A]	37,282	$802	10	$307	$504	$969
George Washington MEM PKWY [A,B]	7,391,260	$241,238	3,038	$145,072	$235,762	$369,265
Gettysburg NMP	742,173	$54,774	653	$30,273	$48,963	$78,752
Gila Cliff Dwellings NM	33,973	$2,275	29	$724	$1,264	$2,422
Glacier Bay NP&PRES [A,B]	703,659	$291,717	3,644	$163,824	$254,593	$498,492
Glacier NP [A]	2,933,616	$372,129	5,725	$186,811	$287,572	$554,585
Glen Canyon NRA [A]	5,206,934	$539,912	6,298	$226,266	$384,281	$670,369
Golden Gate NRA [A,B]	14,953,882	$1,505,100	13,150	$941,065	$1,429,185	$2,012,317
Golden Spike NHS [A]	53,015	$3,474	47	$1,614	$2,761	$4,971
Governors Island NM	38,670	$2,590	28	$1,541	$2,504	$3,797
Grand Canyon NP [A]	4,733,705	$768,411	10,060	$350,177	$582,513	$1,022,191
Grand Portage NM	88,291	$6,515	83	$2,051	$3,642	$6,954
Grand Teton NP [A]	3,417,106	$737,983	9,369	$330,747	$541,797	$936,251
Grant-Kohrs Ranch NHS [A,B]	27,219	$700	11	$336	$509	$970
Great Basin NP [A,B]	143,265	$15,416	180	$7,692	$13,217	$21,765
Great Sand Dunes NP&PRES [A]	512,219	$34,284	427	$11,236	$19,655	$37,941
Great Smoky Mountains NP [A]	13,297,647	$2,198,538	33,748	$1,267,581	$2,000,786	$3,397,905
Greenbelt P [A,B]	91,785	$1,289	17	$723	$1,134	$1,839

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Guadalupe Mountains NP [A]	227,340	$27,545	325	$11,180	$18,633	$32,680
Guilford Courthouse NMP	404,759	$27,107	392	$13,413	$22,066	$39,693
Gulf Islands NS	8,277,857	$417,993	5,367	$180,492	$300,924	$542,713
Hagerman Fossil Beds NM	33,444	$2,239	31	$1,033	$1,711	$3,126
Haleakala NP	791,292	$57,541	556	$25,589	$47,193	$72,127
Hamilton Grange NMEM	48,674	$3,259	35	$1,933	$3,145	$4,764
Hampton NHS	14,612	$978	12	$557	$903	$1,459
Harpers Ferry NHP [A]	427,317	$23,802	319	$14,478	$23,363	$37,664
Harriet Tubman Underground Railroad NHP	11,446	$767	10	$312	$533	$942
Harry S Truman NHS	26,327	$1,763	26	$940	$1,548	$2,787
Hawaii Volcanoes NP	1,620,294	$154,595	1,586	$71,769	$133,618	$203,117
Herbert Hoover NHS	109,728	$7,349	107	$3,147	$5,221	$9,801
Home of Franklin D Roosevelt NHS	117,789	$7,888	92	$4,348	$6,979	$11,162
Homestead NM [A]	49,848	$1,914	25	$694	$1,168	$2,227
Hopewell Culture NHP	62,113	$4,160	60	$2,227	$3,568	$6,335
Hopewell Furnace NHS	54,293	$3,636	51	$2,197	$3,423	$5,761
Horseshoe Bend NMP	72,725	$4,871	74	$2,166	$3,548	$6,750
Hot Springs NP	2,502,967	$184,190	2,591	$72,481	$131,576	$247,690
Hovenweep NM	35,231	$2,559	32	$960	$1,692	$3,137
Hubbell Trading Post NHS	54,187	$3,628	49	$1,277	$2,226	$4,301
Independence NHP	3,042,598	$203,770	2,783	$124,718	$193,661	$323,142

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Indiana Dunes NL	2,765,892	$139,824	1,655	$79,238	$126,206	$206,254
Isle Royale NP [A,C]	28,965	$12,069	140	$3,863	$6,780	$14,821
James A Garfield NHS [A]	36,553	$1,503	22	$832	$1,295	$2,325
Jean Lafitte NP&PRES	248,353	$16,633	229	$7,508	$12,712	$22,800
Jewel Cave NM	121,536	$8,139	112	$3,305	$5,730	$10,730
Jimmy Carter NHS	40,981	$2,745	42	$1,042	$1,782	$3,515
John D. Rockefeller, Jr. MEM PKWY	1,382,345	$9,961	121	$4,382	$6,725	$11,657
John Day Fossil Beds NM [A]	169,016	$9,435	113	$4,037	$6,433	$11,589
John F Kennedy NHS [C]	8,182	$548	7	$330	$514	$834
John Muir NHS	50,872	$3,407	36	$2,016	$3,101	$4,778
Johnstown Flood NMEM [A]	159,403	$11,310	169	$6,241	$9,674	$17,327
Joshua Tree NP [A]	3,270,404	$185,818	2,202	$83,720	$135,427	$227,384
Kalaupapa NHP	46,981	$3,147	32	$1,461	$2,624	$4,056
Kaloko-Honokohau NHP	292,400	$19,583	200	$9,093	$16,332	$25,241
Katahdin Woods and Waters NM	38,455	$2,820	37	$1,142	$1,976	$3,615
Katmai NP&PRES	33,763	$56,471	788	$30,883	$49,295	$84,506
Kenai Fjords NP	387,525	$77,071	1,322	$47,815	$64,799	$117,498
Kennesaw Mountain NBP	1,499,217	$100,406	1,453	$54,675	$91,359	$158,146
Keweenaw NHP	29,221	$1,956	27	$603	$1,098	$2,182
Kings Canyon NP	643,065	$61,219	780	$29,092	$46,560	$79,638
Kings Mountain NMP [A]	219,267	$10,068	138	$5,054	$8,273	$14,505

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Klondike Gold Rush AK NHP [A,B,C]	1,284,320	$208,859	2,796	$123,077	$155,240	$264,857
Klondike Gold Rush WA NHP	71,990	$4,822	51	$2,441	$4,270	$6,634
Knife River Indian Villages NHS	8,134	$545	7	$225	$373	$704
Kobuk Valley NP	17,616	$29,464	411	$16,113	$25,720	$44,092
Korean War Veterans MEM [A]	4,132,456	$117,360	1,559	$74,476	$119,556	$182,460
Lake Chelan NRA	39,419	$3,186	31	$1,592	$2,811	$4,261
Lake Clark NP&PRES [C]	16,728	$27,981	390	$15,302	$24,425	$41,872
Lake Mead NRA	5,798,541	$292,463	3,131	$130,744	$219,232	$357,760
Lake Meredith NRA [A]	1,337,683	$33,113	253	$8,085	$12,482	$23,730
Lake Roosevelt NRA	1,140,360	$59,200	676	$24,131	$43,311	$74,009
Lassen Volcanic NP [A,B]	418,978	$40,318	507	$19,427	$30,619	$51,059
Lava Beds NM [A]	136,164	$6,785	77	$2,730	$4,238	$7,581
Lewis and Clark NHP	284,739	$19,069	248	$10,270	$16,762	$28,173
Lincoln Boyhood NMEM [A]	128,973	$6,981	107	$3,532	$5,550	$10,146
Lincoln Home NHS [A]	158,920	$11,029	152	$4,604	$8,039	$14,675
Lincoln MEM	8,099,148	$175,072	2,174	$101,051	$167,233	$268,254
Little Bighorn Battlefield NM	227,295	$15,222	222	$6,896	$10,389	$20,090
Little River Canyon NPRES	700,638	$46,923	687	$20,865	$34,550	$64,161
Little Rock Central High School NHS	58,571	$3,923	58	$1,623	$2,886	$5,448
Longfellow NHS	67,376	$4,512	56	$2,720	$4,242	$6,874
Lowell NHP	256,303	$17,165	213	$10,330	$16,123	$26,127

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Lyndon B Johnson NHP	118,819	$7,958	116	$4,234	$6,621	$12,021
Lyndon Baines Johnson Memorial Grove on the Potomac NMEM	260,344	$17,435	213	$9,841	$16,080	$25,815
Maggie L Walker NHS	6,382	$427	6	$202	$340	$610
Mammoth Cave NP	654,450	$62,024	822	$32,873	$52,870	$89,560
Manassas NBP	564,905	$37,834	458	$21,222	$34,711	$55,566
Manhattan Project (New Mexico) NHP	20,220	$1,354	17	$566	$935	$1,636
Manhattan Project (Tennessee) NHP	23,006	$503	7	$216	$335	$616
Manhattan Project (Washington) NHP	16,874	$635	7	$249	$444	$732
Manzanar NHS [A]	105,416	$12,722	150	$5,707	$9,181	$15,828
Marsh - Billings - Rockefeller NHP	71,799	$4,808	60	$2,251	$3,824	$6,460
Martin Luther King Jr NHS	481,101	$32,221	466	$17,600	$29,418	$50,845
Martin Luther King, Jr. MEM	3,341,654	$72,233	897	$41,693	$68,999	$110,679
Martin Van Buren NHS [A]	12,438	$597	7	$302	$497	$799
Mary McLeod Bethune Council House NHS [A,B]	3,537	$267	3	$166	$268	$406
Medgar and Myrlie Evers Home NM	59,542	$3,987	60	$1,745	$2,975	$5,640
Mesa Verde NP [A]	505,194	$59,482	776	$23,184	$40,985	$75,637
Mill Springs Battlefield NM	9,150	$612	9	$229	$366	$747
Minidoka (Idaho) NHS [C]	9,059	$181	3	$60	$94	$195
Minidoka (Washington) NHS	9,298	$623	7	$234	$434	$723

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Minute Man NHP	1,001,333	$67,062	836	$40,385	$63,056	$102,307
Minuteman Missile NHS [A]	115,769	$9,902	132	$3,999	$6,951	$12,851
Mississippi NRRA	294,700	$14,921	196	$7,610	$12,368	$21,733
Missouri NRR	116,189	$5,883	76	$2,377	$3,881	$7,171
Mojave NPRES [A,B]	1,178,998	$78,923	900	$38,226	$64,438	$103,836
Monocacy NB [A]	132,098	$5,132	64	$2,198	$3,799	$6,501
Montezuma Castle NM	367,239	$24,596	332	$13,147	$21,871	$37,554
Moores Creek NB	55,483	$4,089	54	$1,552	$2,762	$5,075
Morristown NHP [A]	240,144	$5,262	46	$2,698	$4,344	$6,344
Mount Rainier NP [A]	1,674,294	$70,722	718	$33,767	$59,221	$92,211
Mount Rushmore NMEM [A]	2,431,195	$389,390	5,718	$187,496	$313,979	$556,710
Muir Woods NM [A]	809,697	$101,029	931	$64,328	$99,268	$141,855
Natchez NHP	61,179	$4,097	57	$1,671	$2,845	$5,259
Natchez Trace PKWY [A]	6,784,853	$498,534	5,917	$255,240	$412,081	$673,377
National Capital Parks Central [A]	1,057,835	$103,310	1,376	$65,572	$105,186	$160,633
National Capital Parks East [A,B]	1,252,912	$35,843	447	$21,125	$33,715	$52,730
National Park of American Samoa	12,135	$813	8	$377	$678	$1,047
Natural Bridges NM	83,760	$6,036	70	$2,346	$3,958	$6,973
Navajo NM	44,180	$3,148	37	$1,219	$2,047	$3,606
New Bedford Whaling NHP [A]	17,034	$1,032	14	$661	$1,019	$1,652
New Orleans Jazz NHP	40,357	$2,703	37	$1,271	$2,140	$3,796

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
New River Gorge NR	1,707,223	$86,177	1,127	$33,578	$56,042	$104,397
Nez Perce NHP	377,392	$25,275	318	$10,712	$19,011	$32,976
Nicodemus NHS [A]	7,492	$476	6	$138	$254	$469
Ninety Six NHS	118,207	$7,917	111	$3,403	$5,907	$10,702
Niobrara NSR [A]	75,219	$7,635	105	$2,688	$4,386	$8,928
Noatak NPRES	19,108	$31,961	446	$17,479	$27,899	$47,828
North Cascades NP	40,351	$2,514	24	$1,186	$2,055	$3,114
Obed W&SR [A]	278,944	$5,967	63	$2,135	$3,381	$6,214
Ocmulgee NM	180,928	$12,116	181	$4,527	$7,858	$15,322
Olympic NP	2,947,503	$279,236	2,990	$143,365	$255,285	$393,205
Oregon Caves NM	32,041	$3,011	41	$1,465	$2,272	$4,055
Organ Pipe Cactus NM	186,601	$12,635	164	$6,513	$10,940	$18,754
Ozark NSR	1,334,137	$66,777	908	$22,850	$37,965	$76,762
Padre Island NS	552,687	$27,631	374	$10,975	$17,191	$33,459
Palo Alto Battlefield NHP	160,450	$10,746	162	$4,655	$7,252	$14,216
Paterson Great Falls NHP	279,788	$18,738	227	$10,995	$16,562	$26,795
Pea Ridge NMP	171,562	$11,490	170	$5,029	$8,326	$15,901
Pearl Harbor NMEM [A]	1,692,719	$327,204	3,507	$164,913	$320,381	$483,092
Pecos NHP	50,709	$3,396	47	$1,469	$2,481	$4,537
Pennsylvania Avenue NHS	138,108	$2,985	37	$1,723	$2,852	$4,575
Perry's Victory & International Peace MEM [A]	101,837	$10,264	164	$6,414	$9,953	$17,318

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Petersburg NB	182,695	$12,236	177	$5,866	$9,874	$17,933
Petrified Forest NP	520,491	$38,396	451	$14,635	$24,671	$43,956
Petroglyph NM	314,528	$14,141	195	$6,176	$10,261	$18,746
Pictured Rocks NL	910,939	$45,770	544	$14,991	$26,130	$48,685
Pinnacles NP [A]	341,220	$23,860	204	$12,552	$19,056	$27,541
Pipe Spring NM	24,016	$1,608	22	$646	$1,084	$2,038
Pipestone NM	83,189	$5,571	77	$2,460	$4,038	$7,433
Piscataway P	282,507	$18,921	228	$10,614	$17,370	$27,727
Point Reyes NS	2,268,058	$115,183	1,096	$63,017	$96,396	$147,043
Port Chicago Naval Magazine NMEM	764	$51	1	$30	$47	$72
President's Park	897,181	$19,393	241	$11,194	$18,525	$29,716
President William Jefferson Clinton Birthplace Home NHS	5,024	$337	5	$126	$222	$419
Prince William Forest P [A,B]	295,630	$8,919	101	$4,571	$7,198	$11,202
Pu uhonua O Honaunau NHP	341,502	$22,871	233	$10,620	$19,074	$29,478
Pullman NHP	29,218	$1,957	24	$1,213	$1,899	$3,011
Puukohola Heiau NHS	23,197	$1,554	16	$721	$1,296	$2,003
Rainbow Bridge NM [C]	165	$10	0	$4	$7	$12
Reconstruction Era NHP	23,792	$1,594	19	$619	$1,105	$1,882
Redwood NP	409,105	$29,648	384	$13,748	$21,206	$37,905
Richmond NBP	169,145	$11,329	162	$5,314	$8,975	$16,282

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Rio Grande W&SR [C]	300	$224	4	$91	$136	$280
River Raisin NB	252,796	$16,930	227	$8,963	$14,558	$25,030
Rock Creek P	1,817,868	$39,295	492	$22,724	$37,586	$60,441
Rocky Mountain NP [A]	4,115,837	$568,527	7,833	$341,870	$551,120	$888,656
Roger Williams NMEM	37,707	$2,526	31	$1,493	$2,350	$3,790
Rosie the Riveter WWII Home Front NHP	39,883	$2,671	28	$1,581	$2,431	$3,743
Ross Lake NRA	881,837	$45,519	419	$21,229	$36,578	$55,812
Russell Cave NM	8,678	$581	8	$245	$401	$750
Sagamore Hill NHS	131,333	$8,796	92	$5,192	$8,454	$12,712
Saguaro NP	1,010,906	$74,523	982	$38,786	$65,606	$112,857
Saint-Gaudens NHS [A]	30,537	$1,716	23	$1,048	$1,645	$2,676
Saint Croix Island IHS	12,432	$833	11	$362	$602	$1,084
Saint Croix NSR	806,257	$40,259	529	$20,363	$33,001	$58,110
Saint Paul's Church NHS	11,615	$778	8	$460	$750	$1,130
Salem Maritime NHS	544,747	$36,483	449	$22,187	$34,500	$55,602
Salinas Pueblo Missions NM	39,556	$2,649	37	$1,125	$1,906	$3,501
Salt River Bay NHP&EP	13,731	$920	9	$427	$767	$1,185
San Antonio Missions NHP [A]	1,180,929	$95,046	1,477	$51,316	$82,454	$150,011
San Francisco Maritime NHP	1,769,467	$51,308	472	$25,588	$38,979	$60,901
San Juan Island NHP	457,989	$30,672	309	$15,208	$26,418	$40,456
San Juan NHS [A,B]	1,314,819	$150,754	1,752	$80,637	$152,029	$226,888

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Sand Creek Massacre NHS	5,855	$392	5	$115	$213	$417
Santa Monica Mountains NRA	759,352	$38,448	444	$21,420	$33,702	$54,794
Saratoga NHP	101,943	$6,827	85	$3,076	$5,250	$8,954
Saugus Iron Works NHS	41,314	$2,767	34	$1,679	$2,616	$4,221
Scotts Bluff NM	174,267	$11,671	154	$4,461	$7,452	$13,893
Se uoia NP [A]	980,567	$84,351	1,006	$38,097	$61,470	$103,254
Shenandoah NP	1,576,008	$114,436	1,351	$60,838	$99,409	$159,697
Shiloh NMP	371,735	$24,896	347	$9,094	$15,364	$29,732
Sitka NHP	182,115	$35,798	616	$22,241	$30,073	$54,578
Sleeping Bear Dunes NL [A]	1,598,248	$196,675	2,575	$78,402	$140,352	$253,591
Springfield Armory NHS	15,711	$1,052	13	$595	$942	$1,524
Statue of Liberty NM	3,739,607	$250,450	2,699	$149,004	$242,165	$367,354
Steamtown NHS [A]	58,403	$3,619	51	$1,920	$2,970	$5,226
Stones River NB [A,B]	339,364	$12,827	151	$7,130	$11,663	$18,847
Stonewall NM	832,650	$55,765	603	$33,184	$53,962	$81,936
Sunset Crater Volcano NM	81,519	$5,460	67	$2,236	$3,652	$6,451
Tallgrass Prairie NPRES	28,776	$1,926	27	$799	$1,362	$2,514
Thaddeus Kosciuszko NMEM	2,218	$148	2	$91	$141	$235
Theodore Roosevelt Birthplace NHS	19,892	$1,332	14	$793	$1,289	$1,957
Theodore Roosevelt Inaugural NHS	23,159	$1,551	19	$713	$1,249	$2,101
Theodore Roosevelt Island P	153,053	$10,250	125	$5,785	$9,453	$15,176

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Theodore Roosevelt NP	746,862	$54,223	645	$19,396	$32,967	$60,054
Thomas Edison NHP [A,C]	33,483	$798	7	$435	$696	$1,022
Thomas Jefferson MEM [A]	2,984,919	$102,207	1,354	$65,024	$104,573	$159,315
Thomas Stone NHS	5,757	$386	5	$216	$353	$563
Timpanogos Cave NM	120,656	$8,081	113	$4,012	$6,791	$12,226
Timucuan EHP	959,461	$64,257	916	$30,957	$52,598	$93,536
Tonto NM	31,216	$2,090	28	$1,121	$1,868	$3,221
Tule Lake NM	2,731	$183	2	$76	$117	$213
Tule Springs Fossil Beds NM	60,134	$4,027	45	$1,993	$3,437	$5,508
Tumacacori NHP	37,872	$2,525	33	$1,124	$1,868	$3,309
Tuskegee Airmen NHS [A,B]	22,082	$1,081	15	$436	$755	$1,410
Tuskegee Institute NHS	8,229	$552	8	$214	$356	$703
Tuzigoot NM	102,936	$6,894	93	$3,695	$6,145	$10,543
Ulysses S Grant NHS	33,065	$2,214	33	$1,196	$1,940	$3,476
Upper Delaware NSR&NRR	327,266	$16,571	157	$8,546	$13,853	$20,963
Valles Caldera NPRES	76,090	$5,597	73	$2,361	$4,058	$7,316
Valley Forge NHP [A]	1,880,527	$27,158	411	$16,530	$25,875	$44,666
Vanderbilt Mansion NHS [A]	338,436	$14,569	182	$6,646	$11,649	$18,988
Vicksburg NMP	342,984	$22,970	339	$9,301	$16,082	$30,961
Vietnam Veterans MEM	5,039,454	$108,933	1,353	$62,876	$104,055	$166,912
Virgin Islands NP [A]	343,685	$55,201	617	$27,007	$51,208	$77,716

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Voyageurs NP	220,825	$20,356	279	$8,028	$13,756	$25,640
Waco Mammoth NM	98,123	$6,572	93	$3,044	$4,752	$8,766
Walnut Canyon NM	152,548	$10,217	126	$4,184	$6,834	$12,072
War in the Pacific NHP	415,533	$27,829	284	$12,922	$23,209	$35,869
Washington Monument	248,750	$5,377	67	$3,104	$5,136	$8,239
Washita Battlefield NHS	11,906	$797	12	$245	$424	$901
Weir Farm NHS	36,313	$2,432	26	$1,428	$2,328	$3,508
Whiskeytown NRA	920,311	$46,444	545	$20,032	$31,094	$54,349
White House	553,665	$11,968	149	$6,908	$11,432	$18,338
White Sands NP [A]	729,096	$44,451	595	$16,928	$27,341	$53,386
Whitman Mission NHS	47,232	$3,164	37	$1,251	$2,260	$3,792
William Howard Taft NHS	30,757	$2,060	30	$1,101	$1,748	$3,132
Wilson's Creek NB	316,770	$21,214	311	$9,177	$14,996	$28,723
Wind Cave NP [A]	592,459	$52,011	727	$22,867	$40,501	$74,016
Wolf Trap National Park for the Performing Arts	489,008	$32,750	404	$18,539	$30,280	$48,754
Women's Rights NHP [A]	35,934	$2,962	34	$1,315	$2,412	$3,934
World War I MEM [B]	1,092,228	$23,610	264	$12,969	$21,076	$32,692
World War II Memorial	5,119,541	$110,665	1,374	$63,876	$105,710	$169,567
Wrangell - St Elias NP&PRES	78,305	$130,973	1,827	$71,628	$114,330	$195,996
Wright Brothers NMEM	423,488	$28,362	411	$12,076	$20,444	$38,392

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 5 (continued). NPS visits, spending, and economic contributions to local economies – 2023.

Park Unit	Total Recreation Visits	Total Visitor Spending ($000s, $2023)	Jobs	Labor Income ($000s, $2023)	Value Added ($000s, $2023)	Economic Output ($000s, $2023)
Wupatki NM	215,703	$15,920	190	$6,433	$10,678	$18,743
Yellowstone NP [A]	4,501,382	$623,274	8,561	$290,663	$451,782	$828,347
Yosemite NP [A]	3,897,070	$526,566	6,664	$257,591	$421,894	$724,563
Yukon - Charley Rivers NPRES [C]	1,011	$2,238	31	$1,228	$1,990	$3,385
ion NP [A]	4,623,238	$676,040	10,782	$279,218	$495,371	$967,289

[A] For these parks, results are based on a visitor survey at the designated park. For other parks, visitor characteristics and spending averages are from generic profiles or best available data.

[B] Trip characteristic data, spending data, and/or local area definitions were updated for these parks in 2023.

[C] Area was closed for one or more months in 2023.

Table 6. Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Abraham Lincoln Birthplace NHP	95.6%
Acadia NP	97.8%
Adams NHP	95.6%
African Burial Ground NM	95.6%
Agate Fossil Beds NM	99.2%
Alagnak WR	99.1%
Alibates Flint Quarries NM	95.6%
Allegheny Portage Railroad NHS	95.6%
Amistad NRA	88.0%
Andersonville NHS	95.6%
Andrew Johnson NHS	95.6%
Aniakchak NM&PRES	100.0%
Antietam NB	95.6%
Apostle Islands NL	98.4%
Appomattox Court House NHP	95.6%
Arches NP	99.9%
Arkansas Post NMEM	95.6%
Arlington House, The Robert E. Lee Memorial NMEM	95.6%
Assateague Island NS	88.1%
Aztec Ruins NM	96.3%
Badlands NP	98.8%
Bandelier NM	98.7%
Belmont-Paul Women's Equality NM	91.4%
Bent's Old Fort NHS	95.6%
Bering Land Bridge NPRES	100.0%
Big Bend NP	98.6%
Big Cypress NPRES	99.0%
Big Hole NB	98.7%
Big South Fork NRRA	80.9%
Big Thicket NPRES	98.7%
Bighorn Canyon NRA	88.2%
Biscayne NP	98.7%
Black Canyon of the Gunnison NP	98.7%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Blue Ridge PKWY	94.9%
Bluestone NSR	88.0%
Booker T Washington NM	95.6%
Boston African American NHS	95.6%
Boston Harbor Islands NRA	88.0%
Boston NHP	95.6%
Brown v. Board of Education NHP	95.6%
Bryce Canyon NP	99.2%
Buck Island Reef NM	98.7%
Buffalo NR	88.5%
Cabrillo NM	95.6%
Camp Nelson NM	95.6%
Canaveral NS	67.4%
Cane River Creole NHP	95.6%
Canyon De Chelly NM	98.2%
Canyonlands NP	99.4%
Cape Cod NS	97.9%
Cape Hatteras NS	95.4%
Cape Krusenstern NM	100.0%
Cape Lookout NS	88.4%
Capitol Reef NP	99.1%
Capulin Volcano NM	98.5%
Carl Sandburg Home NHS	95.6%
Carlsbad Caverns NP	98.7%
Carter G. Woodson Home NHS	--
Casa Grande Ruins NM	95.6%
Castillo De San Marcos NM	95.6%
Castle Clinton NM	60.8%
Catoctin Mountain P	36.6%
Cedar Breaks NM	98.7%
Cesar E. Chavez NM	95.6%
Chaco Culture NHP	98.9%
Chamizal NMEM	95.6%
Channel Islands NP	98.8%
Charles Pinckney NHS	95.6%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Charles Young Buffalo Soldiers NM	95.6%
Chattahoochee River NRA	88.0%
Chesapeake & Ohio Canal NHP	91.6%
Chickamauga & Chattanooga NMP	95.6%
Chickasaw NRA	60.0%
Chiricahua NM	98.8%
Christiansted NHS	95.6%
City of Rocks NRES	95.6%
Clara Barton NHS	95.6%
Colonial NHP	98.1%
Colorado NM	98.7%
Congaree NP	94.2%
Coronado NMEM	95.6%
Cowpens NB	98.7%
Crater Lake NP	98.5%
Craters of the Moon NM&PRES	98.6%
Cumberland Gap NHP	89.6%
Cumberland Island NS	89.6%
Curecanti NRA	88.3%
Cuyahoga Valley NP	85.9%
Dayton Aviation Heritage NHP	92.6%
De Soto NMEM	95.6%
Death Valley NP	98.4%
Delaware Water Gap NRA	89.4%
Denali NP&PRES	100.0%
Devils Postpile NM	98.7%
Devils Tower NM	98.7%
Dinosaur NM	98.0%
Dry Tortugas NP	98.7%
Dwight D. Eisenhower MEM	91.6%
Edgar Allan Poe NHS	95.6%
Effigy Mounds NM	95.7%
Eisenhower NHS	95.6%
El Malpais NM	95.6%
El Morro NM	98.7%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Eleanor Roosevelt NHS	95.6%
Eugene O'Neill NHS	95.6%
Everglades NP	94.8%
Federal Hall NMEM	95.9%
Fire Island NS	88.3%
First Ladies NHS	95.6%
First State NHP	95.6%
Flight 93 NMEM	95.6%
Florissant Fossil Beds NM	95.6%
Ford's Theatre NHS	91.6%
Fort Bowie NHS	95.7%
Fort Caroline NMEM	95.6%
Fort Davis NHS	95.6%
Fort Donelson NB	73.8%
Fort Frederica NM	95.6%
Fort Laramie NHS	97.4%
Fort Larned NHS	97.8%
Fort Matanzas NM	95.6%
Fort McHenry NM&SHRINE	95.6%
Fort Necessity NB	95.6%
Fort Point NHS	95.6%
Fort Pulaski NM	98.7%
Fort Raleigh NHS	95.6%
Fort Scott NHS	75.1%
Fort Smith NHS	95.6%
Fort Stanwix NM	96.9%
Fort Sumter NM	95.6%
Fort Union NM	99.8%
Fort Union Trading Post NHS	97.1%
Fort Vancouver NHS	95.6%
Fort Washington P	95.6%
Fossil Butte NM	100.0%
Franklin Delano Roosevelt MEM	54.9%
Frederick Douglass NHS	91.6%
Frederick Law Olmsted NHS	95.6%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Fredericksburg & Spotsylvania NMP	95.6%
Friendship Hill NHS	95.6%
Gates of the Arctic NP&PRES	100.0%
Gateway Arch NP	94.5%
Gateway NRA	65.3%
Gauley River NRA	92.3%
General Grant NMEM	83.0%
George Rogers Clark NHP	95.6%
George Washington Birthplace NM	95.1%
George Washington Carver NM	95.1%
George Washington MEM PKWY	76.5%
Gettysburg NMP	98.7%
Gila Cliff Dwellings NM	95.6%
Glacier Bay NP&PRES	98.8%
Glacier NP	94.1%
Glen Canyon NRA	96.3%
Golden Gate NRA	90.7%
Golden Spike NHS	97.9%
Governors Island NM	95.6%
Grand Canyon NP	98.8%
Grand Portage NM	98.7%
Grand Teton NP	98.6%
Grant-Kohrs Ranch NHS	89.3%
Great Basin NP	81.3%
Great Sand Dunes NP&PRES	99.4%
Great Smoky Mountains NP	95.2%
Greenbelt P	42.0%
Guadalupe Mountains NP	97.6%
Guilford Courthouse NMP	95.6%
Gulf Islands NS	88.1%
Hagerman Fossil Beds NM	95.6%
Haleakala NP	98.7%
Hamilton Grange NMEM	95.6%
Hampton NHS	95.6%
Harpers Ferry NHP	92.1%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Harriet Tubman Underground Railroad NHP	95.6%
Harry S Truman NHS	95.6%
Hawaii Volcanoes NP	98.3%
Herbert Hoover NHS	95.6%
Home of Franklin D Roosevelt NHS	95.6%
Homestead NM	93.5%
Hopewell Culture NHP	95.6%
Hopewell Furnace NHS	95.6%
Horseshoe Bend NMP	95.6%
Hot Springs NP	98.7%
Hovenweep NM	98.7%
Hubbell Trading Post NHS	95.6%
Independence NHP	95.6%
Indiana Dunes NL	88.0%
Isle Royale NP	94.2%
James A Garfield NHS	91.7%
Jean Lafitte NP&PRES	95.6%
Jewel Cave NM	95.6%
Jimmy Carter NHS	95.6%
John D. Rockefeller, Jr. MEM PKWY	93.8%
John Day Fossil Beds NM	98.6%
John F Kennedy NHS	95.6%
John Muir NHS	95.6%
Johnstown Flood NMEM	91.6%
Joshua Tree NP	98.9%
Kalaupapa NHP	95.6%
Kaloko-Honokohau NHP	95.6%
Katahdin Woods and Waters NM	98.7%
Katmai NP&PRES	100.0%
Kenai Fjords NP	100.0%
Kennesaw Mountain NBP	95.6%
Keweenaw NHP	95.6%
Kings Canyon NP	98.4%
Kings Mountain NMP	89.8%
Klondike Gold Rush AK NHP	99.6%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Klondike Gold Rush WA NHP	95.6%
Knife River Indian Villages NHS	95.6%
Kobuk Valley NP	100.0%
Korean War Veterans MEM	93.9%
Lake Chelan NRA	94.7%
Lake Clark NP&PRES	100.0%
Lake Mead NRA	88.3%
Lake Meredith NRA	14.3%
Lake Roosevelt NRA	89.0%
Lassen Volcanic NP	93.4%
Lava Beds NM	95.3%
Lewis and Clark NHP	95.6%
Lincoln Boyhood NMEM	98.5%
Lincoln Home NHS	98.1%
Lincoln MEM	91.6%
Little Bighorn Battlefield NM	95.6%
Little River Canyon NPRES	95.6%
Little Rock Central High School NHS	95.6%
Longfellow NHS	95.6%
Lowell NHP	95.6%
Lyndon B Johnson NHP	95.6%
Lyndon Baines Johnson Memorial Grove on the Potomac NMEM	95.6%
Maggie L Walker NHS	95.6%
Mammoth Cave NP	98.4%
Manassas NBP	95.6%
Manhattan Project (New Mexico) NHP	95.6%
Manhattan Project (Tennessee) NHP	57.5%
Manhattan Project (Washington) NHP	80.3%
Manzanar NHS	99.2%
Marsh - Billings - Rockefeller NHP	95.6%
Martin Luther King Jr NHS	95.6%
Martin Luther King, Jr. MEM	91.6%
Martin Van Buren NHS	86.9%
Mary McLeod Bethune Council House NHS	92.2%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Medgar and Myrlie Evers Home NM	95.6%
Mesa Verde NP	99.8%
Mill Springs Battlefield NM	95.6%
Minidoka (Idaho) NHS	44.3%
Minidoka (Washington) NHS	95.6%
Minute Man NHP	95.6%
Minuteman Missile NHS	100.0%
Mississippi NRRA	88.0%
Missouri NRR	88.0%
Mojave NPRES	95.6%
Monocacy NB	93.3%
Montezuma Castle NM	95.6%
Moores Creek NB	98.7%
Morristown NHP	77.6%
Mount Rainier NP	96.1%
Mount Rushmore NMEM	96.8%
Muir Woods NM	96.2%
Natchez NHP	95.6%
Natchez Trace PKWY	78.5%
National Capital Parks Central	92.1%
National Capital Parks East	39.4%
National Park of American Samoa	95.6%
Natural Bridges NM	98.7%
Navajo NM	98.7%
New Bedford Whaling NHP	95.3%
New Orleans Jazz NHP	95.6%
New River Gorge NR	88.1%
Nez Perce NHP	95.6%
Nicodemus NHS	97.8%
Ninety Six NHS	95.6%
Niobrara NSR	98.2%
Noatak NPRES	100.0%
North Cascades NP	98.9%
Obed W&SR	74.6%
Ocmulgee NM	95.6%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Olympic NP	98.4%
Oregon Caves NM	98.3%
Organ Pipe Cactus NM	98.8%
Ozark NSR	88.5%
Padre Island NS	88.5%
Palo Alto Battlefield NHP	95.6%
Paterson Great Falls NHP	95.6%
Pea Ridge NMP	95.6%
Pearl Harbor NMEM	98.6%
Pecos NHP	95.6%
Pennsylvania Avenue NHS	91.6%
Perry's Victory & International Peace MEM	89.7%
Petersburg NB	95.6%
Petrified Forest NP	98.7%
Petroglyph NM	77.6%
Pictured Rocks NL	88.3%
Pinnacles NP	88.9%
Pipe Spring NM	95.6%
Pipestone NM	95.6%
Piscataway P	95.6%
Point Reyes NS	88.2%
Port Chicago Naval Magazine NMEM	95.5%
President's Park	91.6%
President William Jefferson Clinton Birthplace Home NHS	95.5%
Prince William Forest P	49.2%
Pu`uhonua O Honaunau NHP	95.6%
Pullman NHP	95.6%
Puukohola Heiau NHS	95.6%
Rainbow Bridge NM	95.2%
Reconstruction Era NHP	95.6%
Redwood NP	98.7%
Richmond NBP	95.6%
Rio Grande W&SR	100.0%
River Raisin NB	95.6%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Rock Creek P	91.6%
Rocky Mountain NP	91.4%
Roger Williams NMEM	95.6%
Rosie the Riveter WWII Home Front NHP	95.6%
Ross Lake NRA	88.9%
Russell Cave NM	95.6%
Sagamore Hill NHS	95.6%
Saguaro NP	98.7%
Saint-Gaudens NHS	91.7%
Saint Croix Island IHS	95.6%
Saint Croix NSR	88.6%
Saint Paul's Church NHS	95.6%
Salem Maritime NHS	95.6%
Salinas Pueblo Missions NM	95.6%
Salt River Bay NHP&EP	95.6%
San Antonio Missions NHP	90.0%
San Francisco Maritime NHP	60.8%
San Juan Island NHP	95.6%
San Juan NHS	99.0%
Sand Creek Massacre NHS	95.5%
Santa Monica Mountains NRA	88.0%
Saratoga NHP	95.6%
Saugus Iron Works NHS	95.6%
Scotts Bluff NM	95.6%
Sequoia NP	97.7%
Shenandoah NP	98.8%
Shiloh NMP	95.6%
Sitka NHP	100.0%
Sleeping Bear Dunes NL	97.5%
Springfield Armory NHS	95.6%
Statue of Liberty NM	95.6%
Steamtown NHS	93.7%
Stones River NB	86.5%
Stonewall NM	95.6%
Sunset Crater Volcano NM	95.6%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
Tallgrass Prairie NPRES	95.6%
Thaddeus Kosciuszko NMEM	95.6%
Theodore Roosevelt Birthplace NHS	95.6%
Theodore Roosevelt Inaugural NHS	95.6%
Theodore Roosevelt Island P	95.6%
Theodore Roosevelt NP	98.7%
Thomas Edison NHP	75.9%
Thomas Jefferson MEM	93.9%
Thomas Stone NHS	95.5%
Timpanogos Cave NM	95.6%
Timucuan EHP	95.6%
Tonto NM	95.6%
Tule Lake NM	95.6%
Tule Springs Fossil Beds NM	95.6%
Tumacacori NHP	95.6%
Tuskegee Airmen NHS	92.6%
Tuskegee Institute NHS	95.6%
Tuzigoot NM	95.6%
Ulysses S Grant NHS	95.6%
Upper Delaware NSR&NRR	88.0%
Valles Caldera NPRES	98.7%
Valley Forge NHP	46.2%
Vanderbilt Mansion NHS	90.7%
Vicksburg NMP	95.6%
Vietnam Veterans MEM	91.6%
Virgin Islands NP	100.0%
Voyageurs NP	98.6%
Waco Mammoth NM	95.6%
Walnut Canyon NM	95.6%
War in the Pacific NHP	95.6%
Washington Monument	91.6%
Washita Battlefield NHS	95.6%
Weir Farm NHS	95.6%
Whiskeytown NRA	88.1%
White House	91.6%

Table 6 (continued). Estimated percent of visitor spending made by non-local visitors – 2023.

Park Unit	Percent Visitor Spending from Non-Local Visitors
White Sands NP	98.4%
Whitman Mission NHS	95.6%
William Howard Taft NHS	95.6%
Wilson's Creek NB	95.6%
Wind Cave NP	97.8%
Wolf Trap National Park for the Performing Arts	95.6%
Women's Rights NHP	100.0%
World War I MEM	91.6%
World War II Memorial	91.6%
Wrangell - St Elias NP&PRES	100.0%
Wright Brothers NMEM	95.6%
Wupatki NM	98.7%
Yellowstone NP	99.5%
Yosemite NP	96.7%
Yukon - Charley Rivers NPRES	100.0%
Zion NP	98.5%

Table 7. NPS visits, spending and economic contributions to state economies – 2023.

State	Total Recreation Visits	Total Visitor Spending ($Millions, $2023)	Jobs	Labor Income ($Millions, $2023)	Value Added ($Millions, $2023)	Economic Output ($Millions, $2023)
Alabama	1,287,291	$88.9	1,338	$39.2	$63.6	$121.9
Alaska	3,254,809	$1,504.9	21,274	$838.7	$1,292.4	$2,307.6
American Samoa	12,135	$0.8	8	$0.4	$0.7	$1.0
Arizona	10,809,520	$1,225.0	17,319	$684.2	$1,156.7	$1,997.0
Arkansas	4,447,751	$288.8	4,015	$110.7	$198.1	$375.3
California	36,211,847	$3,162.9	39,678	$2,022.5	$3,229.3	$5,146.1
Colorado	7,280,580	$795.9	11,133	$471.5	$769.4	$1,279.1
Connecticut	36,313	$2.4	28	$1.4	$2.2	$3.5
Delaware	126,414	$8.5	118	$4.2	$6.8	$11.7
District of Columbia	41,101,338	$998.0	9,469	$501.3	$805.1	$1,180.6
Florida	13,309,144	$870.9	12,082	$457.7	$776.6	$1,352.8
Georgia	6,781,835	$403.9	5,742	$203.3	$341.4	$605.4
Guam	415,533	$27.8	284	$12.9	$23.2	$35.9
Hawaii	4,808,385	$586.5	6,131	$284.2	$540.5	$819.1
Idaho	769,552	$44.2	622	$19.0	$31.7	$59.8
Illinois	188,138	$13.0	170	$7.8	$12.6	$20.8
Indiana	3,040,462	$156.6	2,016	$68.3	$115.0	$204.4
Iowa	171,523	$11.9	172	$5.1	$8.4	$15.8
Kansas	106,700	$6.0	80	$2.5	$4.4	$8.0
Kentucky	1,975,538	$114.9	1,690	$53.9	$85.3	$158.9
Louisiana	300,411	$20.1	276	$8.9	$15.2	$27.3
Maine	3,930,777	$478.8	6,819	$254.5	$434.0	$752.4
Maryland	6,305,727	$225.7	2,669	$118.1	$195.2	$313.9
Massachusetts	8,732,682	$862.9	10,482	$539.7	$849.6	$1,349.1

Table 7 (continued). NPS visits, spending and economic contributions to state economies – 2023.

State	Total Recreation Visits	Total Visitor Spending ($Millions, $2023)	Jobs	Labor Income ($Millions, $2023)	Value Added ($Millions, $2023)	Economic Output ($Millions, $2023)
Michigan	2,820,169	$273.4	3,730	$139.4	$237.3	$413.0
Minnesota	1,090,134	$67.5	915	$34.5	$56.4	$99.6
Mississippi	9,065,256	$590.1	8,245	$235.0	$401.2	$757.4
Missouri	4,170,417	$262.9	4,082	$144.8	$231.6	$418.1
Montana	5,656,618	$716.3	10,880	$362.0	$551.2	$1,057.5
Nebraska	314,896	$22.5	330	$11.2	$18.1	$32.9
Nevada	4,552,349	$238.8	2,487	$108.2	$187.1	$301.9
New Hampshire	30,537	$1.7	23	$1.0	$1.7	$2.7
New Jersey	5,195,543	$192.8	2,488	$116.4	$176.9	$286.4
New Mexico	2,265,573	$141.8	1,855	$55.9	$95.7	$177.1
New York	17,197,346	$724.9	7,394	$378.0	$632.0	$965.9
North Carolina	20,893,208	$2,587.4	38,828	$1,525.8	$2,432.1	$4,126.1
North Dakota	767,938	$56.0	711	$22.5	$38.3	$70.5
Ohio	3,195,784	$163.7	2,525	$98.8	$154.4	$267.6
Oklahoma	2,094,232	$41.4	396	$12.8	$20.5	$40.0
Oregon	1,045,772	$86.8	1,199	$48.1	$75.9	$130.6
Pennsylvania	8,300,004	$426.3	6,157	$251.8	$382.4	$662.6
Puerto Rico	1,314,819	$150.8	1,752	$80.6	$152.0	$226.9
Rhode Island	37,707	$2.5	32	$1.3	$2.1	$3.5
South Carolina	1,281,602	$80.9	1,058	$34.4	$60.5	$106.9
South Dakota	4,423,548	$599.9	8,327	$287.9	$477.1	$834.6
Tennessee	10,545,648	$1,400.6	20,021	$832.1	$1,309.3	$2,166.1
Texas	5,339,503	$322.7	4,464	$172.1	$272.2	$487.6
Utah	15,678,160	$1,899.6	26,507	$985.4	$1,702.0	$2,981.2

Table 7 (continued). NPS visits, spending and economic contributions to state economies – 2023.

State	Total Recreation Visits	Total Visitor Spending ($Millions, $2023)	Jobs	Labor Income ($Millions, $2023)	Value Added ($Millions, $2023)	Economic Output ($Millions, $2023)
Vermont	71,799	$4.8	61	$2.1	$3.7	$6.4
Virgin Islands	510,794	$66.6	732	$32.2	$60.7	$92.3
Virginia	23,263,467	$1,494.3	21,159	$769.3	$1,301.3	$2,274.4
Washington	8,294,749	$565.1	6,106	$278.0	$495.3	$780.2
West Virginia	2,343,355	$120.5	1,599	$47.8	$79.2	$146.0
Wisconsin	650,296	$64.6	929	$31.1	$50.7	$93.0
Wyoming	7,683,019	$1,098.6	14,522	$479.3	$796.2	$1,425.0

Table 8. NPS unit type abbreviations.

Park Unit Type	Abbreviation
Ecological & Historic Preserve	EHP
International Historic Site	IHS
Memorial	MEM
Memorial Parkway	MEM PKWY
National & State Parks	NP
National Battlefield	NB
National Battlefield Park	NBP
National Expansion Memorial	NEM
National Historic Site	NHS
National Historical Park	NHP
National Historical Park and Preserve	NP&PRES
National Lakeshore	NL
National Memorial	NMEM
National Military Park	NMP
National Monument	NM
National Monument & Preserve	NM&PRES
National Monument and Historic Shrine	NM&SHRINE
National Monument of America	NM
National Park	NP
National Park & Preserve	NP&PRES
National Preserve	NPRES
National Recreation Area	NRA
National Recreational River	NRR
National Reserve	NRES
National River	NR
National River & Recreation Area	NRRA
National Scenic River	NSR
National Scenic Riverways	NSR
National Seashore	NS
National Wild and Scenic River	W&SR
Park	P
Parkway	PKWY
Scenic & Recreational River	NSR&NRR
Wild & Scenic River	W&SR
National Scenic Riverway	NSR
National Historic Park & Ecological Preserve	NHP&EP
Wild River	WR

Table 9. Visitor Spending Effects visit allocation for multi-state parks.

Park Unit	State	Share
Assateague Island NS	Maryland	33.0%
Assateague Island NS	Virginia	67.0%
Big South Fork NRRA	Kentucky	41.0%
Big South Fork NRRA	Tennessee	59.0%
Bighorn Canyon NRA	Montana	54.0%
Bighorn Canyon NRA	Wyoming	46.0%
Blue Ridge PKWY	North Carolina	62.0%
Blue Ridge PKWY	Virginia	38.0%
Chesapeake & Ohio Canal NHP	District of Columbia	24.0%
Chesapeake & Ohio Canal NHP	Maryland	76.0%
Chickamauga & Chattanooga NMP	Georgia	50.0%
Chickamauga & Chattanooga NMP	Tennessee	50.0%
Cumberland Gap NHP	Kentucky	93.0%
Cumberland Gap NHP	Virginia	7.0%
Death Valley NP	California	100.0%
Death Valley NP	Nevada	0.0%
Delaware Water Gap NRA	New Jersey	71.0%
Delaware Water Gap NRA	Pennsylvania	29.0%
Dinosaur NM	Colorado	74.0%
Dinosaur NM	Utah	26.0%
First State NHP	Delaware	88.4%
First State NHP	Pennsylvania	11.6%
Gateway NRA	New Jersey	19.0%
Gateway NRA	New York	81.0%
Glen Canyon NRA	Arizona	21.9%
Glen Canyon NRA	Utah	78.1%
Great Smoky Mountains NP	North Carolina	44.0%
Great Smoky Mountains NP	Tennessee	56.0%
Gulf Islands NS	Florida	61.7%
Gulf Islands NS	Mississippi	38.3%
Hovenweep NM	Colorado	44.0%
Hovenweep NM	Utah	56.0%
Lake Mead NRA	Arizona	25.0%
Lake Mead NRA	Nevada	75.0%
Natchez Trace PKWY	Alabama	7.0%
Natchez Trace PKWY	Mississippi	80.0%

Table 9 (continued). Visitor Spending Effects visit allocation for multi-state parks.

Park Unit	State	Share
Natchez Trace PKWY	Tennessee	13.0%
National Capital Parks East	District of Columbia	90.0%
National Capital Parks East	Maryland	10.0%
Saint Croix NSR	Minnesota	50.0%
Saint Croix NSR	Wisconsin	50.0%
Upper Delaware NSR&NRR	New York	50.0%
Upper Delaware NSR&NRR	Pennsylvania	50.0%
Yellowstone NP	Montana	51.0%
Yellowstone NP	Wyoming	49.0%

Table 10. Visitor Spending Effects IMPLAN sector bridge – 2023.

Spending Group	Sector Name	IMPLAN Sector	Weight
Hotels	Hotels and motels, including casino hotels	507	1.00
Specialty Lodging [C]	Other accommodations	508	1.00
Camping Fees	Other accommodations	508	1.00
Restaurants	Full-service restaurants	509	0.50
Restaurants	Limited-service restaurants	510	0.50
Groceries [B]	Retail – Food and beverage stores	3406	1.00
Agritourism [A]	Other amusement and recreation	3504	0.25
Agritourism [A,B]	Retail services – Food and beverage stores	3406	0.75
Craft Beverage Recreation [A]	Breweries	106	0.5
Craft Beverage Recreation [A]	Wineries	107	0.5
Gas [B]	Retail – Gasoline stores	3408	1.00
Local Transportation	Transit and ground passenger transportation	418	0.25
Local Transportation	Automotive equipment rental and leasing	450	0.75
Public Transportation [A]	Transit and ground passenger transportation	418	1.00
Rental Cars [A]	Automotive equipment rental and leasing	450	1.00
Local Air Transportation [A]	Air transportation	414	1.00
Local Water Transportation [A]	Water transportation	416	1.00
Local Ferry and Plane Transportation [A]	Air transportation	414	0.5
Local Ferry and Plane Transportation [A]	Water transportation	416	0.5
Scenic and Sightseeing Transportation [A]	Scenic and sightseeing transportation and support activities for transportation	420	1.00
Recreation and Entertainment	Other amusement and recreation industries	504	1.00

[A] Spending group added for newer Socioeconomic Monitoring (SEM) survey data.

[B] Retail margins are applied for these spending groups. For retail purchases, only retail margins are modeled as stimulating economic activity in the local economy.

[C] Due to batch modeling constraints, all specialty lodging expenditures are modeled through the “Other accommodations” sector.

Table 10 (continued). Visitor Spending Effects IMPLAN sector bridge – 2023.

Spending Group	Sector Name	IMPLAN Sector	Weight
National Parks Permits and Fees [A]	Museums, historical sites, zoos, and parks	501	1.00
Guides and Tour Fees [A]	Other amusement and recreation industries	504	1.00
Equipment Rental [A]	General and consumer goods rental except video tapes and discs	451	1.00
Sporting Goods [A,B]	Retail – Sporting goods, hobby, musical instrument and book stores	3410	1.00
Souvenirs and Other Retail [B]	Retail – Miscellaneous store retailers	3412	1.00
Medical Expenses [A]	Offices of physicians	483	0.33
Medical Expenses [A]	Outpatient care centers	486	0.33
Medical Expenses [A]	Hospitals	490	0.34
Cruise Package [A]	Water transportation	416	0.45
Cruise Package [A]	Hotels and motels, including casino hotels	507	0.55
Electric Vehicle Charging [A,B]	Retail services – Gasoline stores	3408	1.00
Automobile Repair [A]	Automotive repair and maintenance, except car washes	512	1.00

[A] Spending group added for newer Socioeconomic Monitoring (SEM) survey data.

[B] Retail margins are applied for these spending groups. For retail purchases, only retail margins are modeled as stimulating economic activity in the local economy.

[C] Due to batch modeling constraints, all specialty lodging expenditures are modeled through the “Other accommodations” sector.

National Park Service
U.S. Department of the Interior

Science Report NPS/SR—2024/174
https://doi.org/10.36967/2305351

Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

NPS 999/194564, August 2024

7. ECONOMIC IMPACTS

7.1 The Carson National Forest Regional Economy

Carson National Forest (NF) generates economic activity from a variety of uses, each of which affects the surrounding region in a number of ways. Carson NF lies mainly within Taos and Rio Arriba Counties, with just a small portion in Mora and Colfax Counties. The principal settlements in the region include Española in Rio Arriba County and Taos in Taos County, though Española is somewhat south of the forest itself. Colfax County contains Springer and Raton, both a significant distance east of the Carson NF. Mora County contains Mora, which is much closer but very small. Further, the economies of Taos and Rio Arriba Counties are much larger than those of Colfax and Mora Counties, and account for 77 percent of the employment in the four county area. Since Carson NF land lies mainly in Taos and Rio Arriba Counties, and the economies of these two counties are significantly larger than Colfax and Mora Counties, the economic contribution of the NF is generally associated with activities in these two counties.

Table 7.1 shows employment and per capita income for the Carson NF region for the year 2003. As a whole, per capita income in the Carson NF assessment area is $21,045, about two-thirds the statewide average but well above average for most rural areas in New Mexico[153]. Rio Arriba and Taos Counties' economies are among the largest in New Mexico, with pockets of relative wealth scattered among mainly rural, low and middle income communities. Colfax County, though smaller than Taos and Rio Arriba Counties, has the highest per capita income of the region, at $22,496. Mora County, by contrast, is the poorest county in the region and among the poorer counties in the state, with a per capita income of only $15,867.

TABLE 7.1 TOTAL EMPLOYMENT AND INCOME BY COUNTY, 2003

	Employment (#)	Percent of Region	Per Capita Income ($)	Relative to US
Colfax County	8,469	19%	22,496	0.71
Mora County	2,016	4%	15,867	0.50
Rio Arriba County	17,535	39%	20,720	0.66
Taos County	17,267	38%	21,694	0.69
Carson Region	45,287	100%	21,045	0.67
New Mexico	1,015,365	--	24,892	0.79
United States	167,488,500	--	31,484	1.00

Source: Bureau of Economic Analysis, 2003

Table 7.2 shows the industrial composition of employment in each county for the years 1980, 1990 and 2000. In general and as in most parts of the U.S. and New Mexico, changes in the industrial structure of the region involve a relative increase of employment in the service sector and retail sectors and, during the 1990s, in the

[153] New Mexico's statewide average is pushed up significantly by relatively high incomes in urban areas, particularly in Albuquerque, Santa Fe and Los Alamos. Few rural counties have incomes above $17,500 per person.

construction sector. All counties saw a decline in shares of farm employment. The principal distinction among the counties was regard to the role of the public sector.

Mora County, with the smallest economy in the region, is distinguished among the four counties as the most rural, with a far higher share of farm employment. Yet, the changes in the composition of employment in the county were also most pronounced among the four counties. In particular, services increased 15 percent during the 1980-2000 period, from only 8 percent to 23 percent of total employment. Conversely, the farm sector and government employment, which together accounted for 69 percent of total employment in 1980, declined sharply in relative shares, to 52 percent in 2000.

Colfax County's industrial structure was fairly stable from 1980 to 2000. There were small increases in the relative size of services[154], retail and government, particularly in state government, and corresponding decreases in farming, manufacturing, and wholesale trade. Growth of the construction sector during the period between 1990-2000 reflects residential development in Angel Fire and Eagle's Nest. The closing of coal mines in Colfax County is not reflected in the 2003 data, but likely had adverse effect on the counties' economic activity.

Employment in Rio Arriba County nearly doubled between 1980 and 2000, driven mainly by the very rapid expansion of the service sector and retail trade sectors. Other sectors grew more slowly, except for the small wholesale trade sector which saw a small decline. In terms of employment composition, as in Mora County, farm and government employment fell sharply in Rio Arriba County.

Taos County followed a similar pattern, albeit from a starting point that was less farm based and already more characteristic of tourism. Services grew very rapidly, along with the retail and construction sectors. By contrast, farm and government sectors continued to lose employment shares. To a lesser extent, employment shares in manufacturing, mining, and transportation and utilities also fell.

[154] Data for 2000 have been supressed by the BEA to avoid disclosing information specific to individual businesses. (D) in the tables indicates 'Disclosure'.

TABLE 7.2 EMPLOYMENT IN PRIMARY SECTORS BY COUNTY IN 1980, 1990, AND 2000

Mora	1980	1990	2000	1980%	1990%	2000%	Growth 1980 1990	Growth 1990 2000
TOTAL	1,061	1,120	1,767	100%	100%	100%	6%	58%
Farm Employment	**407**	**429**	**515**	**38%**	**38%**	**29%**	**5%**	**20%**
Non-farm Employment	**654**	**691**	**1,252**	**62%**	**62%**	**71%**	**6%**	**81%**
Private Employment	**324**	**380**	**853**	**31%**	**34%**	**48%**	**17%**	**124%**
Agricultural services, forestry, and fishing	(D)	35	76	(D)	3%	(D)	(D)	117%
Mining	(L)	(D)	(L)	(L)	(D)	(L)	(D)	(D)
Construction	37	43	93	3%	4%	(D)	16%	116%
Manufacturing	(D)	36	(D)	(D)	3%	(D)	(D)	(D)
Transportation and utilities	46	63	102	4%	6%	6%	37%	62%
Wholesale trade	12	(L)	(D)	1%	(L)	(D)	(D)	(D)
Retail trade	116	68	112	11%	6%	6%	-41%	65%
Services	86	120	405	8%	11%	23%	40%	238%
Government and gov't enterprises	**330**	**311**	**399**	**31%**	**28%**	**23%**	**-6%**	**28%**
Federal, civilian	41	39	46	4%	3%	3%	-5%	18%
Military	19	22	17	2%	2%	1%	16%	-23%
State and local	270	250	336	25%	22%	19%	-7%	34%
State government	68	56	58	6%	5%	3%	-18%	4%
Local government	202	194	278	19%	17%	16%	-4%	43%

Colfax	1980	1990	2000	1980%	1990%	2000%	Growth 1980 1990	Growth 1990 2000
TOTAL	6,674	6,534	8,465	100%	100%	100%	-2%	30%
Farm Employment	**502**	**434**	**499**	**8%**	**7%**	**6%**	**-14%**	**15%**
Non-farm Employment	**6,172**	**6,100**	**7,966**	**92%**	**93%**	**94%**	**-1%**	**31%**
Private Employment	**5,058**	**4,807**	**6,376**	**76%**	**74%**	**75%**	**-5%**	**33%**
Agricultural services, forestry, and fishing	52	82	(D)	1%	1%	(D)	58%	(D)
Mining	551	208	(D)	8%	3%	(D)	-62%	(D)
Construction	382	313	477	6%	5%	6%	-18%	52%
Manufacturing	404	362	409	6%	6%	5%	-10%	13%
Transportation and utilities	254	287	263	4%	4%	3%	13%	-8%
Wholesale trade	130	94	95	2%	1%	1%	-28%	1%
Retail trade	1160	1184	1,654	17%	18%	20%	2%	40%
Services	2,125	2,277	(D)	32%	35%	(D)	7%	(D)
Government and gov't enterprises	**1,114**	**1,293**	**1,590**	**17%**	**20%**	**19%**	**16%**	**23%**
Federal, civilian	55	58	64	1%	1%	1%	5%	10%
Military	63	65	47	1%	1%	1%	3%	-28%
State and local	996	1170	1,479	15%	18%	17%	17%	26%
State government	408	544	736	6%	8%	9%	33%	35%
Local government	588	626	743	9%	10%	9%	6%	19%

Rio Arriba	1980	1990	2000	1980%	1990%	2000%	Growth 1980 1990	Growth 1990 2000
TOTAL	8,387	11,088	15,537	100%	100%	100%	32%	40%
Farm Employment	**874**	**986**	**1,059**	**10%**	**9%**	**7%**	**13%**	**7%**
Non-farm Employment	**7,513**	**10,102**	**14,478**	**90%**	**91%**	**93%**	**34%**	**43%**
Private Employment	**4,252**	**6,526**	**9,821**	**51%**	**59%**	**63%**	**53%**	**50%**
Agricultural services, forestry, and fishing	116	114	192	1%	1%	1%	-2%	68%
Mining	48	68	78	1%	1%	1%	42%	15%
Construction	464	677	953	6%	6%	6%	46%	41%
Manufacturing	256	507	648	3%	5%	4%	98%	28%
Transportation and utilities	346	518	528	4%	5%	3%	50%	2%
Wholesale trade	117	199	209	1%	2%	1%	70%	5%
Retail trade	1,240	1,563	2,484	15%	14%	16%	26%	59%
Services	1,377	2,532	4,153	16%	23%	27%	84%	64%
Government and gov't enterprises	**3,261**	**3,576**	**4,657**	**39%**	**32%**	**30%**	**10%**	**30%**
Federal, civilian	350	406	416	4%	4%	3%	16%	2%
Military	135	175	136	2%	2%	1%	30%	-22%
State and local	2,776	2,995	4,105	33%	27%	26%	8%	37%
State government	860	678	850	10%	6%	5%	-21%	25%
Local government	1,916	2,317	3,255	23%	21%	21%	21%	40%

Taos	1980	1990	2000	1980%	1990%	2000%	Growth 1980 1990	Growth 1990 2000
TOTAL	8,351	11,434	15,918	100%	100%	100%	37%	39%
Farm Employment	**432**	**472**	**494**	**5%**	**4%**	**3%**	**9%**	**5%**
Non-farm Employment	**7,919**	**10,962**	**15,424**	**95%**	**96%**	**97%**	**38%**	**41%**
Private Employment	**6,355**	**9,402**	**13,173**	**76%**	**82%**	**83%**	**48%**	**40%**
Agricultural services, forestry, and fishing	46	124	188	1%	1%	1%	170%	52%
Mining	737	362	271	9%	3%	2%	-51%	-25%
Construction	519	780	1,330	6%	7%	8%	50%	71%
Manufacturing	440	594	410	5%	5%	3%	35%	-31%
Transportation and utilities	207	333	363	2%	3%	2%	61%	9%
Wholesale trade	86	218	226	1%	2%	1%	153%	4%
Retail trade	1,563	2,379	3,310	19%	21%	21%	52%	39%
Services	2,400	4,005	5,944	29%	35%	37%	67%	48%
Government and gov't enterprises	**1,564**	**1,560**	**2,251**	**19%**	**14%**	**14%**	**0%**	**44%**
Federal, civilian	295	318	312	4%	3%	2%	8%	-2%
Military	91	118	99	1%	1%	1%	30%	-16%
State and local	1,178	1,124	1,840	14%	10%	12%	-5%	64%
State government	206	147	365	2%	1%	2%	-29%	148%
Local government	972	977	1,475	12%	9%	9%	1%	51%

Notes: (D) Non-disclosure of confidential information, but included in totals, (L) Less than 10 jobs, and (N) Data not available for this year.
Source: Bureau of Economic Analysis

To complete the picture, **Table 7.3** shows private employment by percent of occupation for each county and the region as a whole. The occupation data supports the data from previous tables, showing a large percent of jobs in management, sales and services occupations, with construction representing a substantial portion as well. Differences in the total employment between **Table 7.2** and **Table 7.3** are due principally to the inclusion of self-employment in the BEA data.

TABLE 7.3 PRIVATE EMPLOYMENT BY OCCUPATION BY COUNTY, 2000

	Colfax County	Mora County	Rio Arriba County	Taos County	Carson Region
Management and Professional	30%	28%	30%	32%	24%
Professional and related	16%	19%	19%	20%	15%
Education, training, and library	7%	8%	7%	6%	5%
Healthcare practitioners and technical	4%	2%	2%	3%	2%
Service	19%	22%	21%	22%	17%
Sales and office	22%	18%	25%	25%	19%
Farming, fishing, and forestry	3%	6%	2%	1%	1%
Construction, extraction, and maintenance	14%	17%	13%	13%	10%
Production and transportation	12%	8%	9%	7%	7%
Total Private Employment	**6,045**	**1,686**	**16,563**	**13,556**	**48,673**

Source: US Census 2000. Calculations by UNM-BBER.

Finally, **Table 7.4** shows the unemployment rates for each of the counties and the region as a whole from 1995 to 2004. The most striking trend in these data is the much higher unemployment rates of Mora County when compared with the other three counties in the region. While unemployment in all counties in the region is consistently higher than the New Mexico average, Colfax, Rio Arriba, and Taos County are only slightly higher, while unemployment in Mora County is significantly higher.

TABLE 7.4 AVERAGE ANNUAL UNEMPLOYMENT RATE BY COUNTY 1995-2004

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Colfax County	12.8	9.3	6.7	6.1	5.5	5.2	5	6.2	5.7	5.4
Mora County	24.1	21.4	20.4	18.6	14.8	10.5	9.6	10.6	11.1	11.7
Rio Arriba County	14	12.9	10.4	7.7	6.6	5.7	6	6.5	6.4	6.2
Taos County	15.8	14.5	13	9	10.2	6.3	6.4	6.4	7	6.4
Carson Region	**16.7**	**14.5**	**12.6**	**10.4**	**9.3**	**6.9**	**6.8**	**7.4**	**7.6**	**7.4**
NM TOTAL	**6.4**	**7.4**	**7.1**	**6.3**	**6**	**5.2**	**4.8**	**5.2**	**5.8**	**5.9**

Source: Bureau of Labor Statistics, Local Area Unemployment Statistics (LAUS).

The data presented in this section show a region that is substantially oriented toward retail and service industries, though Mora County is an exception to this. As such, the most important aspect of Carson NF use is the revenues generated by recreational visitors. This is not to neglect the primary industrial uses of the forest land, but the main economic concerns of the region with respect to the forest are likely oriented toward maintaining or extending recreational use. This is particularly true for ski visitors, who make up a substantial portion of recreation and, at least in Taos County, are a very important source of revenue during the otherwise non-tourist winter season. One additional aspect discussed in Chapter 5: Uses and Users is that a number of region residents make use of forest food and fuel products to supplement low incomes and provide heat throughout the winter.

7.2 Methodology and Organization of Impact Analysis

In estimating the contribution of the Carson NF to the regional economy, we consider both the operations of the FS in the region as well as the various uses of forest related products. The IMPLAN software is used to determine total economic value of each activity and the operations of the FS. IMPLAN uses county-level input-output (I-O) data to determine the extent to which these activities contribute to the local economy. In doing so, IMPLAN distinguishes between direct, indirect, and induced impacts, where:

Direct impacts include the economic value generated by the activity itself, such as the value of cattle grazed on Carson NF land.

Indirect impacts include the value generated by purchases to support that activity and the corresponding purchases to support those activities, in perpetuity. For example, indirect impacts would include the value of fencing purchased for ranching, the value of steel purchased to make the fencing, and so on.

Induced impacts capture the value of economic activity generated from spending by employees that produce the direct and indirect goods. The ranch employees will purchase food, pay for electricity, etc…all of which generates additional value from the purchases, as well as sparking new rounds of indirect and induced value.

The IMPLAN region is the same region used throughout this report, consisting of the four counties containing or bordering any of the Carson NF districts. These counties

include: Colfax, Mora, Rio Arriba, and Taos County. This single region, containing the above four counties, makes up the area considered as "local," and the results shown from IMPLAN are for this region of four counties as a whole.

As discussed in Chapter 5: Uses and Users, the principal economic value generating activities related to the forest land itself include ranching, and recreation and wildlife visits. Oil and gas production also generates high economic value in the region, but the impacts of this activity on the local region are limited. For each activity, we estimate the direct impact, and use IMPLAN to estimate the total economic value by direct, indirect, and induced impacts. The FS is unique in that it does not directly produce a good or service, and so there is no easy measure of its direct economic value. Instead, we look at FS expenditures and salaries and wages to estimate the first round of indirect and induced impacts of the FS, and the corresponding economic activity generated by each. The indirect activity is captured by FS expenditures, and the induced activity is captured by the disposable income of FS employees. Of course, in examining the contribution of the FS, we also consider direct employment by the FS.

This analysis draws on a wide range of data and information sources. Data on the structure of the local economies and characteristics of the workforce comes largely from the 2000 Decennial Census Summary File 3 and US Department of Labor Local Area Unemployment Statistics (LAUS). The FS provided data on the specific activities that occurred on the forest. Specific sources included INFRA (grazing); NVUM (recreation and wildlife); Region 3 Office (procurement, wages & salaries). The US Department of Agriculture National Agricultural Statistics Service (NASS) was the source of data on agricultural land values and cattle stocking rates. Oil and gas production values are from the ONGARD database provided by the Oil Conservation Division at the New Mexico Energy, Minerals and Natural Resources Department and the New Mexico Taxation and Revenue Department, while oil and gas prices are from GO-TECH at New Mexico Institute of Mining and Technology.

7.3 Direct Impact of Carson National Forest on the Regional Economy

The principal economic activities on the Carson NF include ranching, timber harvests, recreation and wildlife visits, and the operation activities of the FS. As mentioned above, oil and gas extraction generates a large volume of output, the benefits of which for the most part do not accrue to the local region (this is discussed further below). Some of these activities are quite large economically, though their benefit to the local region can vary substantially. Additionally, there is considerable economic activity in terms of guided trips, including hunting tours, whitewater rafting, horseback riding vacations, and other luxury recreational activities that are either not captured in the recreational data used here, or are likely to be substantially underrepresented. In such cases we attempt to address major contributions individually.

To maintain consistency, data for 2004 was used wherever possible. Where 2004 data is not available, or more recent data is available, we used that instead, making sure to

adjust values back to 2004. Data for FS salaries and wages is from fiscal year 2005 adjusted to 2004 dollars. Data on grazing land is from 2002. Visitor estimations are derived from the 2003 NVUM survey. All other data is from 2004 unless noted.

The FS provided data on cattle grazing from the INFRA database in terms of Animal Unit Months (AUMs), and we estimated the number of employees needed per AUM. Together these values provide an estimated number of employees needed to produce the 2002 AUMs. Using the IMPLAN value for output per employee, we derive a ranching output for grazing on the Carson NF. This is the direct value of ranching on Carson NF land. Similarly, timber harvesting data was derived from the TIMS database provided by the FS. We use 2004 timber prices to derive the total value of timber cut, which measures the direct value of timber harvested in Carson NF in 2004.

Oil and gas production values come from the Oil Conservation Division of the New Mexico Energy, Minerals and Natural Resources Department. The data list production for 2004 and the geographic location of each well, so we were able to match well locations to find those wells located on Carson NF land. Using 2004 oil and gas prices gives us a market value for the production on forest land. Rock and mineral extraction data was provided by the FS and the market value of the production was calculated using an average of prices from relevant surveyed New Mexico businesses.

For recreation and wildlife visitors, we use estimates of visitors from NVUM data provided by the FS, broken out into several categories based on locality (local or non-local), the type of trip (day, overnight on the forest, overnight off the forest), and the reason for the visit (recreation or wildlife). The FS provided an average expenditure profile for each type of visitor, which estimates the direct economic value of visitor spending to the local economy. It is likely that there are several benefits here that are not captured. Many of additional benefits of a forest in terms of recreation are not economic transactions and hence cannot be easily measured. In addition to these unmeasured benefits, there is some degree of outfitter and guide activity that is likely not captured. The outfitter businesses include guided hunting trips, whitewater rafting on the Carson River, and other specialized uses by private companies. The impacts from this segment are small, but can be important, since the customers are almost exclusively non-local and the trips can be quite expensive.

Finally, the FS provided data on salaries and wages for Carson NF employees and other direct expenditures. Since the direct economic value associated with the FS personnel expenditures is unknown, we use expenditures to capture the first round indirect impacts and salaries and wages to capture the first round induced impacts. In both cases, the associated later round indirect and induced impacts are calculated by the IMPLAN model.

Table 7.5 is a summary of the output, employment and labor incomes directly associated with Carson NF-based activities[155]. These are the direct inputs to the IMPLAN model. As the table shows, there is the equivalent of 112 full-time annual jobs

[155] Labor income is the sum of employee compensation and proprietor income.

in the ranching industry and a similar 15 jobs in harvesting lumber from the Carson NF. In the case of FS operations, employment is the number of employees directly employed by the FS in the Carson NF, and labor income is the wages paid to those employees. Output for the FS is actually FS spending on operations, and does not include the costs of fighting wildfires, which is broken out separately. Finally, while mineral and rock extraction data is available, its market value is quite low, estimated at less than $15,000 in 2004. There is negligible minerals extraction on Carson NF, so that is not considered as an impact here. For various reasons, the impacts of wildfire suppression, oil and gas extraction, and ski visitors activities on the local economy are likely overestimated by IMPLAN. These factors are considered in greater detail below, in section 7.4.

TABLE 7.5 DIRECT INPUTS OF THE CARSON NF, 2004
(000s of 2004 $, except employment)

	Output	Employment	Labor Income
Ranching[1]	**5,149**	**112**	**232**
Timber Harvesting	**2,232**	**15**	**274**
Oil & Gas	**163,122**	**2**	**204**
Visitors & Recreation	**159,835**	**	**
Skiers	**57,131**	**	**
Forest Service Operations[2]	**8,884**	**223**	**7,601**
Wildfire Suppression[2]	**687**	**	**805**

[1] For Ranching, we use proprietor income from 2001, since proprietor income for 2002 is negative

[2] Forest service operations output is actually the first round of indirect spending, while labor income is disposable employee income.

**It makes no sense to associate employment or labor income with visitor spending in the input phase, since there are no jobs until after the money has been spent. Since the impact is originating as consumer spending, there are only indirect/induced impacts, no direct effects except the spending.

Table 7.6 presents total employment and output for industrial sectors that may be affected by Carson NF. A comparison of the IMPLAN generated FS impact values with these data offers a measure of the dependence of local industries on Carson NF resources – to the extent that IMPLAN values comprise a large share of the overall level of activity for a sector, that sector can be said to depend on FS resources. In the case of ranching and timber harvesting, Carson NF contributes about $7.4 million in output and 127 jobs combined, equivalent to only about 7 percent of the total for the assessment area. FS operations and employment account for 223 jobs and $8.9 million in output, equivalent to a substantially larger share of federal non-military activities in the assessment area. Most significantly, recreation and tourism related activities associated with the Carson NF contribute about $160 million, accounting for a substantial share of such activities in the assessment area.

TABLE 7.6 EMPLOYMENT AND OUTPUT FOR SELECT INDUSTRIES BY COUNTY, 2002

	Output	Employment
Carson NF Region	2,495,898	35,575
Cattle Ranching, Farming	79,068	1,720
Logging	21,052	140
Oil & Gas	18,750	52
Support Activities for Oil & Gas	8,394	82
Drilling Oil & Gas Wells	2,792	26
Gold, Silver and Other Metals Mining	18,753	98
Coal Mining	50,035	180
Sand, Stone and Gravel Quarrying	942	11
Hotels, Motels and Casinos	52,003	1,076
Food and Beverage Stores	28,587	619
Food Services and Drinking Places	102,834	2793
Federal Non-Military	53,476	728

Source: IMPLAN 2002 data, calculations by UNM-BBER. Percents do not sum to 100 because not all industries are included.

7.4 Economic Impacts and Multipliers

The direct activities associated with the Carson NF create indirect and induced impacts as businesses and workers make expenditures and purchases that cycle through the local economy. The sum of the direct, indirect, and induced expenditures constitutes the total impact of the Carson NF on the economies of the neighboring communities. These impacts, in terms of employment, income and total output, are summarized in **Table 7.7**. Economic multipliers, equal to the total impact divided by the direct impact, indicate the effectiveness of the industries to retain and recycle revenues locally, generating growth in the local economy. Economic multipliers are shown in **Table 7.8**.

In total, the Carson NF contributes directly and indirectly an estimated $414 million in output, 4,003 jobs and $89.3 million in income to the economies of the four counties included in this study. This is equivalent to nearly 9 percent of the 45,287[156] jobs in these areas in 2003. Visitor spending is by far the largest source of activity, contributing a total of 83 percent of the employment labor income impacts. The FS is the second largest contributor in terms of both employment and income. Oil and gas extraction contribute substantially to revenue generation, but have a marginal employment impact. Ranching is very much the opposite – it generates some employment and income but very little revenues. The impacts of timber harvesting are negligible in all regards.

[156] 2003 employment for the region as a whole from Table 7.1.

TABLE 7.7 DIRECT, INDIRECT AND INDUCED IMPACTS OF THE CARSON NF, 2004
TOTAL OUTPUT IMPACTS (000s of 2002 $)

	Direct	Indirect	Induced	Total
Ranching	5,628	4,129	483	10,240
Timber Harvesting	2,234	990	199	3,423
Oil & Gas Extraction	163,086	19,069	806	182,961
Visitors & Recreation	147,525	26,610	25,230	199,365
Skiers	53,865	8,821	11,399	74,085
Forest Service Operations	--	10,836	6,312	17,148
Wildfire Suppression	--	394	478	871
Total	318,473	62,028	33,508	414,008

TOTAL EMPLOYMENT IMPACTS (#)

	Direct	Indirect	Induced	Total
Ranching	112	67	6	185
Timber Harvesting	15	9	3	27
Oil & Gas Extraction	1	52	10	63
Visitors & Recreation	2,695	303	333	3,331
Skiers	912	90	138	1,140
Forest Service Operations	223	85	82	390
Wildfire Suppression		3	4	7
Total	3,046	519	438	4,003

TOTAL LABOR INCOME IMPACTS (000s of 2002 $)

	Direct	Indirect	Induced	Total
Ranching	253	924	155	1,332
Timber Harvesting	247	187	58	492
Oil & Gas Extraction	108	1,959	253	2,320
Visitors & Recreation	55,169	7,627	8,072	70,868
Skiers	25,882	2,601	3,647	32,130
Forest Service Operations	8,308	3,179	1,983	13,470
Wildfire Suppression	440	127	218	785
Total	64,525	14,003	10,739	89,267

The comparatively large contribution of recreational and visitor spending is a direct result of the number of people visiting the Carson NF. More than one million individuals visited the Carson NF in 2003, which indicates a substantial level of use. We can see in **Table 7.7** that a large portion of the economic activity is due to skiing visitors.

In fiscal year 2004, FS spending on wildfire suppression in the Carson NF was about $1.74 million – $1.16 million in compensation and $687 thousand in spending. As shown in **Table 7.7**, wildfire related spending by the FS generated 14 jobs, $1.7 million

in additional output, and $1.5 million in additional labor income. There are of course also the firefighter's jobs themselves, which are not included as they are largely not local.

Estimates for skiing, oil and gas, and fire suppression carry a high degree of uncertainty and rest on series of very specific assumptions. In the case of ski visitors, the difficulty is that it is not known the degree to which the impact of ski visitors is already captured in the visitors and recreation impacts shown in **Table 7.7**. Taos County includes Taos Ski Valley, Red River Ski Area, and Sipapu Resort, each of which generates a substantial number of visitors each winter. If one believes that the FS NVUM data accurately captures these visitors, than the impact of ski visitors should be considered a subset of the visitor and recreation impacts, and should not be added to the total impacts shown earlier. On the other hand, it is useful to see the impact of ski visitors as a separate category because downhill skier spending patterns are likely different from other recreational forest users, and because they may not be accurately counted in the NVUM data. This is especially true in the Carson NF region because skiing is such a large industry. In **Table 7.7** skiers are not included in the totals, as they are assumed to be included in the Visitors & Recreation data.

In the case of oil and gas, the region benefits from state and local governmental distributions in addition to the IMPLAN estimated impacts of extraction. Within Carson NF, oil and gas extraction occurs exclusively in the Jicarilla Ranger District, which lies in the Chama Municipality in Rio Arriba County. Using 2005 *ad velorum* tax rates, the tax benefit to Rio Arriba is estimated to be about $1.4 million (2004 $) – about $1 million to the County and $379 thousand to the Chama School District. In addition, in 2005 FS oil and gas-related disbursements amounted to almost $400,000 to the region's County governments. In total, these funds equal almost $2 million dollars in additional tax revenues to Rio Arriba County. Further, there are indirect and induced impacts that occur as the county governments spend these revenues. Finally, state taxes generate about $11.5 million in revenues from oil and gas extraction on Carson NF, though it is difficult estimate the share of this total that is returned by the State to the region through its expenditures. These public distributions are not included in **Table 7.7**.

For FS wildfire suppression spending, the pattern of expenditures by laborers is uncertain but has substantial implications. In this analysis, it is assumed that only half of the take home income of fire fighters is spent locally, as most work only temporarily in the area and their schedule entails the long periods of intensive work with little free time. With better estimates for the portion of income that is spent within the local region, it is a simple matter to share these impacts down to their appropriate amounts.

The economic multipliers listed in **Table 7.9** offer additional insights into the economic dynamics of the Carson NF. In particular, note the high labor income multipliers for ranching and wildfire suppression. In the case of ranching, this is due to the extremely low direct income generated per worker (only around $2,000) that is a result of very low proprietor income in the base year data. In the case of wildfire suppression, the high multiplier is caused by the large degree of indirect spending, which generates almost half of the total labor income impacts for that category, but which is not captured in

estimates of direct labor income. The resulting multiplier is substantially higher simply because of the high expenditures of the FS when fighting wildfires. Many of the other higher multipliers are an artifact of high output to employment ratios (in the case of oil and gas) or very low income to employment ratios (in the case of ranching and timber).

TABLE 7.8 ECONOMIC MULTIPLIERS FOR THE CARSON NF, 2004

	Output	Employment	Income
Ranching	1.82	1.60	5.26
Timber Harvesting	1.53	1.76	1.99
Oil & Gas	1.12	57.18	21.40
Visitors & Recreation	1.35	1.24	1.28
Skiers	1.38	1.25	1.24
Forest Service Operations	--	1.75	1.62
Wildfire Suppression	--	--	1.78

7.5 Challenges and Opportunities for Forest Management

Carson NF contributes substantially to the regional economy, accounting for nearly 9 percent of all employment in the four county assessment area. Visitor and recreational activities, including skiing, account for about 4 of 5 jobs and an equivalent share of labor income, and FS operations make up much of the remainder. Oil and gas extraction in Rio Arriba County generates revenues but little in the way in the way of employment and labor income. Despite their traditional significance, ranching and timber harvesting on the Carson NF make only a marginal contribution to the local economy.

Rio Arriba County contains almost 928,000 acres of the 1.58 million acres of the Carson NF. Carson NF land covers 25 percent of the entire county. With such a large piece of the NF land, Rio Arriba County captures majority of the economic contributions of the Carson NF, particularly among resource-based activities. Indeed, all active oil and gas wells in the Carson NF are located in Rio Arriba County, as well as a substantial volume of grazing and fuelwood harvesting.

Taos County contains almost 570,000 acres of Carson NF land, which covers 40 percent of the county's land area. With principal recreational assets located in the County, including Taos and Red River, Taos County captures substantial economic benefits for the NF. Additionally, the proximity of the NF and the amenities that it offers is attractive to developers and second home owners, generating additional activity not measured in this report.

Colfax and Mora Counties have only small slices of Carson NF land, and derive only marginal benefit from the use of forest land. Colfax County likely realizes some benefit from the proximity of the NF in developments in Angel Fire and Eagle's Nest, but this is

very difficult to quantify. More direct activities, such as grazing and timber harvesting, are minimal in these Counties.

Oil & gas development has an uncertain economic impact, representing both opportunity and risk. The continuation of high prices are likely to heighten interest in exploration mainly in western Rio Arriba County and in the neighboring Jicarilla RD. Resource exploration and development typically generates the greatest number and the highest paying jobs, possibly to the benefit of the very low income communities on the Jicarilla Apache Reservation as well as communities in central Rio Arriba County. Of course, the economic risk associated with oil & gas development is the volatility of economic cycles.

Apart from the specific areas where oil and gas exploration is possible, there is no reason to believe that the established trend away from resource-based activities such as grazing and timber harvesting and toward recreational uses will not continue. Further, the assessment region will likely continue to attract second home buyers and retirees attracted by the beauty and amenities of the Carson NF. Economically, this portends continued growth of urban-based economic activities such as retail, service, hospitality, real estate and construction. These activities will continue to create jobs, though many will pay only low to moderate wages. Development will also require large investments in infrastructure, in many cases in areas that are difficult to access. The expansion of recreational uses and amenity-based development also will likely continue to drive up land prices, not only near already urbanized areas such as Taos, Red River, and Angel Fire, but increasingly in eastern and central Rio Arriba County. Tourism, recreational and amenity residential development are often characterized by highly volatile economic cycles – periods of rapid expansion followed by periods of declining investment, particularly in construction and real estate sectors. To be sure, volatility is not new to communities that have traditionally depended on resource development, whether in ranching, timber or mining. Yet, a significant difference is that rural economies in the region have been traditionally tied to the land and were able to balance multiple uses to soften the impacts of downswings in any given sector. Such opportunities are less available as the amenity-based economy continues to grow. High land values in the region discourage resource-based activities, particularly those that cross boundaries of public-private land. For example, grazing activities that provide supplemental income and food sources to rural communities typically combine the use of public land with private land to remain viable, but rising land values threaten these strategies.

Residential and amenity-based development along the boundaries of the NF also has implications for fire prevention. Residential development along forest boundaries both increases the likelihood of fire and the costs associated with fire fighting. These risks are especially high near many of the more remote areas of Carson NF, where fire fighting is especially problematic. The risks, of course, are not only economic, but there are concerns that are specifically economic in nature. Development increases concern for fire prevention, encouraging officials to limit access to the forest. This can have very

substantial and adverse impacts on the regional economy, which increasingly depends on recreational opportunities that the NF offers.

Another risk facing the local economy concerns drought and global warming more generally. Dry conditions increase fire hazards and thus limit recreational opportunities on forest land. Further, dry winters mean less snow at the region's ski resorts, which are among the principal economic drivers in the area. The risk is not only short term and specific – that a dry winter will bring fewer skiers – but long term and general. Global warming will likely encourage resort developers to move north, where ski conditions are less at risk. As it is, Carson NF's ski areas are southern most along the Rockies and likely the first to be impacted by rising global temperatures.

Finally, the Carson NF plays a key role in terms of water generation and retention, which is vital to economic development in the arid southwest region. The factors that determine hydrological capacity of the forest are well beyond the scope of this study, but the economic implications cannot be overstated. Suffice to say, there are few economic activities discussed in this report or otherwise that could be sustained without the water that is so closely associated with Carson NF. This is ultimately the most significant economic contribution and risk associated with forest management.

7 Economic impacts

7.1 Santa Fe National Forest Regional Economy

The Santa Fe National Forest is situated in the center of New Mexico, falling mainly within Rio Arriba, San Miguel, and Sandoval Counties, but also laying partly in Santa Fe, Mora, and Los Alamos Counties. Taos County is also included in the region, since a small part of the Pecos Wilderness is co-managed by the Santa Fe and Carson NFs. The relevance of Taos County is minute in terms of determining the economic contribution of the Santa Fe NF. This region contains several of the larger metropolitan areas in the state as well as Santa Fe and Los Alamos Counties, the two richest counties per capita in the state. Significant settlements in the region include the state capitol of Santa Fe, Los Alamos, which is home to Los Alamos National Laboratory and boasts the highest per capita income in New Mexico, and Rio Rancho, one of the fastest growing cities in the state, as well as Las Vegas, Española, and Taos. The economic contribution of the Santa Fe NF, composed largely of visitor spending, varies significantly by county, creating a complex picture.

The bulk of the regional economic activity occurs in Santa Fe, Los Alamos and Sandoval Counties account for 73 percent of the region's employment. However, most of the forest lies in other counties, with more than 30 percent of the forest contained by Rio Arriba County. Santa Fe and Los Alamos County contain only 15 and 2 percent respectively. This does not imply that the bulk of the forest impacts are felt in Rio Arriba County. The city of Santa Fe is adjacent to a portion of the Santa Fe NF and garners a significant amount of economic activity from various forest uses. Furthermore, the city of Santa Fe is largely dependent on the forest setting provided by the Santa Fe NF which creates the scenic beauty for which the city is famous for as a tourist destination. While a larger degree of logging or ranching activity may occur in counties such as Sandoval, San Miguel, or Rio Arriba, Santa Fe County is the primary benefactor of the visitor spending impacts.

The economy in the majority of New Mexico's counties can be characterized as rural and relatively poor. This characterization is certainly true for some areas that contain parts of the Gila or Cibola NF. In the Santa Fe NF there are areas, such as Mora County that are similarly poor. But overall, the region is comparatively wealthy. This wealth is centered in Santa Fe and Los Alamos County, the only two counties in New Mexico that have per capita incomes above the national average, but even the other counties in the assessment are fairly well off when compared with most New Mexico Counties. These trends are shown in **Table 7.1**.

Table 7.1: Total Employment and Income by County, 2003

	Employment (#)	Percent of Region	Per Capita Income ($)	Relative to US
Los Alamos	21,417	11%	49,581	1.57
Mora	2,016	1%	15,867	0.50
Rio Arriba	17,535	9%	20,720	0.66
Sandoval	33,451	18%	24,746	0.79
Santa Fe	84,070	44%	32,999	1.05
San Miguel	13,569	7%	19,708	0.63
Taos	17,267	9%	21,694	0.69
Santa Fe Region	189,325	100%	26,474	0.84
New Mexico	1,015,365	--	24,892	0.79
United States	167,488,500	--	31,484	1.00

Source: Bureau of Economic Analysis, 2003

The industrial composition of employment in each county from 1980 to 2000 is shown in **Table 7.2**. In general, the region, as with New Mexico and the United States, is characterized by an increase in the relative importance of the service sector in the overall economy. This is particularly true in Los Alamos, Santa Fe, and Taos, while other counties are less dependent on the retail and service sectors.

The Los Alamos economy, as the home of one of the largest military and science research centers in the country, is almost entirely composed of government, retail, and service sector jobs. These three sectors combined make up more than 90 percent of the county's employment. From 1980 to 2000, Los Alamos has been steadily gaining service sector jobs, while other sectors have remained relatively stable. This has lead to an increased reliance on services as a main employment provider. Though government still provides just over half of the county's jobs. Los Alamos is somewhat unique in its lack of farming and other "core" industry sectors such as construction and manufacturing. While the non-farm primary industry sectors have been growing over the last 20 years, it is only in minute amounts, and certainly much slower than the growth in services.

Mora County is by far the smallest county in the region, in terms of size as well as economy. It is fitting then that Mora County has experienced the largest changes in employment composition over the past 20 years from 1980 to 2000. In particular, while farm employment increased slightly, the relative size of the farm sector decreased by 9 percent from 1990 to 2000, while services increased 12 percent in the same period. The government sector as a whole also shows declining relative size. With only 1,767 jobs in 2000, these changes can represent a small number of employees, but the resulting percent changes in sector composition can be quite large.

In Rio Arriba County, strong growth primarily in the services sector, but also in retail trade, has buoyed employment levels significantly, though no sector shows decreases in employment. The relative size of services and retail trade has been increasing while the relative size of farm and government has been decreasing; but again, this is due more to the extraordinarily strong growth in services and retail trade rather than any decrease in farm or government.

Sandoval County contains part of the Albuquerque MSA and the state's fast-growing city Rio Rancho, as well as the town of Bernalillo, and a significant stretch of Interstate 25 between Albuquerque and Santa Fe. Much of the economic activity in the county is centered in its southeastern corner, and is directly involved with the Albuquerque MSA and travel to Santa Fe. As such, Sandoval County has the second largest economy in the Santa Fe NF region. As with the other counties, the largest employment sectors are retail, services, and government, but in Sandoval County there is also a substantial degree of manufacturing[1], construction, transportation, and utilities employment. The relative size of these sectors is larger in Sandoval County than in any other county in the Santa Fe NF region. Furthermore, in Sandoval County more than any county in New Mexico, the growth of the manufacturing and other primary industries has kept pace with growth in retail, services, and government. All of this suggests that Sandoval County receives a significant benefit from its close proximity to Albuquerque and Santa Fe. Finally, a large portion of Sandoval County is composed of several Native American pueblos, which effectively border the Santa Fe NF throughout much of the county.

[1] Manufacturing in Sandoval is dominated by Intel in Rio Rancho, which is why employment numbers are subject to non-disclosure.

Santa Fe County, which contains the state capitol of Santa Fe and the associated economic activity, has by far the largest employment in the Santa Fe NF region. It also contains one of the state's largest ski resorts, as well as a thriving tourist industry. Hence, it is no surprise that employment in Santa Fe County is nearly as consolidated in retail, services, and government as Los Alamos County. The exception to this is the larger portion of employment that the construction industry makes up in Santa Fe County. However, the relative compositions can be misleading. Santa Fe County has larger employment numbers in the primary industries than any of the other counties in the region except Sandoval. While the percent contribution of those sectors to total employment in Santa Fe is small, they are still larger in absolute terms than in the other counties. Thus, Santa Fe County is both the geographic and economic center of the region; even setting government aside it exerts great influence on the rest of the area. Over time the employment trends in Santa Fe have exhibited only small changes in the relative composition of the sectors, with services becoming a larger portion of the economy, but most sectors showing only small gains or losses in relative composition.
In contrast, San Miguel County is fairly small, and farm employment makes up a larger portion of overall employment there than in any other county in the region except Rio Arriba. As in other counties, retail, services, and government make up the lions share of employment, but the relative size of government has been decreasing over the years as growth in other sectors has been much faster. San Miguel also contains Las Vegas, the largest population center in New Mexico east of Santa Fe and Albuquerque and a significant location on Interstate 25 as visitors travel from the north to Santa Fe.

Taos County shares some of the traits of Colfax and Rio Arriba County. Like Santa Fe and Los Alamos County, the service sector in Taos County makes up a huge portion of employment. In 2000, the services made up 37 percent of the total employment in the county. This is consistent with Taos' heavily tourist based economy. Like Santa Fe, Taos County has also experienced strong, though not as disproportionately large, growth in services and retail trade. In addition to the drop in mining from 1980 to 1990, Taos County also experienced relative losses in state and local government and farming. This was mainly due to increases in services rather than any decrease in those sectors. From 1990 to 2000, there was not a substantial change in the sector composition of Taos County. The relative size of services grew slightly, as did construction and state and local government, while manufacturing, mining, and transportation and utilities fell slightly.

Table 7.2: Total Employment in Primary Sectors by County in 1980, 1990, and 2000

Los Alamos	1980	1990	2000	1980%	1990%	2000%	Change in % 1980-1990	Change in % 1990-2000
TOTAL	14,116	18,481	19,832	100%	100%	100%	0%	0%
Farm Employment	0	0	0	0%	0%	0%	0%	0%
Non-farm Employment	14,116	18,481	19,832	100%	100%	100%	0%	0%
Private Employment	5,342	8,093	9,706	38%	44%	49%	6%	5%
Agricultural services, forestry, and	28	54	(D)	0%	0%	(D)	0%	-
Mining	0	33	43	0%	0%	0%	0%	0%
Construction	278	279	297	2%	2%	1%	0%	0%
Manufacturing	64	128	151	0%	1%	1%	0%	0%
Transportation and utilities	74	112	(D)	1%	1%	(D)	0%	-
Wholesale trade	33	157	141	0%	1%	1%	1%	0%
Retail trade	1,146	1,430	1,332	8%	8%	7%	0%	-1%
Services	3,269	5,326	6,722	23%	29%	34%	6%	5%
Government and government	8,774	10,388	10,126	62%	56%	51%	-6%	-5%
Federal, civilian	417	178	193	3%	1%	1%	-2%	0%
Military	90	106	63	1%	1%	0%	0%	0%
State and local	8,267	10,104	9,870	59%	55%	50%	-4%	-5%
State government	7,354	9,001	(D)	52%	49%	(D)	-3%	-
Local government	913	1,103	(D)	6%	6%	(D)	0%	-

Mora	1980	1990	2000	1980%	1990%	2000%	Change in % 1980-1990	Change in % 1990-2000
TOTAL	1,061	1,120	1,767	100%	100%	100%	0%	0%
Farm Employment	407	429	515	38%	38%	29%	0%	-9%
Non-farm Employment	654	691	1,252	62%	62%	71%	0%	9%
Private Employment	324	380	853	31%	34%	48%	3%	14%
Agricultural services, forestry, and	(D)	35	76	(D)	3%	4%	-	1%
Mining	(L)	(D)	(L)	(L)	(D)	(L)	-	-
Construction	37	43	93	3%	4%	5%	0%	1%
Manufacturing	(D)	36	(D)	(D)	3%	(D)	-	-
Transportation and utilities	46	63	102	4%	6%	6%	1%	0%
Wholesale trade	12	(L)	(D)	1%	(L)	(D)	-	-
Retail trade	116	68	112	11%	6%	6%	-5%	0%
Services	86	120	405	8%	11%	23%	3%	12%
Government and government	330	311	399	31%	28%	23%	-3%	-5%
Federal, civilian	41	39	46	4%	3%	3%	0%	-1%
Military	19	22	17	2%	2%	1%	0%	-1%
State and local	270	250	336	25%	22%	19%	-3%	-3%
State government	68	56	58	6%	5%	3%	-1%	-2%
Local government	202	194	278	19%	17%	16%	-2%	-2%

Rio Arriba	1980	1990	2000	1980%	1990%	2000%	Change in % 1980-1990	Change in % 1990-2000
TOTAL	8,387	11,088	15,537	100%	100%	100%	0%	0%
Farm Employment	874	986	1,059	10%	9%	7%	-2%	-2%
Non-farm Employment	7,513	10,102	14,478	90%	91%	93%	2%	2%
Private Employment	4,252	6,526	9,821	51%	59%	63%	8%	4%
Agricultural services, forestry, and	116	114	192	1%	1%	1%	0%	0%
Mining	48	68	78	1%	1%	1%	0%	0%
Construction	464	677	953	6%	6%	6%	1%	0%
Manufacturing	256	507	648	3%	5%	4%	2%	0%
Transportation and utilities	346	518	528	4%	5%	3%	1%	-1%
Wholesale trade	117	199	209	1%	2%	1%	0%	0%
Retail trade	1,240	1,563	2,484	15%	14%	16%	-1%	2%
Services	1,377	2,532	4,153	16%	23%	27%	6%	4%
Government and government	3,261	3,576	4,657	39%	32%	30%	-7%	-2%
Federal, civilian	350	406	416	4%	4%	3%	-1%	-1%
Military	135	175	136	2%	2%	1%	0%	-1%
State and local	2,776	2,995	4,105	33%	27%	26%	-6%	-1%
State government	860	678	850	10%	6%	5%	-4%	-1%
Local government	1,916	2,317	3,255	23%	21%	21%	-2%	0%

Sandoval	1980	1990	2000	1980%	1990%	2000%	Change in % 1980-1990	Change in % 1990-2000
TOTAL	5,583	14,723	32,379	100%	100%	100%	0%	0%
Farm Employment	448	416	411	8%	3%	1%	-5%	-2%
Non-farm Employment	5,135	14,307	31,968	92%	97%	99%	5%	2%
Private Employment	3,851	12,052	26,710	69%	82%	82%	13%	1%
Agricultural services	141	230	308	3%	2%	1%	-1%	-1%
Mining	34	44	110	1%	0%	0%	0%	0%
Construction	596	1,063	2,531	11%	7%	8%	-3%	1%
Manufacturing	643	2,831	(D)	12%	19%	(D)	8%	-
Transportation and utilities	201	397	2,306	4%	3%	7%	-1%	4%
Wholesale trade	74	288	(D)	1%	2%	(D)	1%	-
Retail trade	698	2,835	5,368	13%	19%	17%	7%	-3%
Services	1,063	3,474	6,719	19%	24%	21%	5%	-3%
Government	1,284	2,255	5,258	23%	15%	16%	-8%	1%
Federal, civilian	212	389	347	4%	3%	1%	-1%	-2%
Military	159	323	298	3%	2%	1%	-1%	-1%
State and local	913	1,543	4,613	16%	10%	14%	-6%	4%
State government	130	106	206	2%	1%	1%	-2%	0%
Local government	783	1,437	4,407	14%	10%	14%	-4%	4%

Santa Fe	1980	1990	2000	1980%	1990%	2000%	Change in % 1980-1990	Change in % 1990-2000
TOTAL	37,471	58,881	81,875	100%	100%	100%	0%	0%
Farm Employment	365	368	462	1%	1%	1%	0%	0%
Non-farm Employment	37,106	58,513	81,413	99%	99%	99%	0%	0%
Private Employment	26,345	45,559	63,789	70%	77%	78%	7%	1%
Agricultural services	239	387	1145	1%	1%	1%	0%	1%
Mining	444	393	507	1%	1%	1%	-1%	0%
Construction	2471	4,275	5,514	7%	7%	7%	1%	-1%
Manufacturing	1528	2,587	2310	4%	4%	3%	0%	-
Transportation and utilities	1002	1176	1,485	3%	2%	2%	-1%	0%
Wholesale trade	577	1268	1596	2%	2%	2%	1%	-
Retail trade	6544	11,457	15,498	17%	19%	19%	2%	-1%
Services	10,869	19,747	28,836	29%	34%	35%	5%	2%
Government	10,761	12,954	17,624	29%	22%	22%	-7%	0%
Federal, civilian	1405	1523	1414	4%	3%	2%	-1%	-1%
Military	371	518	435	1%	1%	1%	0%	0%
State and local	8985	10,913	15,775	24%	19%	19%	-5%	1%
State government	6690	7628	9494	18%	13%	12%	-5%	-1%
Local government	2295	3,285	6,281	6%	6%	8%	-1%	2%

San Miguel	1980	1990	2000	1980%	1990%	2000%	Change in % 1980-1990	Change in % 1990-2000
TOTAL	7,727	9,932	12,281	100%	100%	100%	0%	0%
Farm Employment	627	737	849	8%	7%	7%	-1%	-1%
Non-farm Employment	7,100	9,195	11,432	92%	93%	93%	1%	1%
Private Employment	3,645	5,195	7,011	47%	52%	57%	5%	5%
Agricultural services	28	77	120	0%	1%	1%	0%	0%
Mining	15	11	41	0%	0%	0%	0%	0%
Construction	336	534	585	4%	5%	5%	1%	-1%
Manufacturing	104	302	188	1%	3%	2%	2%	-
Transportation and utilities	203	184	287	3%	2%	2%	-1%	0%
Wholesale trade	148	135	117	2%	1%	1%	-1%	-
Retail trade	1204	1,612	1,968	16%	16%	16%	1%	0%
Services	1,318	2,000	3,171	17%	20%	26%	3%	6%
Government	3,455	4,000	4,421	45%	40%	36%	-4%	-4%
Federal, civilian	202	179	177	3%	2%	1%	-1%	0%
Military	106	131	99	1%	1%	1%	0%	-1%
State and local	3147	3,690	4,145	41%	37%	34%	-4%	-3%
State government	2016	2390	2497	26%	24%	20%	-2%	-4%
Local government	1131	1,300	1,648	15%	13%	13%	-2%	0%

Taos	1980	1990	2000	1980%	1990%	2000%	Change in % 1980-1990	Change in % 1990-2000
TOTAL	8,351	11,434	15,918	100%	100%	100%	0%	0%
Farm Employment	432	472	494	5%	4%	3%	-1%	-1%
Non-farm Employment	7,919	10,962	15,424	95%	96%	97%	1%	1%
Private Employment	6,355	9,402	13,173	76%	82%	83%	6%	1%
Agricultural services, forestry, and	46	124	188	1%	1%	1%	1%	0%
Mining	737	362	271	9%	3%	2%	-6%	-1%
Construction	519	780	1,330	6%	7%	8%	1%	2%
Manufacturing	440	594	410	5%	5%	3%	0%	-3%
Transportation and utilities	207	333	363	2%	3%	2%	0%	-1%
Wholesale trade	86	218	226	1%	2%	1%	1%	0%
Retail trade	1,563	2,379	3,310	19%	21%	21%	2%	0%
Services	2,400	4,005	5,944	29%	35%	37%	6%	2%
Government and government	1,564	1,560	2,251	19%	14%	14%	-5%	0%
Federal, civilian	295	318	312	4%	3%	2%	-1%	-1%
Military	91	118	99	1%	1%	1%	0%	0%
State and local	1,178	1,124	1,840	14%	10%	12%	-4%	2%
State government	206	147	365	2%	1%	2%	-1%	1%
Local government	972	977	1,475	12%	9%	9%	-3%	1%

Notes: (D) Non-disclosure of confidential information, but included in totals, (L) Less than 10 jobs, and (N) Data not available for this year.
Source: Bureau of Economic Analysis

On the whole the Santa Fe NF is comprised of the large economy surrounding the city of Santa Fe, surrounded by a variety of urban and rural regions that are altogether more widely populated and active than in most other areas of New Mexico. While most of the forest itself lies in Rio Arriba and Sandoval County, the economic base of the region, and the greatest degree of recreational use, is centered on the city of Santa Fe. In all cases, the data indicate that the Santa Fe NF regional economy is composed of a large degree of government, retail, and service employment, and is not heavily dependent on primary industry uses of the forest such as logging, oil and gas extraction, and rock and mineral extraction. This is likely to be different on a sub-county level where small communities have formed around the use of forest resources for ranching or logging, but the observation for the region as a whole fits quite well.

To complete the picture, **Table 7.3** shows private employment by percent of occupation for each county and the region as a whole. The occupation data supports the data from previous tables, showing a large percent of jobs in management, sales and services occupations, with construction representing a substantial portion as well. Most notable in this case is that 50 percent of employment in Los Alamos County is professional, while the rest of the region has values closer to 20 percent. This is due to the unique nature of Los Alamos County as a scientific center as discussed above.

Table 7.3: Private Employment by Occupation for Region Counties in 2000

	Los Alamos County	Mora County	Rio Arriba County	Sandoval County	Santa Fe County	San Miguel County	Taos County	Santa Fe Region
Management and Professional	68%	28%	30%	36%	42%	34%	32%	39%
Professional and related	50%	19%	19%	23%	26%	23%	20%	25%
Education, training, and library	7%	8%	7%	5%	6%	9%	6%	6%
Healthcare practitioners and technical	5%	2%	2%	4%	4%	6%	3%	4%
Service	9%	22%	21%	15%	16%	22%	22%	17%
Sales and office	15%	18%	25%	28%	26%	25%	25%	25%
Farming, fishing, and forestry	0%	6%	2%	0%	0%	1%	1%	1%
Construction, extraction, and maintena	4%	17%	13%	10%	10%	11%	13%	10%
Production and transportation	3%	8%	9%	11%	6%	7%	7%	8%
Total Private Employment	**9,656**	**1,686**	**16,563**	**38,870**	**64,930**	**11,372**	**13,556**	**156,633**

Source: US Census 2000. Calculations by UNM-BBER.

Finally, **Table 7.4** shows the unemployment rates for each of the counties and the region as a whole from 1995 to 2004. The most striking trend in **Table 7.4** is the much higher unemployment rates of Mora County when compared with the other counties in the region. This trend is true to a lesser degree for Rio Arriba, Taos, and San Miguel County. However, Los Alamos, Santa Fe, and Sandoval County, as the region's more developed areas, had consistently lower unemployment rates than New Mexico as a whole.

Table 7.4 : Average Annual Unemployment Rate for Region Counties, 1995-2004

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Los Alamos	3.2	1.9	1.6	1.5	1.3	2.3	2	2	2.3	2.5
Mora	24.1	21.4	20.4	18.6	14.8	10.5	9.6	10.6	11.1	11.7
Rio Arriba	14	12.9	10.4	7.7	6.6	5.7	6	6.5	6.4	6.2
Sandoval	4.1	5	4	4.8	2.8	3.6	4.7	5.5	5.1	4.9
Santa Fe	4.7	4.7	3.7	2.9	2.4	3.2	3.3	3.7	3.9	3.9
San Miguel	9.6	11.8	9.9	6.8	5.8	5.5	5.9	6.2	6	6.3
Taos	15.8	14.5	13	9	10.2	6.3	6.4	6.4	7	6.4
Santa Fe Region	**10.8**	**10.3**	**9.0**	**7.3**	**6.3**	**5.3**	**5.4**	**5.8**	**6.0**	**6.0**
NM TOTAL	**6.4**	**7.4**	**7.1**	**6.3**	**6**	**5.2**	**4.8**	**5.2**	**5.8**	**5.9**

Source: Bureau of Labor Statistics, Local Area Unemployment Statistics (LAUS).

7.2 Methodology and Organization of Santa Fe National Forest Impact

In estimating the contribution of the Santa Fe NF to the regional economy, we consider both the operations of the USAD FS in the region as well as the various uses of forest related products. The IMPLAN software is used to determine total economic value of each activity and the operations of the USAD FS. IMPLAN uses county-level input-output (I-O) data to determine the extent to which these activities contribute to the local economy. In doing so, IMPLAN distinguishes between direct, indirect, and induced impacts, where:

> **Direct impacts** include the economic value generated by the activity itself, such as the value of cattle grazed on the Santa Fe NF land.
>
> **Indirect impacts** include the value generated by purchases to support that activity and the corresponding purchases to support those activities, in perpetuity. For example, indirect impacts would include the value of fencing purchased for ranching, the value of steel purchased to make the fencing, and so on.

> **Induced impacts** capture the value of economic activity generated from spending by employees that produce the direct and indirect goods. The ranch employees will purchase food, pay for electricity, etc…all of which generates additional value from the purchases, as well as sparking new rounds of indirect and induced value.

The IMPLAN region is the same region used throughout this report, consisting of all counties containing or bordering any of the Santa Fe NF districts. These counties include: Los Alamos, Mora, Rio Arriba, San Miguel, Sandoval, Santa Fe, and Taos County. This single region, containing the above seven counties, makes up the area considered as "local," and the results shown from IMPLAN are for this region of seven counties as a whole.

As discussed in **Chapter 5: Uses and Users**, the principal economic value generating activities related to the forest land itself include recreation and wildlife visits as well as smaller degrees of ranching, logging, and oil and gas extraction. Oil and gas production generates a fairly high economic value in the region, but the impacts of this activity on the local region are limited. For each activity, we estimate the direct impact, and use IMPLAN to estimate the total economic value by direct, indirect, and induced impacts. The USAD FS is unusual in that it does not directly produce a good or service, and so there is no easy measure of its direct economic value. Instead, we look at USAD FS expenditures, and salaries, and wages to estimate the first round of indirect and induced impacts of the USAD FS, and the corresponding economic activity generated by each. The indirect activity is captured by USAD FS expenditures, and the induced activity is captured by the disposable income of USAD FS employees. Of course, in examining the contribution of the USAD FS, we also consider direct employment by the USAD FS.

This analysis draws on a wide range of data and information sources. Data on the structure of the local economies and characteristics of the workforce come largely from the 2000 Decennial Census summary file 3 and the US Department of Labor Local Area Unemployment Statistics. The USAD FS provided data on the specific activities that occurred on the Forest. Specific sources included INFRA (grazing); NVUM (recreation and wildlife); and Region 3 Office (procurement, wages & salaries). The US Department of Agriculture National Agricultural Statistics Service (NASS) was the source of data on agricultural land values and cattle stocking rates. Oil and gas production values are from the ONGARD database provided by the Oil Conservation Division at the New Mexico Energy, Minerals and Natural Resources Department and the New Mexico Taxation and Revenue Department. Oil and gas prices are from GO-TECH at New Mexico Institute of Mining and Technology.

7.3 Direct Impact of the Santa Fe National Forest on the Local Economies

The principal economic activities on the Santa Fe NF include ranching, timber harvests, oil and gas extraction, recreation and wildlife visits, and the operation activities of the USAD FS. Some of these activities are quite large economically, though their benefit to the local region can vary substantially. For example, oil and gas extraction generates a significant value of output, the benefits of which for the most part do not accrue to the local region (this is discussed further below). Additionally, there are large impacts particularly due to ski visitors that are examined here as a subsection of visitor impacts.

To maintain consistency, data for 2004 was used wherever possible. However, if data for that year did not exist, or more recent data was more easily available, we used that instead, making sure to adjust values back to 2004. Data for USAD FS salaries and wages is from fiscal year 2005 adjusted to 2004 dollars. Data on grazing land is from 2002. Visitor estimations are derived from the 2003 NVUM survey. All other data is from 2004 unless noted.

The USAD FS provided data on cattle grazing from the INFRA database in terms of Animal Unit Months (AUMs), and we estimated the number of employees needed per AUM. Together these values provide an estimated number of employees needed to produce the 2002 AUMs. Using the IMPLAN value for output per employee, we derive a ranching output for grazing on the Santa Fe NF. This is the direct value of ranching on the Santa Fe NF land.

Similarly, timber harvesting data was derived from the TIMS database provided by the USAD FS. We use 2004 timber prices to derive the total value of timber cut, which measures the direct value of timber harvested in the Santa Fe NF in 2004.

For recreation and wildlife visitors, we use estimates of visitors from NVUM data, broken out into several categories based on locality (local or non-local), the type of trip (day, overnight on the forest, overnight off the forest), and the reason for the visit (recreation or wildlife). The USAD FS provided an average expenditure profile for each type of visitor, which estimates the direct economic value of visitor spending to the local economy.

Oil and gas production values come from the Oil Conservation Division of the New Mexico Energy, Minerals and Natural Resources Department. The data list production for 2004 and the geographic location of each well, so we were able to match well locations to find those wells located on the Santa Fe NF. Using 2004 oil and gas prices gives us a market value for the production on forest land.

Rock and mineral extraction data was provided by the USAD FS and the market value of the production was calculated using an average of prices from relevant surveyed New Mexico businesses.

Finally, for USAD FS operations, the FS provided data on salaries and wages for its Santa Fe NF employees and total spending with an associated expenditure profile for use in IMPLAN. Since the direct economic value associated with the USAD FS is unknown, we use expenditures to capture the first round indirect impacts and salaries and wages to capture the first round induced impacts. In both cases, the associated later round indirect and induced impacts are calculated by the IMPLAN model.

Table 7.5 is a summary of the output, employment and labor incomes directly associated with these activities.[2] These direct impacts are, in effect, 'what you see' – a measure of activities and their economic value as they actually occur on the Santa Fe NF. For example, there is the equivalent of approximately 19 full-time annual jobs harvesting lumber from the Santa Fe NF, and similarly 58 jobs in the ranching industry. In the case of the FS, employment is the number of employees directly employed by the FS in the Santa Fe NF, and labor income is the wages paid to those employees. Output for the FS is actually FS spending on operations, and does not include the costs of fighting wildfires, which is broken out separately. Finally, while mineral and rock extraction data is available, its permit value is only $50,829 and though the market value is likely

[2] Labor income is the sum of employee compensation and proprietor income.

to be quite a bit higher, it is still a fairly small impact and it is not included in the following tables or discussion.

Looking at this direct level of activity, we can see that the contribution of recreation and wildlife visitors is by far the largest source of impact from the Santa Fe NF. As a subsection of visitor impacts, the economic activity generated by ski visitors is more than a quarter of total visitor impacts, and by itself is larger than other activities generated by the forest. Forest Service operations are the second largest contributor, providing 336 jobs in the region and a large amount of labor income. Other direct activities are comparatively small.

Table 7.5: Direct Inputs of the Santa Fe National Forest, 2004 (000S OF 2002 $, except employment)

	Output	Employment	Labor Income
Ranching	2,630	58	175
Timber Harvesting	2,494	19	212
Oil & Gas	6,493	18	1,570
Visitors & Recreation	100,331	--	--
Skiers	27,552	--	--
Forest Service Operations[1]	13,880	336	9,979
Wildfire Suppression[1]	789	--	1,474

[1] Forest service operations output is actually the first round of indirect spending, while labor income is disposable employee income.

7.4 Economic Impacts and Multipliers

The direct activities associated with the Santa Fe NF shown in **Table 7.5** create indirect and induced impacts as businesses and workers make expenditures and purchases, and these funds cycle through the local economy. The sum of the direct, indirect, and induced expenditures constitutes the total impact that the Santa Fe NF has on the economies of the neighboring communities. These impacts, in terms of employment, income and total output, are summarized in **Table 7.6**. Economic multipliers are shown in **Table 7.7**. Economic multipliers, equal to the total impact divided by the direct impact, indicate the effectiveness of the industry in generating growth in the local economy.

In total, the Santa Fe NF contributes directly or indirectly an estimated 2,379 jobs and $69.2 million in income to the economies of the seven counties included in this study. This is equivalent to about 1.25 percent of the 189,325[3] jobs in the region in 2003. Visitor spending is by far the largest source of activity, contributing a total of 69.3 percent of the employment and 66 percent of the labor income impacts. The FS is the second largest contributor in terms of both employment and income, while ranching, and logging have smaller impacts.

There are three impacts shown in **Table 7.6** that warrant detailed discussion. Ski visitors, oil and gas extraction, and wildfire spending contain various complications that in general limit their usefulness as a measured impact. In the case of ski visitor spending as a sub-category of

[3] 2003 employment for the region as a whole from Table 7.1.

recreation and wildlife visitor spending, the level of spending is drawn from NVUM estimates of the proportion of visitors that are downhill skiers. This compensates for the unavailability of the number of ski visitors to the Santa Fe Ski Area. Hence, this value is just an approximation, and may vary substantially. Oil and gas extraction is problematic for different reasons. Though the data for the value of extracted oil and gas are reliable, the economics of oil and gas extraction suggest that little if any of the benefits from the extraction accrue to the Santa Fe NF region. In particular, revenues from sales are sure to leave the region, as extraction companies are rarely local. Furthermore, the extraction process uses very little labor, and often workers may be transported in and out of an area to maintain equipment, which does not add anything to the economic activity of the region except for what is spent there by employees during their stay. Hence, it is likely that the contribution from oil and gas shown in **Table 7.6** overstates the actual benefit to the region. There is one area that oil and gas extraction does benefit the region, and that is from local taxes, which typically support school districts and transportation projects. These impacts are discussed more thoroughly below. Finally, wildfire spending fluctuates widely in any given year. Beyond that, such impacts are difficult to measure because a large amount of the labor involved in wildfire suppression is brought in from outside the region. A similar process occurs in the purchase and use of equipment[4]. The only tangible impact that wildfire suppression has on the local region is derived from worker spending while in the region. In **Table 7.6** the values shown include all disposable income, and probably overstate the impacts of spending to some degree.

Table 7.6: Direct, Indirect and Induced Impacts of the Santa Fe National Forest, 2004

TOTAL OUTPUT IMPACTS (000s of 2002 $)

	Direct	Indirect	Induced	Total
Ranching	2,630	1,835	244	4,709
Timber Harvesting	2,283	1,025	142	3,451
Oil & Gas Extraction	5,940	927	746	7,612
Visitors & Recreation	86,280	13,878	16,221	116,379
Skiers	25,438	4,154	4,940	34,532
Forest Service Operations	--	16,850	8,565	25,416
Wildfire Operations	--	970	990	1,960
Total	97,132	35,486	26,908	159,526

[4] Though this should be accounted for to some extent by the use of spending profiles that include wildfire spending and hence adjust for spending that occurs outside the region. These are forest wide profiles, and should be relatively accurate.

TOTAL EMPLOYMENT IMPACTS (#)

	Direct	Indirect	Induced	Total
Ranching	58	27	3	88
Timber Harvesting	17	8	2	27
Oil & Gas Extraction	17	7	9	32
Visitors & Recreation	1315	138	196	1649
Skiers	404	42	60	505
Forest Service Operations	336	130	101	567
Wildfire Operations	--	8	8	16
Total	1743	317	319	2379

TOTAL LABOR INCOME IMPACTS (000s of 2002 $)

	Direct	Indirect	Induced	Total
Ranching	175	417	81	674
Timber Harvesting	194	150	47	391
Oil & Gas Extraction	1,436	368	248	2,052
Visitors & Recreation	35,668	4,666	5,403	45,738
Skiers	10,890	1,397	1,646	13,933
Forest Service Operations	9,979	5,617	2,761	18,357
Wildfire Operations	1,474	321	201	1,996
Total	48,927	11,539	8,742	69,208

As discussed above, the gains from oil and gas extraction may be much smaller than the impacts in **Table 7.6** suggest. Though the oil and gas does come from forest land and is then sold off, it is unlikely that the benefits of that activity accrue to the local region. In the first place, only in the extremely rare case that a local extraction company is performing the extraction will some portion of profits remain in the local region. Secondly, equipment and other purchases to supply the extraction industry come almost exclusively from outside the local area, so indirect impacts are likely to be negligible. Finally, extraction is very capital intensive, requiring only a minimal amount of labor to maintain production levels. Even the 17 direct employees suggested by IMPLAN are probably much higher than the real value. However, the output impacts are acceptable, and can be relied on as an appropriate estimate of the contribution to output from oil and gas extraction within the Santa Fe NF. As stated above, the unique characteristics of the oil and gas extraction industry lead us to conclude that the economic activity generated directly from oil and gas is quite small.

Though there is unlikely to be any significant economic impact directly from the extraction of oil and gas, the local region does receive benefit in the form of state and local taxes and forest service tax disbursements for transportation and road costs. The Santa Fe NF oil and gas extraction occurs exclusively in the Cuba Ranger District in Rio Arriba County. Using 2005 tax rates, the estimated tax benefit to Rio Arriba is about $42 thousand (2004 $). In the region as a whole, the 2005 forest service disbursements amounted to more than $580 thousand in additional funds given to the region's county governments. In total these funds equal almost $600 thousand

in additional tax revenues for the Santa Fe NF region. There are of course indirect and induced impacts that occur as the county governments spend these revenues. Additionally, state taxes generate about $450 thousand in revenues from oil and gas extraction on the Santa Fe NF, but these funds are not tied to the Santa Fe NF region, so it is difficult to estimate their benefit to the region itself.

The economic multipliers shown in **Table 7.7** offer additional insights into the economic dynamics of the Santa Fe NF. Most of the multipliers fall in a range we would expect, but the multiplier for ranching income is rather high. This is due to the extremely low direct income generated per worker (only around $3,000) that is a result of low employee compensation and proprietor income in the base year data. Many of the other higher multipliers are an artifact of high output to employment ratios (in the case of oil and gas) or very low income to employment ratios (in the case of ranching and timber).

Table 7.7: Economic Multipliers for the Santa Fe National Forest, 2004

	Output	Employment	Income
Ranching	**1.79**	**1.51**	**3.85**
Timber Harvesting	**1.51**	**1.59**	**2.02**
Oil & Gas	**1.28**	**1.94**	**1.43**
Visitors & Recreation	**1.35**	**1.25**	**1.28**
Skiers	**1.36**	**1.25**	**1.28**
Forest Service Operations	**--**	**1.69**	**1.84**
Wildfire Suppression	**--**	**--**	**1.35**

7.5 Opportunities, Risks and Special Circumstances

Looking strictly at economic impacts, it is estimated that the Santa Fe NF contributes to about 1.25 percent of the regional economic activity in terms of employment. Compared to the other national forests, this value is relatively small. However, the distribution of forest land throughout the counties, and the differences in the size of the economy in each county suggest different degrees of reliance on the Santa Fe NF as a source of economic activity. In this case, the unmeasured aesthetic value of the forest in creating a scenic environment for the city of Santa Fe is probably quite large. As the major cultural and economic center, Santa Fe County receives the majority of visitor spending impacts, though smaller amounts are likely felt throughout the rest of the counties. In the counties with smaller economies and a generally poorer population, the dependence on the use of forest products is probably more acute. As mentioned earlier, the impacts of the Santa Fe NF on Taos County are probably negligible.

San Miguel and Mora County contain minor, though substantial, sections of the Santa Fe NF. These two counties, as the smaller and poorer economies of the region, likely rely more heavily on the benefits of the forest as a provider of primary products such as fuel wood and food, as well as land for ranching and logging. This is not to say that the populations of the other counties don't also make significant use of the forest as a resource for these products, but rather that those areas have easier access to alternative heating methods and are generally wealthier and hence make less

use of the forest as a food source[5]. San Miguel may gain some benefit from visitors to the forest who are traveling through the county on their way to Santa Fe.

Sandoval County, as the intersection between Santa Fe and Albuquerque, has a relatively large economy, and most of its population is focused in that southeast quadrant of the County along Interstate 25. However, the presence of a number of Native American pueblos and their access to the forest suggest that a substantial number of Native Americans may make use of primary forest products. Sandoval itself probably sees little gain from visitor spending, except as they are passing through on the way between Santa Fe and Albuquerque.

Rio Arriba contains the largest portion of the forest of any of the region's counties, but its benefits are probably felt most strongly in terms of additional revenues from oil and gas extraction. Additionally, it is likely that a significant number of Rio Arriba residents make use of the forest as a source of fuel wood and food.

Santa Fe County is the most complicated. As the largest economy, the geographical center, and the prime tourist destination, Santa Fe County likely realizes a large majority of the benefits from visitor spending. The attraction of Santa Fe is extremely dependent on the beauty of its location, and hence the benefits of the forest extend far beyond the visitor spending impacts, probably playing a substantial role in the continued vitality of the service sector, Santa Fe's largest industry sector. Furthermore, it is likely that residents of Santa Fe County, especially those that live further away from the city of Santa Fe, make good use of primary forest products. The difference between these uses in Santa Fe County versus smaller counties such as Mora and San Miguel is that the inability to make use of primary forest products in Santa Fe County would affect a relatively small proportion of its population, while the same thing in Mora or San Miguel County could conceivably affect a significant portion of their population.

In addition to the strictly economic contributions discussed above and in section 7.4, there are several less strictly economic impacts that are nevertheless capable of causing a significant difference in the economic activity of the region. One particularly good example is the water retention and generation properties of the forest, but other factors such as the role the forest (and more appropriately the minerals underneath it) played in the initial founding of settlements are important. In arid southwest regions such as this, the presence of a river is crucial to enabling the survival of local populations. The economic implications of this are drastic, but how removing the Santa Fe NF would affect the local water table and consequently the current settlements is beyond the scope of this report. Suffice it to say that there are ecological impacts from the forest that leads to supporting economic activity in the region beyond the activities that have been measured here.

In examining forest planning and management issues, the region containing the Santa Fe NF consists of some of the wealthier counties in New Mexico as well as some of the poorer counties. The importance of primary forest products in these poorer regions is likely substantial, especially considering the presence of a number of Native American pueblos and reservations. Santa Fe serves as a large attractor, keeping a large portion of the visitor benefits within Santa Fe County.

[5] This again comes down to relative sizes. The larger population of Santa Fe County may mean that a greater number of people make use of the forest's primary products than in the smaller counties, but relatively, it is likely that a greater percentage of the population in Mora and San Miguel are dependent on the use of these products than in Santa Fe and Sandoval County.

Hence, Santa Fe sees the greatest benefit from the forest, though it makes up only a small portion of the economy of the region as a whole.

Mean Annual Renewable Water Supply of the Contiguous United States

Thomas C. Brown and Pamela Froemke
Rocky Mountain Research Station, U.S. Forest Service, Fort Collins, Colorado

Vinod Mahat and Jorge A. Ramirez
Colorado State University, Fort Collins

23 January 2016

Our fresh water supply begins as precipitation falling on land and fresh waters. From there the water naturally evaporates from the land or vegetation, percolates down to groundwater aquifers, or flows toward sea via rivers and streams. Water that evaporates is unavailable for use until it falls again elsewhere as precipitation. What remains is—until it reaches the sea—available for use by humans and other species, and in a broad sense is our renewable fresh water supply.

We estimated water supply across the contiguous 48 states for the period 1981-2010. Political, administrative, watershed, and land cover boundaries then were mapped over the gridded water supply estimates to indicate the amount of water supply that originates in an average year in respective land areas. The estimates focus on the contribution of forests and public lands, with special attention to wilderness areas. These water supply estimates are an update of those provided in Brown et al. (2008) and in two related reports posted online in 2009: "Estimated mean annual contribution to water supply from units of the National Forest System (NFS) of the U.S. Forest Service," September 2009; and "Estimated mean annual contribution to water supply from designated wilderness in the coterminous United States," October 2009. Compared with these earlier papers, these new estimates incorporate more recent precipitation and temperature data, apply a different water yield model, and utilize more and newer land cover and land ownership data.

Methods

Daily water yield was estimated using the Variable Infiltration Capacity (VIC) model at each 1/8º by 1/8º (about 12 km by 12 km) grid cell across the conterminous U.S. Yields were aggregated over time to estimate mean annual yield. Having the spatially distributed estimates of mean annual water yield at its source, land boundaries were then overlaid. Aggregating estimates of yield across cells within a boundary indicates the amount of water supply originating within the designated area.

Water yield model

The VIC model (Cherkauer et al., 2003; Liang et al., 1994; Liang et al., 1996; Nijssen et al., 1997) is a semi-distributed, macro-scale, grid-based hydrological model that solves the vertical energy and water balances in each grid cell. The model has been applied to many basins in the United States, including California's Central Valley (Brekke et al., 2008; Cayan et al., 2010), the

Colorado River Basin (Christensen and Lettenmaier, 2007), the Columbia River Basin (Hamlet et al., 2010), and several other basins in the U.S. (Maurer et al., 2002) and elsewhere (Lohmann et al., 1998).

The VIC model allows for sub grid-scale heterogeneity of land surface properties (e.g., vegetation class, soil type, etc.) and of fluxes and storages (e.g., soil moisture storage, evaporation, runoff production, etc.). Vegetation characteristics are assigned for each vegetation class, including leaf area index (LAI), albedo, stomatal resistance, roughness length, relative fraction of roots in each soil layer, and displacement length.

Three soil layers are recognized in the VIC model. Surface runoff is generated from the upper two soil layers using a variable infiltration curve considering both infiltration excess and saturation excess, and base flow is produced from the bottom layer as a nonlinear function of soil moisture in the layer. Water yield is simulated as the superposition of surface runoff and base flow. The model uses gridded daily precipitation, minimum and maximum temperatures, and wind speed, along with gridded land surface and soil data, to simulate daily soil moisture, base flow and surface runoff among other fluxes and storages.

Climatic forcings (precipitation, minimum and maximum temperatures, and wind speed) and other inputs (soil properties, vegetation and snow albedo data) for the historical period (1981-2010) required to run the VIC model at the 1/8º x 1/8º grid scale for the contiguous U.S. were obtained from the Surface Water Modeling group at the University of Washington (http://www.hydro.washington.edu/Lettenmaier/Data/gridded/).

Beginning with a version of the model calibrated by Maurer et al. (2002) at the Water Resources Region (WRR) scale, we further calibrated the model at the Assessment Sub-region (ASR) spatial scale (Figure 1). The 98 ASRs of the contiguous U.S. are subdivisions of the 18 WRRs, and were first delineated by the U.S. Water Resources Council (1978). ASRs have been used in two recent assessments of the effects of climate change on U.S. water supply (Blanc et al., 2014; Foti et al., 2014). For the calibration, independent estimates of annual water yield of the ASRs were developed for the period 1953-2005 from the following three data sources using methods outlined by Foti et al. (2012):

Figure 1. Water Resource Regions and Assessment Sub-regions of the contiguous U.S.

- A 42-year (1953-1994) series of annual streamflow records for 655 relatively unmodified test basins across the U.S (Hobbins et al., 2001; Slack and Landwehr, 1992).
- Reconstructed natural streamflow estimates for years 1906-2006 for a set of watersheds in the Colorado River Basin, provided by the U.S. Bureau of Reclamation.
- 30-year average reconstructed natural streamflow for the 8-digit basins (HUC-8) of the U.S. estimated by the U.S. Geological Survey (Krug et al., 1989).

Data of the 655 test basins were used to estimate annual water yields where possible; 8-digit basin data, supplemented by the Bureau of Reclamation estimates, were used where data from the test basins were not available. The test basins were preferred because they are relatively unaffected by human intervention, thereby avoiding the need for natural flow reconstruction. Hereafter, these estimated water yields are referred to as "observed" water yields.

We recalibrated the model for each ASR by adjusting soil depths only (adjusting other parameters did not help to significantly reduce the observed bias). Remaining differences between the observed and simulated mean annual water yields range among the ASRs from -10 mm to 6 mm. These biases are less than 4% of the U.S. average observed historical flow of about 300 mm. See Mahat et al. (2015) for more detail on the calibration.

The VIC model was implemented at a daily time-step over the period 1981-2010 for the entire contiguous U.S. Estimates of yield by cell were aggregated temporarily to the annual time step, and the annual estimates were then averaged over the 30-year period.

Land designations

We report land area and associated water supply for alternative political, hydrologic, administrative, and land cover units of the contiguous U.S.

Political units

Results are presented by state and by groups of states called regions. Five regions were defined, as follows:

- **East**: CT, DC, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT
- **South**: AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV
- **Midwest**: IA, IL, IN, MI, MN, MO, OH, WI
- **Plains**: KS, ND, NE, OK, SD, TX
- **West**: AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY.

Official boundaries of some states extend into major water bodies, such as the Great Lakes (e.g., Wisconsin) or major bays and estuaries (e.g., Washington). In these cases we clipped state boundaries at the water's edge.

Hydrologic units

Some results are presented by Water Resource Region (Figure 1).

Administrative units

Land management boundaries were taken from three sources. First, federal land administration was distinguished from non-federal (state and private) administration based on boundaries taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S. (http://nationalatlas.gov/atlasftp.html) at the 100-m grid spatial resolution. Four categories of federal ownership (Forest Service, Park Service, Bureau of Land Management, and other) were tracked. This database contains U.S. Forest Service proclamation boundaries, which include some adjacent private land. All land not specified as federal in this database was lumped into the "state and private" category, which includes Indian reservations.

Second, land ownership boundaries of the National Forest System were taken from the "U.S. Forest Service Surface Ownership Parcels" database, dated November 11, 2015 (https://catalog.data.gov/dataset/u-s-forest-service-basic-ownership). These boundaries do not include adjacent private land.

Third, wilderness area boundaries for the various federal agencies were obtained from the Wilderness Institute at the University of Montana's College of Forestry and Conservation, dated October 12, 2015 (http://www.wilderness.net/NWPS/geography).

Land cover

Land cover was taken from two primary sources, the 2006 National Land Cover Database (NLCD) (Fry et al., 2011) (http://www.mrlc.gov/nlcd06_data.php.at) and the 2012 (lf 1.3.0) LandFire release (http://www.landfire.gov/NationalProductDescriptions21.php). Data from each database are available at the 30-m grid spatial resolution. These data were then resampled to the 100-m grid spatial resolution. Five cover classes were formed from each database. For the NLCD, the following classes were formed from the original 16 classes with data for the contiguous U.S.:

- **Forest**: deciduous forest (41), evergreen forest (42), mixed forest (43)
- **Rangeland**: shrub/scrub (shrubland) (52), grasslands/herbaceous (herbaceous) (71)
- **Agriculture**: pasture/hay (81), cultivated crops (82)
- **Developed**: developed, open space (21), developed, low intensity (22), developed, medium intensity (23), developed, high intensity (24)
- **Riparian**: woody wetlands (90), emergent herbaceous wetlands (95)
- **Other**: bare rock/sand/clay (31), open water (11), perennial ice/snow (12).

Of the several cover classifications provided by LandFire, we used the EVT_PHYS (Physiognomy) data. To reduce the data to six classes similar to the NLCD groupings, we used the existing vegetation system group (EVT_GP) to apportion the Exotic tree-shrub and Exotic herbaceous EVT_PHYS classes. The following classes were formed from the original 20 EVT_PHYS classes containing data for the contiguous United States:

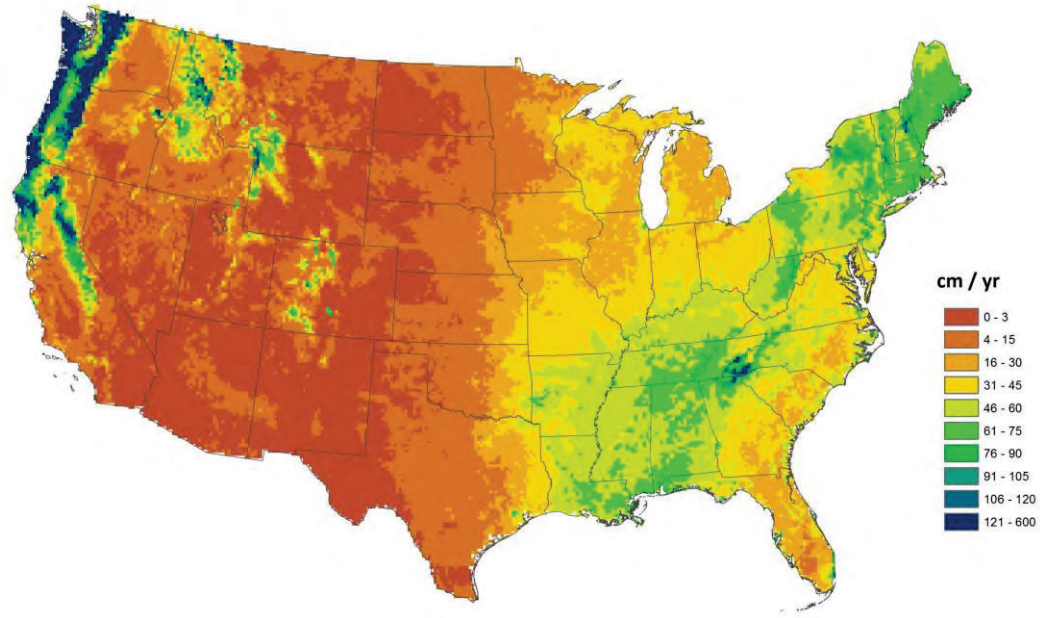
- **Forest**: Conifer, Conifer-hardwood, Hardwood, Hardwood-conifer, Exotic tree-shrub if EVT_GP = 707.
- **Rangeland**: Grassland, Shrubland, Exotic herbaceous if EVT_GP = 702, 703, or 704.
- **Agriculture**: Agricultural
- **Developed**: Developed, Developed-roads, Developed-high intensity, Developed-medium intensity, Developed-low intensity.
- **Riparian**: Riparian, Exotic tree-shrub if EVT_GP = 701 or 705, Exotic herbaceous if EVT_GP = 709.
- **Other**: Barren, Quarries-strip mines-gravel pits, Snow-ice, Sparsely vegetated, Open water.

In addition, we used the 2008 U.S. Forest Service's Forest Inventory and Analysis (FIA) forest cover data (http://data.fs.usda.gov/geodata/rastergateway/biomass/) available at the 250-m grid spatial resolution.

Results

Mean annual 1981-2010 water yield depths for the contiguous U.S. estimated using the VIC model are shown in Figure 2. In the West the highest yields are concentrated in the mountainous areas of the north Pacific Coast, the Sierras of California, and the northern and central Rocky Mountains. Away from these mountains areas mean annual yields tend to be ≤ 15 cm/y. Yields are uniformly ≤ 15 cm/y in the Great Plains and Southwest. Yields east of the Great Plains tend to exceed 30 cm/y except for areas along the eastern edge of the Great Plains, some areas near the Great Lakes, and areas along the south Atlantic coast including Florida.

Figure 2. Mean annual water yield depth.

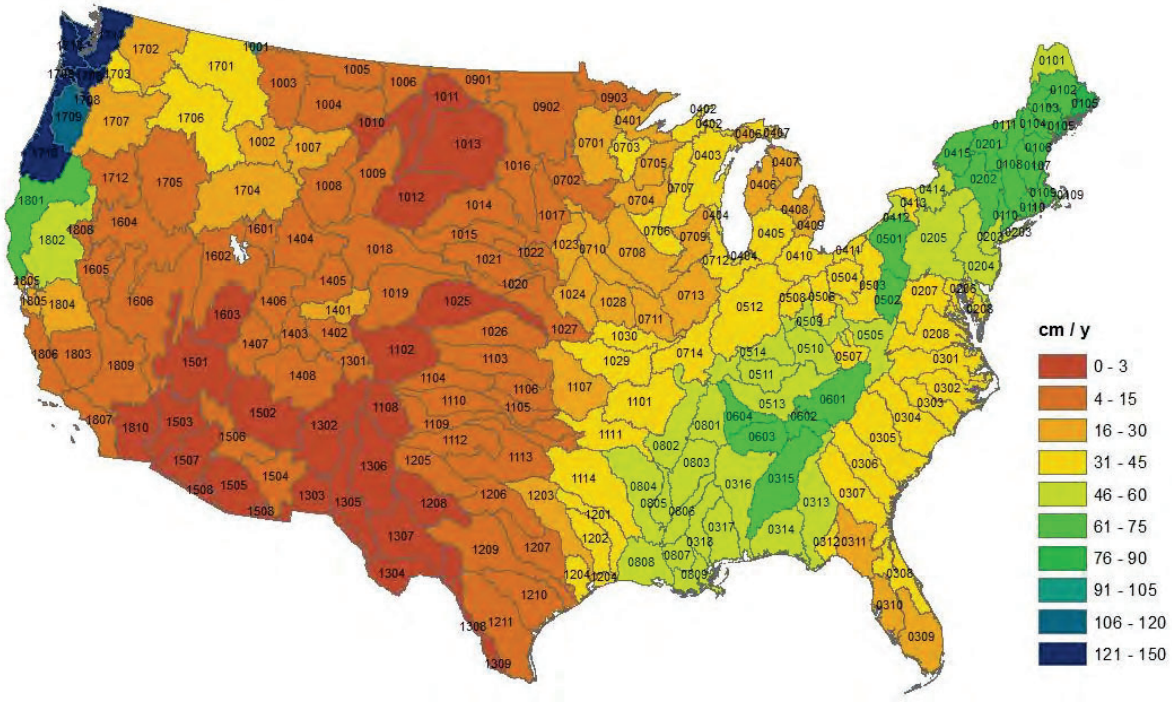


A summary at the 4-digit hydrologic unit level (Figure 3) shows mean annual yield ranging from <1 cm/y (HUCs 1108, 1502, 1503, 1507, 1508, and 1810) to >100 cm/y (HUCs 1708, 1709, 1710, and 1711). Across all 204 HUCs, the mean and median annual yields are 30 and 29 cm/y, respectively.

Water supply volumes and area estimates by land ownership and land cover are summarized below in three subsections: (1) by land ownership/administration and land cover type for the contiguous U.S. as a whole and by major region of the U.S.; (2) for units administered by the U.S. Forest Service; and (3) for designated wilderness areas.

In addition, the appendices contain a total of 43 tables giving more detail on land area and contribution to water supply. Estimates are provided by state, water resource region, NFS region, and NFS unit.

Figure 3. Mean annual water yield depth by 4-digit HUC.



Land area and water supply by federal agency and cover type

National-level estimates

Federal land, as reported in the National Atlas, occupies 24% of the contiguous U.S. and yields 23% of its mean annual water supply (Table 1). Federal agencies differ greatly in terms of water supply, because of differences in amount of land they manage and in the elevation and rainfall that occur on those lands. For example, Forest Service lands yield 18% of the water supply from 11% of the land area whereas BLM lands yield 2% of the water supply from 9% of the land area (Table 1). See Appendix A for results in volumetric units.

Based on NLCD land cover data, forests occupy 26% of the land area of the contiguous U.S. but yield 46% of the mean annual water supply, whereas rangelands occupy 37% of the land but yield only 14% of the water supply (Table 2). Notably, results by land cover depend on which land cover data are used, which in turn reflects the different definitions

Table 1. Percent of land and water supply by land ownership type and region.

	E	S	M	P	W	All
	Percent of land*					
FS	2	7	6	2	21	11
BLM	0	0	0	0	23	9
NPS	0	1	0	0	3	1
Other fed.	1	2	1	1	4	2
S&P	97	90	93	96	50	76
	Percent of mean annual water supply					
FS	3	8	6	3	49	18
BLM	0	0	0	0	6	2
NPS	0	1	0	0	6	2
Other fed.	1	2	1	2	1	1
S&P	97	89	93	96	37	77

E = East, S = South, M = Midwest, P = Plains, W = West, FS = Forest Service, BLM = Bureau of Land Management, NPS = National Park Service, Other federal = all other federal agencies.
* 2005 Federal land designations taken from the Federal Lands of the United States database of the National Atlas of the U.S.

used to distinguish among cover types. In contrast to the NLCD land cover data, with the Landfire PHYS land cover data forests occupy 29% of the land and provide 50% of the water supply, whereas rangelands occupy 30% of the land and provide 7% of the water supply (Table 3). Further, based on the FIA cover data, forests occupy 34% of the land and provide 59% of the water supply (see Appendix E for more detail).

Regional-level estimates

In all regions but the West, the great majority of the land is in private (or state) ownership. Percentages of land in federal ownership are as follows: 3, 10, 7, 4, and 50 in the East, South, Midwest, Plains, and West, respectively (Table 1). Percentages of the water supply originating on federal land roughly match the percentages of the land in federal ownership except in the West, where much of the high country is in national forests or parks. The following percentages of water supply originate on federal lands: 3, 11, 7, 4, and 63 in the East, South, Midwest, Plains, and West, respectively (Table 1, Figure 4).

Across the regions, forests occupy from 8% (Plains) to 58% (East) of the land based on NLCD designations, and yield from 19% (Plains) to 60% (East) of the water supply (Table 2, Figure 4). The percentages of water supply roughly match the percentages of land by cover type except for the Plains and West regions, where, for the regions as a whole, forests are disproportionally important and rangelands are relatively unimportant. For example, in the West forests are the source of 58% of the water supply but occupy only 23% of the land. The relative roles of forests and rangelands in yielding water supply in the Plains and West reflect the dryness of much of the western rangeland areas versus the relatively high rainfall of their forest areas.

Table 2. Percent of land and water supply by NLCD cover type and region.

	E	S	M	P	W	All
	Percent of land					
Forest	58	44	25	8	23	26
Rangeland	4	9	3	49	62	37
Agriculture	17	23	52	33	8	23
Developed	11	9	9	5	3	6
Riparian	7	14	8	3	1	5
Other	3	3	3	2	3	3
	Percent of mean annual water supply					
Forest	60	46	28	19	58	46
Rangeland	4	8	3	31	30	14
Agriculture	15	22	50	35	4	22
Developed	11	9	10	8	3	8
Riparian	7	12	7	5	1	7
Other	3	3	2	2	4	3

E = East, S = South, M = Midwest, P = Plains, W = West.

Table 3. Percent land area in forest and water volume from forests, by region and cover data source.

	E	S	M	P	W	All
	Percent of all land					
NLCD	58	44	25	8	23	26
LandFire	60	50	27	11	27	29
FIA	66	66	28	11	30	34
	Percent of total mean annual water supply					
NLCD	60	46	28	19	58	46
LandFire	62	51	30	22	64	50
FIA	69	66	30	27	75	59

See notes to Table 1. LandFire = EVT_PHYS classes.

The role of forests in the West rises in importance if other land cover data are used. Using the LandFire PHYS designations, forests cover 27% of the land area and yield 64% of the water supply, whereas using FIA data forests cover 30% of the land area and yield 75% of the water supply (Table 3).

Among the three sources of forest cover data, the NLCD data indicate the smallest amount of forest area in all regions (Figure 5). The FIA data indicate the greatest amount of forest area in

all regions except the Plains, where the LandFire data indicate the most forest cover. In all regions, NLCD indicates the least amount of water supply originating in forests and FIA indicates the most water originating in forests.

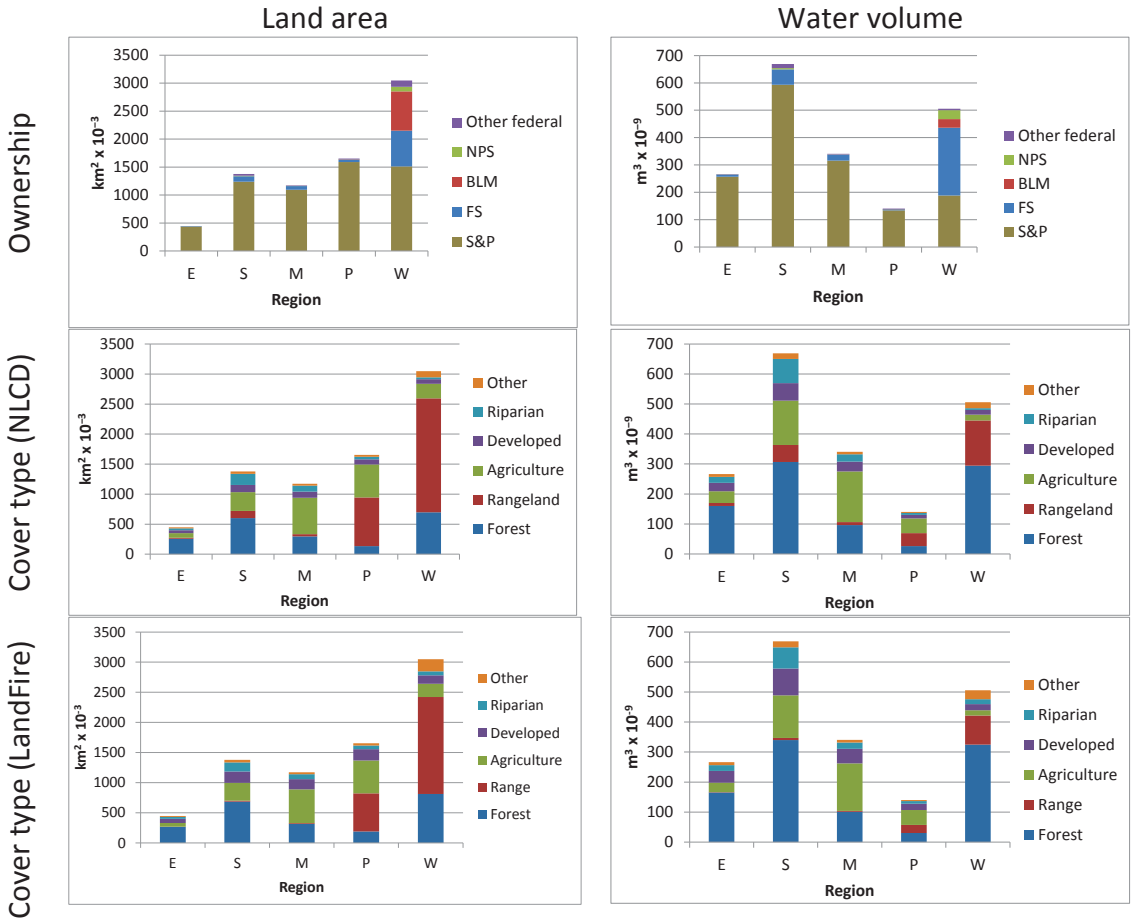
As reported above, the three cover type data layers—those from NLCD, LandFire PHYS, and FIA—are not always in agreement about the location of forest cover. They may differ in many ways depending on location, but when examining the differences some general patterns emerge. Those general patterns are summarized by region in Table 4. Typically the greater forest area of FIA than of LandFire/PHYS, and the greater forest area of LandFire/PHYS than of NLCD, is due to classification of range or riparian pixels as forest.

Table 4. Major discrepancies among the three estimates of forest area.

Region	Forest in LandFire/PHYS but as follows in NLCD	Forest in FIA but as follows in LandFire/PHYS
East	Range	Riparian
South	Riparian especially in Southeast Coastal region; Range and riparian further north and inland	Riparian
Midwest	Riparian in the northern states; riparian and range elsewhere	Riparian, mostly in the northern states
Plains	Range, especially in central Texas	Agriculture and range generally, with some riparian in Texas*
West	Range	Range

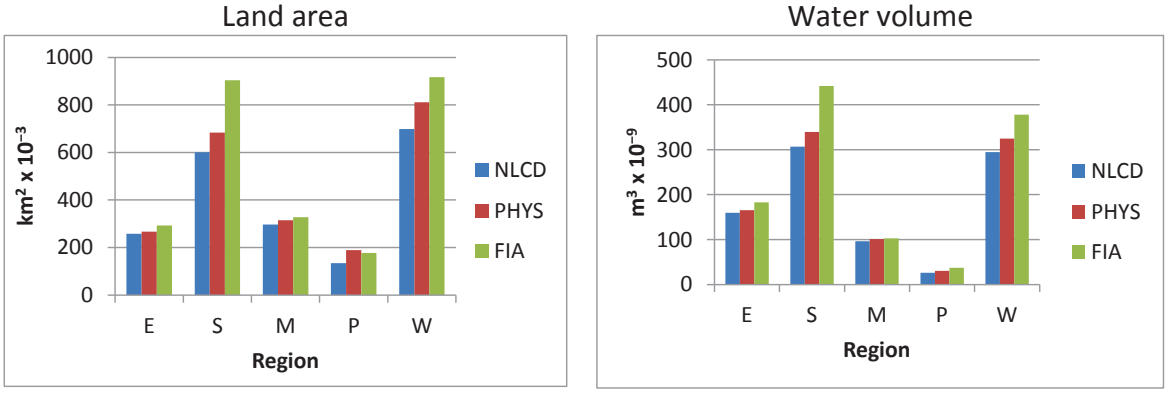
* LandFire/PHYS forest area exceeds FIA forest area in the Plains region. The FIA forest pixels that are not also LandFire/PHYS forest are generally LandFire/PHYS riparian and located in eastern Oklahoma and Texas.

Figure 4. Regional land area and water supply by land ownership and cover



E = East, S = South, M = Midwest, P = Plains, W = West.

Figure 5. Forest land area and water volume by region and cover data



E = East, S = South, M = Midwest, P = Plains, W = West, PHYS = LandFire EVT_PHYS classes.

Land area and water supply of the National Forest System

Recent estimates from the Forest Service of the land area of the National Forest System (NFS) indicate that over the contiguous U.S. the NFS occupies about 693 thousand km^2, which is 82% of the NSF administrative (proclamation) boundary area of 845 thousand km^2 (Table 5). The NFS provides an annual average of 280 billion m^3 of water yield, equal to 83% of the yield from the larger administrative area. See Appendix F for estimates at the state and NFS unit level.

Table 5. National Forest System land area according to two area designations, and associated mean annual water supply volume, by region of the contiguous U.S.*

Region	Land area ($km^2 \times 10^{-3}$)		Water volume per year ($m^3 \times 10^{-9}$)	
	Proclamation	Ownership	Proclamation	Ownership
East	9	7	7	6
South	96	54	56	31
Midwest	66	38	21	12
Plains	38	21	4	2
West	637	573	248	230
U.S.	845	693	337	280

* NFS proclamation boundaries taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S. NFS land ownership boundaries taken from the November 2015 U.S. Forest Service Surface Ownership Parcels database.

Land area and water supply of wilderness areas

Designated wilderness in the contiguous U.S. occupies about 212 thousand km^2, of which 59% is on national forests, 20% is on national parks, and 17% is on BLM land (Table 6). See Appendix G for more detail.

Within the NFS, designated wilderness occupies 18% of the land and provides 25% of the contribution to water supply (Table 7). Looking at the West alone, where most of the national forest and wilderness lands are found, wilderness occupies 20% of the land and provides 29% of the contribution to water supply.

Table 6. Wilderness land area and associated mean annual water supply volume, by federal agency and region of the contiguous U.S.

Region	Land area (km^2)*					Water volume per year ($m^3 \times 10^{-6}$)				
	FS	BLM	NPS	FWS	Total	FS	BLM	NPS	FWS	Total
East	1,050	0	0	65	1,115	1,109	0	0	39	1,148
South	3,336	0	3,757	1,684	8,777	2,227	0	1,204	721	4,153
Midwest	5,426	0	719	187	6,332	1,119	0	240	63	1,421
Plains	306	0	559	98	963	93	0	8	3	104
West	115,691	36,598	36,676	6,010	194,975	65,898	1,614	20,130	120	87,762
U.S.	125,809	36,598	41,711	8,044	212,162	70,447	1,614	21,582	946	94,588

* Based on data from the Wilderness Institute at the University of Montana's College of Forestry and Conservation.

Table 7. Wilderness as a percent of total NFS land area and associated mean annual water supply volume, by region of the contiguous U.S.

Region	Land area			Water volume per year		
	NFS (km^2)	NFS wilderness (km^2)	Percent wilderness	NFS ($m^3 \times 10^{-6}$)	NFS wilderness ($m^3 \times 10^{-6}$)	Percent wilderness
East	7,052	1,050	15	5,904	1,109	19
South	53,687	3,336	6	31,117	2,227	7
Midwest	38,441	5,426	14	11,722	1,119	10
Plains	20,871	306	1	1,998	93	5
West	573,035	115,691	20	229,608	65,898	29
U.S.	693,087	125,809	18	280,349	70,447	25

Closing Comments

These estimates highlight the importance of forests and public lands in the provision of renewable water supply. Forested watersheds provide roughly two-thirds of the water supply of the East and West regions, roughly half of the water supply in the South, and somewhat less than one-third of the water supply of the Midwest and Plains regions. Because forests are also generally the source of the highest quality runoff (Brown and Binkley, 1994), it is not an exaggeration to say that forests play an extremely important role in the provision of water in the United States.

Public lands provide about 60% of the water supply in the West (but much lower proportions in the other regions), and considerably more than 60% in some western states. For example, public lands provide at least 75% of the water supply in the states of Colorado, Idaho, Nevada, Utah, and Wyoming. This also is good for water quality, because public lands are partially protected from the effects of development. Furthermore, in the West nearly 30% of the water from public lands originates on wilderness areas, where effects of development are nearly always avoided. The beneficiaries of such large scale water quality protection include not only onsite water users—recreationists and those who live or work in forests or adjacent to public lands—but also water users downstream of the forests and federally protected areas, whether they rural or urban residents, farmers or industrial water users.

References

Blanc, E.; Strzepek, K.; Schlosser, A.; Jacoby, H.; Gueneau, A.; Fant, C., et al. 2014. Modeling U.S. water resources under climate change. *Earth's Future* 2: 197-224.

Brekke, L.; Dettinger, M.; Maurer, E.; Anderson, M. 2008. Significance of model credibility in estimating climate projection distributions for regional hydroclimatological risk assessments. *Climatic Change* 89(3-4): 371-394.

Brown, T. C.; Binkley, D. 1994. *Effect of management on water quality in North American forests*. General Technical Report RM-GTR-248. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Brown, T. C.; Hobbins, M. T.; Ramirez, J. A. 2008. Spatial distribution of water supply in the coterminous United States. *Journal of the American Water Resources Association* 44(6): 1474-1487.

Cayan, D. R.; Das, T.; Pierce, D. W.; Barnett, T. P.; Tyree, M.; Gershunov, A. 2010. Future dryness in the southwest US and the hydrology of the early 21st century drought. *Proceedings of the National Academy of Sciences* 107(50): 21271-21276.

Cherkauer, K. A.; Bowling, L. C.; Lettenmaier, D. P. 2003. Variable infiltration capacity cold land process model updates. *Global and Planetary Change* 38(1–2): 151-159.

Christensen, N. S.; Lettenmaier, D. P. 2007. A multimodel ensemble approach to assessment of climate change impacts on the hydrology and water resources of the Colorado River Basin. *Hydrology and Earth System Sciences* 11(4): 1417-1434.

Foti, R.; Ramirez, J. A.; Brown, T. C. 2012. *Vulnerability of U.S. water supply to shortage: a technical document supporting the Forest Service 2010 RPA Assessment*. General Technical Report RMRS-GTR-295. Fort Collins, Colorado: U.S. Forest Service, Rocky Mountain Research Station.

Foti, R.; Ramirez, J. A.; Brown, T. C. 2014. A probabilistic framework for assessing vulnerability to climate variability and change: the case of the US water supply system. *Climatic Change* 125(3-4): 413-427.

Fry, J.; Xian, G.; Jin, S.; Dewitz, J.; Homer, C.; Yang, L., et al. 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States. *PE&RS* 77(9): 858-864.

Hamlet, A.; Lee, S.-Y.; Mickelson, K. B.; Elsner, M. 2010. Effects of projected climate change on energy supply and demand in the Pacific Northwest and Washington State. *Climatic Change* 102(1-2): 103-128.

Hobbins, M. T.; Ramírez, J. A.; Brown, T. C. 2001. The complementary relationship in estimation of regional evapotranspiration: An enhanced advection-aridity model. *Water Resources Research* 37(5): 1389-1403.

Krug, W. R.; Gebert, W. A.; Graczyk, D. J. 1989. *Preparation of average annual runoff map of the United States, 1951-80.* . U.S. Geological Survey Open-File Report 87-535.

Liang, X.; Lettenmaier, D. P.; Wood, E. F.; Burges, S. J. 1994. A simple hydrologically based model of land surface water and energy fluxes for general circulation models. *Journal of Geophysical Research* 99(D7): 14415-14428.

Liang, X.; Wood, E. F.; Lettenmaier, D. P. 1996. Surface Soil Moisture Parameterization of the VIC-2L Model: Evaluation and Modification. *Global and Planetary Change* 13(1996): 195-206.

Lohmann, D.; Raschke, E.; Nijssen, B.; Lettenmaier, D. P. 1998. Regional scale hydrology: I. Formulation of the VIC-2L model coupled to a routing model. *Hydrological Sciences Journal* 43(1): 131-141.

Mahat, V.; Ramirez, J. A.; Brown, T. C. 2015. 21st Century U.S. Climate in CMIP5 Simulations: Implications for Water Yield Unpublished manuscript.

Maurer, E. P.; Wood, A. W.; Adam, J. C.; Lettenmaier, D. P.; Nijssen, B. 2002. A Long-Term Hydrologically Based Dataset of Land Surface Fluxes and States for the Conterminous United States. *Journal of Climate* 15: 3237-3251.

Nijssen, B.; Lettenmaier, D. P.; Liang, X.; Wetzel, S. W.; Wood, E. F. 1997. Streamflow Simulation for Continental-Scale River Basins. *Water Resources Research* 33(4): 711-724.

Slack, J. R.; Landwehr, J. M. 1992. *Hydro-Climatic Data Network (HCDN): A USGS streamflow data set for the U.S. for the study of climate variations*. Open-File Report 92-129: U.S. Geological Survey.

U.S. Water Resources Council. 1978. *The nation's water resources*. Washington, DC: U.S. Government Printing Office.

Appendices

A. Mean Annual 1981-2010 Water Supply Volume

Table A1. Mean annual water supply of the contiguous U.S. by region and federal agency, $m^3 \times 10^{-9}$.

Table A2. Mean annual water supply of the contiguous U.S. by WRR and federal agency, $m^3 \times 10^6$.

Table A3. Mean annual water supply of the contiguous U.S. by state and federal agency, $m^3 \times 10^6$.

Table A4. Mean annual water supply of the contiguous U.S. by region and NLCD cover type, $m^3 \times 10^9$.

Table A5. Mean annual water supply of the contiguous U.S. by WRR and NLCD cover type, $m^3 \times 10^6$.

Table A6. Mean annual water supply of the contiguous U.S. by state and NLCD cover type, $m^3 \times 10^6$.

Table A7. Mean annual water supply of the contiguous U.S. by region and LandFire/PHYS cover type, $m^3 \times 10^9$.

Table A8. Mean annual water supply of the contiguous U.S. by WRR and LandFire/PHYS cover type, $m^3 \times 10^6$.

Table A9. Mean annual water supply of the contiguous U.S. by state and LandFire/PHYS cover type, $m^3 \times 10^6$.

Figure A1. Water yield by state and federal agency.

Figure A2. Water yield by state and NLCD cover class.

B. Percent of Mean Annual 1981-2010 Water Supply

Nine tables similar to those of Appendix A, but for percent of mean annual water supply instead of water supply volume.

C. Land Area

Nine tables similar to those of Appendix A, but for land area instead of water supply volume.

D. Percent of Land Area

Nine tables similar to those of Appendix A, but for percent of land area instead of water supply volume.

E. Forest Land and Water Supply

Table E1. Estimates of forest land area from three sources, and associated water supply, by region of the contiguous U.S.

Table E2. Estimates of forest land area from three sources, and associated water supply, by WRR of the contiguous U.S.

Table E1. Estimates of forest land area from three sources, and associated water supply, by state in the contiguous U.S.

F. Mean Annual 1981-2010 Water Supply and Land Area of the National Forest System

Table F1. National Forest System ownership land area, and associated mean annual water supply volume, by NFS region in the contiguous U.S.

Table F2. National Forest System land area according to two area designations, and associated mean annual water supply volume, by state in the contiguous U.S.

Table F3. National Forest System ownership land area, and associated mean annual water supply volume, by unit of the NFS in the contiguous U.S.

G. Mean Annual 1981-2010 Water Supply and Land Area of Designated Wilderness Areas

Table G1. Wilderness land area and associated mean annual water supply volume, by federal agency and state of the contiguous U.S.

A. Mean Annual 1981-2010 Water Supply Volume

Table A1. Mean annual water supply of the contiguous U.S. by region and federal agency, $m^3 \times 10^{-9}$.*

Region	FS	BLM	NPS	Other fed	S&P	Total
East	7.4	0.0	0.3	1.6	257.0	266.3
South	56.0	0.0	5.2	14.9	593.1	669.2
Midwest	21.2	0.0	0.6	2.6	315.9	340.4
Plains	3.5	0.0	0.2	2.3	134.0	140.1
West	248.3	31.5	32.8	5.3	187.9	505.8
U.S.	336.5	31.5	39.1	26.7	1487.8	1921.8

* 2005 Federal land designations taken from the Federal Lands of the United States database of the National Atlas of the U.S.

Table A2. Mean annual water supply of the contiguous U.S. by WRR and federal agency, $m^3 \times 10^{-6}$.*

WRR	FS	BLM	NPS	Other fed	S&P	Total
1	4,438	0	11	406	94,498	99,353
2	5,013	0	752	1,046	130,524	137,335
3	17,215	0	1,803	7,060	274,314	300,392
4	8,481	0	171	611	91,627	100,890
5	15,751	0	645	2,304	185,035	203,735
6	13,514	0	2,042	2,246	50,626	68,429
7	3,388	0	203	1,129	123,467	128,186
8	5,577	0	65	2,815	126,268	134,725
9	1,356	0	57	122	10,618	12,152
10	20,512	1,876	6,188	985	80,563	110,125
11	10,879	50	401	2,152	95,552	109,035
12	2,035	1	147	821	49,783	52,786
13	2,845	424	150	119	3,084	6,623
14	13,346	2,869	356	68	3,635	20,276
15	1,983	860	113	177	2,193	5,326
16	6,414	5,828	54	579	3,074	15,950
17	151,832	15,297	20,347	3,074	120,848	311,398
18	51,938	4,309	5,642	1,032	42,137	105,058
U.S.	336,518	31,515	39,146	26,748	1,487,848	1,921,775

* 2005 Federal land designations taken from the Federal Lands of the United States database of the National Atlas of the U.S.

Table A3. Mean annual water supply of the contiguous U.S. by state and federal agency, m^3 x 10^{-6}.*

State	FS	BLM	NPS	Other fed	S&P	Total
AL	3,270	0	41	1,026	74,961	79,298
AZ	1,462	425	93	123	2,075	4,178
AR	7,407	0	193	1,391	56,953	65,944
CA	51,719	4,073	5,376	898	41,459	103,526
CO	14,265	1,537	723	54	4,325	20,904
CT	0	0	0	10	8,418	8,428
DE	0	0	0	38	2,000	2,039
DC	0	0	7	3	85	96
FL	1,989	0	1,596	1,529	39,064	44,177
GA	5,523	0	63	2,335	57,217	65,138
ID	38,650	3,538	231	344	11,223	53,986
IL	1,773	0	0	338	45,625	47,735
IN	1,189	0	14	435	34,628	36,266
IA	0	0	3	201	34,639	34,842
KS	12	0	10	256	22,279	22,557
KY	4,361	0	203	998	47,111	52,673
LA	1,870	0	48	1,694	59,131	62,743
ME	232	0	7	166	52,833	53,238
MD	0	0	84	164	9,676	9,924
MA	0	0	2	124	12,347	12,473
MI	5,912	0	106	298	36,836	43,151
MN	3,250	0	145	326	27,880	31,602
MS	5,325	0	8	889	61,652	67,873
MO	4,892	0	203	582	56,952	62,629
MT	28,774	1,159	3,753	307	13,450	47,442
NE	54	0	12	49	12,771	12,886
NV	2,217	5,963	42	674	1,408	10,304
NH	3,043	0	0	42	13,063	16,147
NJ	0	0	108	223	9,912	10,244
NM	1,540	553	19	116	2,341	4,570
NY	36	0	12	420	70,536	71,004
NC	10,122	0	1,131	1,379	46,038	58,671
ND	128	2	3	98	5,579	5,810
OH	1,515	0	51	144	38,630	40,342
OK	816	0	5	915	28,424	30,159
OR	48,163	11,377	604	343	51,577	112,063
PA	1,873	0	100	256	62,755	64,984
RI	0	0	0	1	1,534	1,535
SC	2,519	0	49	644	27,077	30,289
SD	387	22	27	81	5,635	6,151
TN	3,039	0	1,159	2,144	59,472	65,814
TX	2,136	1	179	924	59,276	62,516
UT	4,901	1,413	137	90	2,176	8,716
VT	2,255	0	2	108	13,810	16,174

VA	5,571	0	510	744	36,607	43,432
WA	44,200	125	15,539	2,169	54,127	116,161
WV	5,021	0	176	138	27,819	33,154
WI	2,709	0	112	318	40,695	43,834
WY	12,398	1,326	6,263	198	3,767	23,951
U.S.	336,518	31,515	39,146	26,748	1,487,848	1,921,775

* 2005 Federal land designations taken from the Federal Lands of the United States database of the National Atlas of the U.S.

Table A4. Mean annual water supply of the contiguous U.S. by region and NLCD cover type, $m^3 \times 10^{-9}$.

Region	Forest	Range	Agriculture	Developed	Riparian	Other	Total
East	160	10	39	28	20	9	266
South	307	56	148	58	81	19	669
Midwest	97	10	169	32	25	8	340
Plains	26	44	49	11	7	3	140
West	295	151	19	16	6	20	506
U.S.	884	271	424	146	138	59	1922

Table A5. Mean annual water supply of the contiguous U.S. by WRR and NLCD cover type, $m^3 \times 10^{-6}$.

WRR	Forest	Range	Agriculture	Developed	Riparian	Other	Total
1	66,091	5,652	4,551	8,548	10091	4,421	99354
2	77,476	3,162	27,350	18,042	7770	3,536	137335
3	128,821	35,450	49,801	30,255	48947	7,119	300392
4	37,198	4,770	30,364	10,227	15164	3,168	100890
5	105,850	5,908	68,731	18,746	1371	3,129	203735
6	41,273	4,026	14,666	5,833	879	1,752	68429
7	29,497	4,031	71,552	11,783	7855	3,469	128186
8	33,559	9,209	49,167	9,153	26807	6,828	134725
9	1,874	613	5,424	455	2994	793	12153
10	27,405	32,060	41,063	4,701	1959	2,937	110125
11	45,094	19,076	32,229	6,740	3330	2,565	109035
12	11,564	15,879	12,533	6,064	5166	1,580	52786
13	2,328	3,866	58	71	118	181	6623
14	10,834	6,979	283	133	362	1,684	20276
15	1,920	3,172	41	104	13	76	5326
16	4,855	9,515	375	374	123	708	15950
17	198,404	74,002	12,925	10,572	4271	11,224	311398
18	59,772	33,429	3,314	4,090	572	3,881	105058
U.S.	883,814	270,800	424,427	145,890	137,794	59,051	1,921,776

Table A6. Mean annual water supply of the contiguous U.S. by state and NLCD cover type, $m^3 \times 10^{-6}$.

State	Forest	Range	Agriculture	Developed	Riparian	Other	Total
AL	41,606	10,210	13,580	5,800	6250	1,853	79298
AZ	1,335	2,622	36	90	12	84	4178
AR	29,703	2,797	22,276	3,861	5676	1,631	65944
CA	58,537	33,275	3,180	4,101	508	3,924	103526
CO	11,370	6,234	735	207	506	1,854	20904
CT	4,737	144	636	1,894	762	255	8428
DE	228	44	817	405	451	93	2039
DC	10	0	0	82	1	2	96
FL	9,114	5,538	6,308	6,881	14648	1,688	44177
GA	31,015	6,271	10,899	7,244	8415	1,294	65138
ID	32,131	18,588	1,720	372	388	787	53986
IL	7,730	348	32,135	5,839	819	865	47735
IN	8,972	694	21,740	3,878	498	485	36266
IA	2,935	1,765	26,466	2,614	677	386	34842
KS	1,665	7,129	11,665	1,513	258	327	22557
KY	27,438	2,324	17,338	3,906	545	1,122	52673
LA	13,301	5,967	15,204	4,641	18587	5,044	62743
ME	35,586	4,650	1,902	1,767	6399	2,934	53239
MD	3,563	182	3,059	1,919	955	246	9924
MA	6,547	180	774	2,995	1486	492	12473
MI	15,333	2,308	11,289	4,740	8275	1,206	43151
MN	7,840	1,586	11,535	1,935	6800	1,906	31602
MS	26,197	8,834	16,928	4,373	9908	1,634	67873
MO	24,140	1,190	30,785	4,294	1247	972	62629
MT	26,585	16,430	2,109	351	419	1,550	47442
NE	368	4,844	6,551	678	295	150	12886
NV	1,597	8,202	93	75	66	272	10304
NH	12,438	487	577	1,119	967	560	16147
NJ	2,996	242	1,463	3,145	2021	376	10244
NM	1,690	2,669	89	47	22	53	4570
NY	41,543	2,742	13,732	5,675	4844	2,468	71004
NC	29,166	4,537	11,119	6,117	6704	1,029	58671
ND	93	1,140	3,791	271	296	218	5810
OH	13,188	829	19,450	5,994	337	545	40342
OK	10,417	7,913	8,767	2,021	234	807	30159
OR	72,364	24,363	6,848	4,488	1264	2,737	112063
PA	39,509	1,345	14,160	7,827	1062	1,080	64984
RI	759	29	61	421	196	67	1535
SC	12,243	3,405	4,591	2,991	6011	1,048	30289
SD	273	2,705	2,615	205	150	202	6151
TN	34,175	3,972	18,210	6,180	1740	1,539	65814
TX	13,342	19,863	15,604	6,644	5432	1,631	62516
UT	4,509	3,008	244	285	60	612	8716
VT	11,893	311	1,909	826	706	529	16175

VA	25,652	1,970	9,060	4,137	1969	645	43432
WA	74,505	22,729	4,073	5,548	2366	6,940	116161
WV	27,135	514	2,706	2,257	54	488	33154
WI	16,446	1,239	15,367	3,152	6037	1,591	43834
WY	9,896	12,433	231	88	472	831	23951
U.S.	883,814	270,800	424,427	145,890	137,794	59,051	1,921,776

Table A7. Mean annual water supply of the contiguous U.S. by region and LandFire/PHYS cover type, $m^3 \times 10^{-9}$.

Region	Forest	Rangeland	Agriculture	Developed	Riparian	Other	Total
East	165	1	32	39	19	9.8	266
South	340	7	142	90	70	20.4	669
Midwest	101	3	159	49	21	8.4	340
Plains	30	27	50	21	9	3.6	140
West	325	97	17	20	17	29.4	506
U.S.	961	135	400	219	136	72	1922

Table A8. Mean annual water supply of the contiguous U.S. by WRR and LandFire/PHYS cover type, $m^3 \times 10^{-6}$.

WRR	Forest	Rangeland	Agriculture	Developed	Riparian	Other	Total
1	70,810	372	3,237	10,938	9604	4,393	99353
2	78,542	647	23,218	24,806	5772	4,350	137335
3	153,737	5,592	45,552	48,836	39124	7,551	300392
4	40,227	1,152	27,770	14,487	13942	3,312	100890
5	105,407	496	66,707	24,353	3103	3,669	203735
6	43,006	248	14,429	7,773	1054	1,918	68429
7	32,053	1,031	64,841	20,582	6042	3,638	128186
8	37,969	564	47,830	14,844	26415	7,103	134725
9	2,319	419	4,684	1,349	2539	841	12152
10	29,317	23,205	40,004	9,275	3016	5,308	110125
11	46,070	10,806	33,051	12,636	3751	2,721	109035
12	15,916	7,080	12,725	9,645	5800	1,619	52786
13	3,054	3,023	57	120	103	266	6623
14	11,495	5,439	191	287	367	2,497	20276
15	2,011	2,708	48	128	143	289	5326
16	5,721	8,013	366	509	201	1,141	15950
17	217,644	41,188	12,087	13,201	12292	14,985	311398
18	65,858	22,853	2,755	5,052	2564	5,976	105058
U.S.	961,156	134,835	399,554	218,821	135,833	71,577	1,921,775

Table A9. Mean annual water supply of the contiguous U.S. by state and LandFire/PHYS cover type, $m^3 \times 10^{-6}$.

State	Forest	Rangeland	Agriculture	Developed	Riparian	Other	Total
AL	45,828	879	13,240	9,790	7402	2,158	79298
AZ	1,427	2,256	41	111	113	231	4178
AR	30,526	421	22,060	6,059	5182	1,697	65944
CA	64,772	22,451	2,638	5,034	2484	6,146	103526
CO	12,594	4,678	596	476	321	2,239	20904
CT	4,729	5	369	2,356	731	238	8428
DE	390	27	735	549	211	127	2039
DC	9	0	0	83	0	4	96
FL	15,942	764	6,014	9,460	10394	1,603	44177
GA	35,818	635	9,560	11,537	6190	1,398	65138
ID	33,467	13,941	1,761	664	1286	2,867	53986
IL	7,422	250	31,783	6,443	831	1,006	47735
IN	8,708	77	21,252	4,992	673	563	36266
IA	3,529	303	21,738	8,033	854	385	34842
KS	1,387	3,973	13,421	2,714	738	324	22557
KY	27,745	138	17,704	5,003	851	1,232	52673
LA	16,480	362	14,511	7,407	18872	5,111	62743
ME	39,680	285	1,479	2,561	6291	2,943	53238
MD	3,657	58	2,559	2,813	478	358	9924
MA	6,645	13	493	3,550	1294	478	12473
MI	16,540	815	10,669	6,201	7619	1,306	43151
MN	9,971	472	9,296	4,508	5361	1,993	31602
MS	30,142	732	16,522	8,748	9865	1,863	67873
MO	23,281	517	30,690	5,885	1287	970	62629
MT	27,833	12,095	1,519	1,195	1223	3,578	47442
NE	338	3,938	6,440	1,487	528	156	12886
NV	2,247	7,213	82	114	120	527	10304
NH	12,808	61	361	1,481	883	553	16147
NJ	3,730	88	992	3,886	999	550	10244
NM	1,979	2,195	107	83	66	140	4570
NY	41,451	406	11,265	8,997	6375	2,511	71004
NC	32,546	2,205	8,803	9,920	4150	1,046	58671
ND	63	970	3,370	869	277	261	5810
OH	12,683	32	18,930	7,255	863	580	40342
OK	10,625	5,145	8,337	4,507	669	876	30159
OR	81,808	11,503	6,542	5,850	3976	2,385	112063
PA	39,365	109	11,743	11,235	1059	1,474	64984
RI	768	1	38	475	186	67	1535
SC	15,872	277	4,431	4,641	4029	1,039	30289
SD	274	2,392	2,485	616	138	246	6151
TN	35,425	223	18,579	8,122	1758	1,707	65814
TX	17,565	10,301	16,001	10,795	6156	1,697	62516
UT	4,487	2,533	233	390	118	956	8716
VT	12,151	9	1,672	1,226	589	528	16174

VA	26,609	555	8,235	5,860	1256	918	43432
WA	81,845	10,397	3,733	6,254	6307	7,626	116161
WV	26,772	124	2,086	3,029	499	644	33154
WI	18,867	243	14,217	5,333	3586	1,588	43834
WY	12,355	7,767	223	225	697	2,684	23951
U.S.	961,156	134,835	399,554	218,821	135,833	71,577	1,921,775

Figure A1. Water yield by state and federal agency

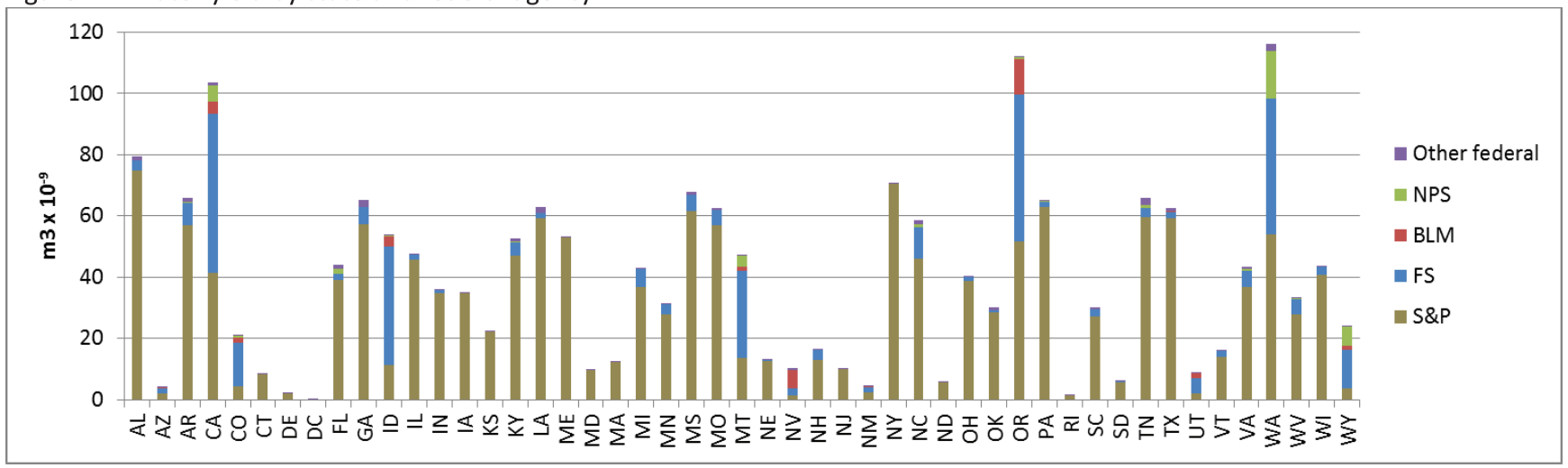
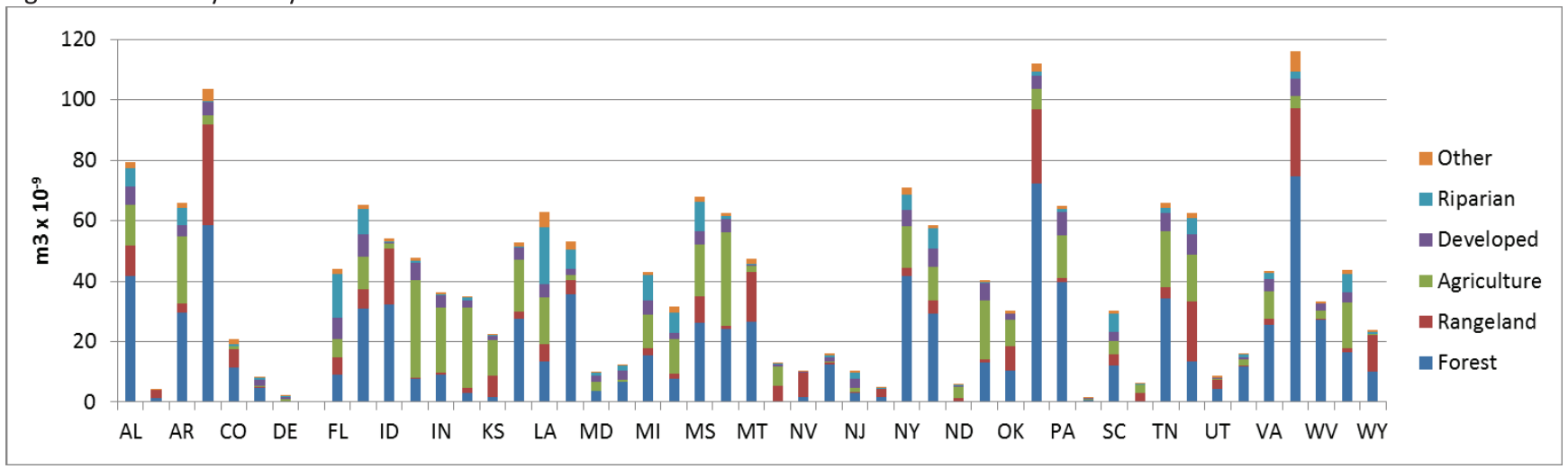


Figure A2. Water yield by state and NLCD cover class



B. Percent of Mean Annual 1981-2010 Water Supply

Table B1. Percent of mean annual water supply of the contiguous U.S. by region and federal agency.*

Region	FS	BLM	NPS	Other fed	S&P
East	2.8	0.0	0.1	0.6	96.5
South	8.4	0.0	0.8	2.2	88.6
Midwest	6.2	0.0	0.2	0.8	92.8
Plains	2.5	0.0	0.2	1.7	95.6
West	49.1	6.2	6.5	1.1	37.2
U.S.	17.5	1.6	2.0	1.4	77.4

* Federal land designations taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S.

Table B2. Percent of mean annual water supply of the contiguous U.S. by WRR and federal agency.*

WRR	FS	BLM	NPS	Other fed	S&P
1	4.5	0.0	0.0	0.4	95.1
2	3.6	0.0	0.5	0.8	95.0
3	5.7	0.0	0.6	2.4	91.3
4	8.4	0.0	0.2	0.6	90.8
5	7.7	0.0	0.3	1.1	90.8
6	19.7	0.0	3.0	3.3	74.0
7	2.6	0.0	0.2	0.9	96.3
8	4.1	0.0	0.0	2.1	93.7
9	11.2	0.0	0.5	1.0	87.4
10	18.6	1.7	5.6	0.9	73.2
11	10.0	0.0	0.4	2.0	87.6
12	3.9	0.0	0.3	1.6	94.3
13	43.0	6.4	2.3	1.8	46.6
14	65.8	14.2	1.8	0.3	17.9
15	37.2	16.1	2.1	3.3	41.2
16	40.2	36.5	0.3	3.6	19.3
17	48.8	4.9	6.5	1.0	38.8
18	49.4	4.1	5.4	1.0	40.1
U.S.	17.5	1.6	2.0	1.4	77.4

* Federal land designations taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S.

Table B3. Percent of mean annual water supply of the contiguous U.S. by state and federal agency.*

State	FS	BLM	NPS	Other fed	S&P
AL	4.1	0.0	0.1	1.3	94.5
AZ	35.0	10.2	2.2	2.9	49.7
AR	11.2	0.0	0.3	2.1	86.4
CA	50.0	3.9	5.2	0.9	40.0
CO	68.2	7.4	3.5	0.3	20.7
CT	0.0	0.0	0.0	0.1	99.9
DE	0.0	0.0	0.0	1.9	98.1
DC	0.0	0.0	7.6	3.6	88.8
FL	4.5	0.0	3.6	3.5	88.4
GA	8.5	0.0	0.1	3.6	87.8
ID	71.6	6.6	0.4	0.6	20.8
IL	3.7	0.0	0.0	0.7	95.6
IN	3.3	0.0	0.0	1.2	95.5
IA	0.0	0.0	0.0	0.6	99.4
KS	0.1	0.0	0.0	1.1	98.8
KY	8.3	0.0	0.4	1.9	89.4
LA	3.0	0.0	0.1	2.7	94.2
ME	0.4	0.0	0.0	0.3	99.2
MD	0.0	0.0	0.9	1.6	97.5
MA	0.0	0.0	0.0	1.0	99.0
MI	13.7	0.0	0.2	0.7	85.4
MN	10.3	0.0	0.5	1.0	88.2
MS	7.8	0.0	0.0	1.3	90.8
MO	7.8	0.0	0.3	0.9	90.9
MT	60.6	2.4	7.9	0.6	28.3
NE	0.4	0.0	0.1	0.4	99.1
NV	21.5	57.9	0.4	6.5	13.7
NH	18.8	0.0	0.0	0.3	80.9
NJ	0.0	0.0	1.1	2.2	96.8
NM	33.7	12.1	0.4	2.5	51.2
NY	0.1	0.0	0.0	0.6	99.3
NC	17.3	0.0	1.9	2.4	78.5
ND	2.2	0.0	0.1	1.7	96.0
OH	3.8	0.0	0.1	0.4	95.8
OK	2.7	0.0	0.0	3.0	94.2
OR	43.0	10.2	0.5	0.3	46.0
PA	2.9	0.0	0.2	0.4	96.6
RI	0.0	0.0	0.0	0.1	99.9
SC	8.3	0.0	0.2	2.1	89.4
SD	6.3	0.4	0.4	1.3	91.6
TN	4.6	0.0	1.8	3.3	90.4
TX	3.4	0.0	0.3	1.5	94.8
UT	56.2	16.2	1.6	1.0	25.0
VT	13.9	0.0	0.0	0.7	85.4

VA	12.8	0.0	1.2	1.7	84.3
WA	38.1	0.1	13.4	1.9	46.6
WV	15.1	0.0	0.5	0.4	83.9
WI	6.2	0.0	0.3	0.7	92.8
WY	51.8	5.5	26.1	0.8	15.7
U.S.	17.5	1.6	2.0	1.4	77.4

* Federal land designations taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S.

Table B4. Percent of mean annual water supply of the contiguous U.S. by region and NLCD cover type.

Region	Forest	Range	Agriculture	Developed	Riparian	Other
East	60.0	3.9	14.7	10.5	7.5	3.4
South	45.8	8.4	22.1	8.7	12.0	2.8
Midwest	28.4	2.9	49.6	9.5	7.3	2.3
Plains	18.7	31.1	35.0	8.1	4.8	2.4
West	58.2	29.8	3.8	3.1	1.2	3.9
U.S.	46.0	14.1	22.1	7.6	7.2	3.1

Table B5. Percent of mean annual water supply of the contiguous U.S. by WRR and NLCD cover type.

WRR	Forest	Range	Agriculture	Developed	Riparian	Other
1	66.5	5.7	4.6	8.6	10.2	4.4
2	56.4	2.3	19.9	13.1	5.7	2.6
3	42.9	11.8	16.6	10.1	16.3	2.4
4	36.9	4.7	30.1	10.1	15.0	3.1
5	52.0	2.9	33.7	9.2	0.7	1.5
6	60.3	5.9	21.4	8.5	1.3	2.6
7	23.0	3.1	55.8	9.2	6.1	2.7
8	24.9	6.8	36.5	6.8	19.9	5.1
9	15.4	5.0	44.6	3.7	24.6	6.5
10	24.9	29.1	37.3	4.3	1.8	2.7
11	41.4	17.5	29.6	6.2	3.1	2.4
12	21.9	30.1	23.7	11.5	9.8	3.0
13	35.2	58.4	0.9	1.1	1.8	2.7
14	53.4	34.4	1.4	0.7	1.8	8.3
15	36.1	59.5	0.8	2.0	0.3	1.4
16	30.4	59.7	2.4	2.3	0.8	4.4
17	63.7	23.8	4.2	3.4	1.4	3.6
18	56.9	31.8	3.2	3.9	0.5	3.7
U.S.	46.0	14.1	22.1	7.6	7.2	3.1

Table B6. Percent of mean annual water supply of the contiguous U.S. by state and NLCD cover type.

State	Forest	Range	Agriculture	Developed	Riparian	Other
AL	52.5	12.9	17.1	7.3	7.9	2.3
AZ	31.9	62.7	0.9	2.1	0.3	2.0
AR	45.0	4.2	33.8	5.9	8.6	2.5
CA	56.5	32.1	3.1	4.0	0.5	3.8
CO	54.4	29.8	3.5	1.0	2.4	8.9
CT	56.2	1.7	7.5	22.5	9.0	3.0
DE	11.2	2.2	40.1	19.9	22.1	4.6
DC	10.4	0.2	0.1	85.7	1.1	2.6
FL	20.6	12.5	14.3	15.6	33.2	3.8
GA	47.6	9.6	16.7	11.1	12.9	2.0
ID	59.5	34.4	3.2	0.7	0.7	1.5
IL	16.2	0.7	67.3	12.2	1.7	1.8
IN	24.7	1.9	59.9	10.7	1.4	1.3
IA	8.4	5.1	76.0	7.5	1.9	1.1
KS	7.4	31.6	51.7	6.7	1.1	1.5
KY	52.1	4.4	32.9	7.4	1.0	2.1
LA	21.2	9.5	24.2	7.4	29.6	8.0
ME	66.8	8.7	3.6	3.3	12.0	5.5
MD	35.9	1.8	30.8	19.3	9.6	2.5
MA	52.5	1.4	6.2	24.0	11.9	3.9
MI	35.5	5.3	26.2	11.0	19.2	2.8
MN	24.8	5.0	36.5	6.1	21.5	6.0
MS	38.6	13.0	24.9	6.4	14.6	2.4
MO	38.5	1.9	49.2	6.9	2.0	1.6
MT	56.0	34.6	4.4	0.7	0.9	3.3
NE	2.9	37.6	50.8	5.3	2.3	1.2
NV	15.5	79.6	0.9	0.7	0.6	2.6
NH	77.0	3.0	3.6	6.9	6.0	3.5
NJ	29.2	2.4	14.3	30.7	19.7	3.7
NM	37.0	58.4	1.9	1.0	0.5	1.2
NY	58.5	3.9	19.3	8.0	6.8	3.5
NC	49.7	7.7	19.0	10.4	11.4	1.8
ND	1.6	19.6	65.2	4.7	5.1	3.8
OH	32.7	2.1	48.2	14.9	0.8	1.4
OK	34.5	26.2	29.1	6.7	0.8	2.7
OR	64.6	21.7	6.1	4.0	1.1	2.4
PA	60.8	2.1	21.8	12.0	1.6	1.7
RI	49.5	1.9	4.0	27.4	12.8	4.4
SC	40.4	11.2	15.2	9.9	19.8	3.5
SD	4.4	44.0	42.5	3.3	2.4	3.3
TN	51.9	6.0	27.7	9.4	2.6	2.3
TX	21.3	31.8	25.0	10.6	8.7	2.6
UT	51.7	34.5	2.8	3.3	0.7	7.0
VT	73.5	1.9	11.8	5.1	4.4	3.3

VA	59.1	4.5	20.9	9.5	4.5	1.5
WA	64.1	19.6	3.5	4.8	2.0	6.0
WV	81.8	1.6	8.2	6.8	0.2	1.5
WI	37.5	2.8	35.1	7.2	13.8	3.6
WY	41.3	51.9	1.0	0.4	2.0	3.5
U.S.	46.0	14.1	22.1	7.6	7.2	3.1

Table B7. Percent of mean annual water supply of the contiguous U.S. by region and LandFire/PHYS cover type.

Region	Forest	Rangeland	Agriculture	Developed	Riparian	Other
East	62.1	0.4	11.9	14.7	7.2	3.7
South	50.8	1.1	21.2	13.4	10.5	3.1
Midwest	29.7	0.8	46.6	14.3	6.2	2.5
Plains	21.6	19.1	35.7	15.0	6.1	2.5
West	64.2	19.2	3.5	4.0	3.3	5.8
U.S.	50.0	7.0	20.8	11.4	7.1	3.7

Table B8. Percent of mean annual water supply of the contiguous U.S. by WRR and LandFire/PHYS cover type.

WRR	Forest	Rangeland	Agriculture	Developed	Riparian	Other
1	71.3	0.4	3.3	11.0	9.7	4.4
2	57.2	0.5	16.9	18.1	4.2	3.2
3	51.2	1.9	15.2	16.3	13.0	2.5
4	39.9	1.1	27.5	14.4	13.8	3.3
5	51.7	0.2	32.7	12.0	1.5	1.8
6	62.8	0.4	21.1	11.4	1.5	2.8
7	25.0	0.8	50.6	16.1	4.7	2.8
8	28.2	0.4	35.5	11.0	19.6	5.3
9	19.1	3.5	38.5	11.1	20.9	6.9
10	26.6	21.1	36.3	8.4	2.7	4.8
11	42.3	9.9	30.3	11.6	3.4	2.5
12	30.2	13.4	24.1	18.3	11.0	3.1
13	46.1	45.6	0.9	1.8	1.6	4.0
14	56.7	26.8	0.9	1.4	1.8	12.3
15	37.7	50.8	0.9	2.4	2.7	5.4
16	35.9	50.2	2.3	3.2	1.3	7.2
17	69.9	13.2	3.9	4.2	3.9	4.8
18	62.7	21.8	2.6	4.8	2.4	5.7
U.S.	50.0	7.0	20.8	11.4	7.1	3.7

Table B9. Percent of mean annual water supply of the contiguous U.S. by state and LandFire/PHYS cover type.

State	Forest	Rangeland	Agriculture	Developed	Riparian	Other
AL	57.8	1.1	16.7	12.3	9.3	2.7
AZ	34.1	54.0	1.0	2.6	2.7	5.5
AR	46.3	0.6	33.5	9.2	7.9	2.6
CA	62.6	21.7	2.5	4.9	2.4	5.9
CO	60.2	22.4	2.8	2.3	1.5	10.7
CT	56.1	0.1	4.4	28.0	8.7	2.8
DE	19.1	1.3	36.0	26.9	10.3	6.2
DC	9.4	0.1	0.0	86.2	0.5	3.8
FL	36.1	1.7	13.6	21.4	23.5	3.6
GA	55.0	1.0	14.7	17.7	9.5	2.1
ID	62.0	25.8	3.3	1.2	2.4	5.3
IL	15.5	0.5	66.6	13.5	1.7	2.1
IN	24.0	0.2	58.6	13.8	1.9	1.6
IA	10.1	0.9	62.4	23.1	2.5	1.1
KS	6.1	17.6	59.5	12.0	3.3	1.4
KY	52.7	0.3	33.6	9.5	1.6	2.3
LA	26.3	0.6	23.1	11.8	30.1	8.1
ME	74.5	0.5	2.8	4.8	11.8	5.5
MD	36.9	0.6	25.8	28.3	4.8	3.6
MA	53.3	0.1	4.0	28.5	10.4	3.8
MI	38.3	1.9	24.7	14.4	17.7	3.0
MN	31.6	1.5	29.4	14.3	17.0	6.3
MS	44.4	1.1	24.3	12.9	14.5	2.7
MO	37.2	0.8	49.0	9.4	2.1	1.5
MT	58.7	25.5	3.2	2.5	2.6	7.5
NE	2.6	30.6	50.0	11.5	4.1	1.2
NV	21.8	70.0	0.8	1.1	1.2	5.1
NH	79.3	0.4	2.2	9.2	5.5	3.4
NJ	36.4	0.9	9.7	37.9	9.8	5.4
NM	43.3	48.0	2.3	1.8	1.4	3.1
NY	58.4	0.6	15.9	12.7	9.0	3.5
NC	55.5	3.8	15.0	16.9	7.1	1.8
ND	1.1	16.7	58.0	15.0	4.8	4.5
OH	31.4	0.1	46.9	18.0	2.1	1.4
OK	35.2	17.1	27.6	14.9	2.2	2.9
OR	73.0	10.3	5.8	5.2	3.5	2.1
PA	60.6	0.2	18.1	17.3	1.6	2.3
RI	50.1	0.1	2.5	31.0	12.1	4.3
SC	52.4	0.9	14.6	15.3	13.3	3.4
SD	4.5	38.9	40.4	10.0	2.3	4.0
TN	53.8	0.3	28.2	12.3	2.7	2.6
TX	28.1	16.5	25.6	17.3	9.8	2.7
UT	51.5	29.1	2.7	4.5	1.3	11.0
VT	75.1	0.1	10.3	7.6	3.6	3.3

VA	61.3	1.3	19.0	13.5	2.9	2.1
WA	70.5	9.0	3.2	5.4	5.4	6.6
WV	80.7	0.4	6.3	9.1	1.5	1.9
WI	43.0	0.6	32.4	12.2	8.2	3.6
WY	51.6	32.4	0.9	0.9	2.9	11.2
U.S.	50.0	7.0	20.8	11.4	7.1	3.7

C. Land Area

Table C1. Land area of the contiguous U.S. by region and federal agency, $km^2 \times 10^{-3}$.*

Region	FS	BLM	NPS	Other fed	S&P	Total
East	9	0	1	3	434	447
South	96	0	12	31	1240	1378
Midwest	66	0	2	9	1095	1172
Plains	38	1	6	19	1591	1655
West	637	704	82	113	1513	3048
U.S.	845	705	102	175	5874	7700

* Federal land designations taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S.

Table C2. Land area of the contiguous U.S. by WRR and federal agency, km^2.*

WRR	FS	BLM	NPS	Other fed	S&P	Total
1	4,904	0	14	636	142,889	148,443
2	10,981	0	1,573	2,203	249,254	264,012
3	29,948	0	6,714	15,939	625,982	678,583
4	28,059	0	467	1,650	260,115	290,291
5	28,129	0	1,141	4,491	388,014	421,775
6	17,215	0	2,161	3,742	82,754	105,872
7	10,849	0	754	4,032	475,813	491,447
8	10,815	0	115	5,417	241,302	257,649
9	9,763	1	318	1,809	138,344	150,234
10	105,170	69,721	11,475	17,409	1,118,301	1,322,076
11	36,702	2,368	1,080	9,821	592,170	642,141
12	7,097	57	469	4,752	446,879	459,254
13	35,076	46,886	5,755	15,330	237,195	340,243
14	58,462	113,303	9,591	2,590	109,966	293,911
15	61,526	90,196	13,048	22,427	173,403	360,599
16	48,871	206,706	1,402	26,361	78,313	361,653
17	239,981	117,018	15,415	14,003	316,565	702,981
18	101,728	58,356	30,391	22,002	196,419	408,896
U.S.	845,276	704,612	101,882	174,613	5,873,677	7,700,060

* Federal land designations taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S.

Table C3. Land area of the contiguous U.S. by state and federal agency, km^2.*

State	FS	BLM	NPS	Other fed	S&P	Total
AL	5,160	0	63	1,733	126,247	133,203
AZ	47,168	50,278	10,254	18,683	166,822	293,205
AR	13,884	0	427	3,009	120,371	137,691
CA	97,873	61,027	31,250	19,612	192,497	402,260
CO	69,220	33,037	2,990	2,728	161,761	269,736
CT	0	0	0	14	12,442	12,456
DE	0	0	0	64	4,725	4,789
DC	0	0	12	6	139	156
FL	5,170	0	6,355	3,733	122,934	138,193
GA	7,175	0	101	5,258	138,818	151,353
ID	86,756	47,611	1,998	4,268	75,791	216,424
IL	3,574	0	0	925	141,202	145,701
IN	2,546	0	36	994	90,138	93,714
IA	0	0	7	641	145,199	145,846
KS	520	0	47	1,768	210,788	213,124
KY	8,209	0	368	1,889	94,058	104,525
LA	3,775	0	79	3,205	109,393	116,452
ME	314	0	8	238	78,709	79,269
MD	0	0	202	369	22,266	22,837
MA	0	0	3	201	18,852	19,057
MI	18,838	0	292	1,026	122,114	142,270
MN	17,959	0	714	2,043	194,229	214,945
MS	9,492	0	15	1,607	112,200	123,314
MO	11,978	0	463	1,672	166,462	180,575
MT	76,677	30,984	5,029	6,034	260,715	379,439
NE	2,252	0	194	1,089	196,671	200,206
NV	25,180	194,933	2,712	25,149	38,310	286,284
NH	3,300	0	0	66	20,347	23,713
NJ	0	0	171	436	18,247	18,854
NM	42,153	57,328	1,618	15,057	198,024	314,180
NY	84	0	23	807	120,708	121,622
NC	11,887	0	1,215	2,959	107,319	123,382
ND	8,964	172	291	3,795	168,931	182,154
OH	3,456	0	140	379	101,831	105,805
OK	3,198	0	40	4,362	173,440	181,040
OR	70,612	62,761	793	3,135	111,373	248,674
PA	2,901	0	168	469	113,474	117,012
RI	0	0	0	1	2,237	2,239
SC	5,443	0	110	1,890	70,421	77,864
SD	13,577	826	1,249	2,506	181,601	199,759
TN	4,929	0	1,334	3,703	99,216	109,181
TX	9,013	48	4,225	5,668	659,330	678,284
UT	37,044	94,722	7,988	8,366	66,220	214,340
VT	2,544	0	3	185	21,953	24,685
VA	12,837	0	1,111	1,566	84,669	100,183

WA	40,074	1,244	7,601	5,634	115,992	170,545
WV	7,579	0	352	229	54,530	62,690
WI	8,021	0	352	1,007	134,157	143,536
WY	43,938	69,641	9,479	4,435	125,803	253,297
U.S.	845,276	704,612	101,882	174,613	5,873,677	7,700,060

* Federal land designations taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S.

Table C4. Land area of the contiguous U.S. by region and NLCD cover type, $km^2 \times 10^{-3}$.

Region	Forest	Range	Agriculture	Developed	Riparian	Other	Total
East	258	17	75	49	33	15	447
South	600	121	312	119	186	39	1378
Midwest	296	37	607	103	99	31	1172
Plains	134	810	550	85	44	32	1655
West	699	1896	241	77	31	104	3048
U.S.	1987	2882	1785	433	394	220	7700

Table C5. Land area of the contiguous U.S. by WRR and NLCD cover type, km^2.

WRR	Forest	Range	Agriculture	Developed	Riparian	Other	Total
1	97,980	8,612	7,143	12,960	15173	6,575	148,443
2	145,007	6,295	56,620	34,163	15357	6,569	264,012
3	264,771	81,273	122,871	66,203	126910	16,555	678,583
4	99,327	13,522	92,594	29,069	47042	8,738	290,291
5	205,187	11,687	155,905	39,898	2706	6,392	421,775
6	61,313	6,383	24,569	9,288	1432	2,887	105,872
7	98,801	16,737	289,012	42,046	30595	14,255	491,447
8	67,497	17,930	93,310	17,140	49503	12,269	257,649
9	15,009	11,095	83,657	6,190	26738	7,547	150,236
10	119,438	687,864	423,696	42,358	25794	22,929	1,322,078
11	134,520	276,101	180,631	30,942	9837	10,110	642,141
12	65,155	216,493	111,885	36,073	21555	8,093	459,254
13	38,097	284,178	5,512	5,062	2119	5,274	340,242
14	83,450	180,029	7,620	2,564	3094	17,154	293,911
15	62,771	275,101	5,888	7,980	1389	7,470	360,599
16	56,682	263,998	10,149	4,808	2707	23,308	361,653
17	270,762	312,905	72,368	20,204	8159	18,584	702,982
18	101,502	211,596	41,584	25,703	3420	25,091	408,896
U.S.	1,987,270	2,881,799	1,785,013	432,651	393,530	219,800	7,700,063

Table C6. Land area of the contiguous U.S. by state and NLCD cover type, km^2.

State	Forest	Range	Agriculture	Developed	Riparian	Other	Total
AL	70,106	17,209	22,962	9,504	10365	3,058	133,203
AZ	44,175	228,493	5,151	6,582	1198	7,605	293,204
AR	62,931	6,077	45,486	8,128	11675	3,394	137,691
CA	94,712	212,994	40,650	25,674	2981	25,247	402,260
CO	77,136	136,967	38,215	7,531	4154	5,732	269,736
CT	6,972	214	944	2,828	1118	379	12,456
DE	557	112	2,030	852	1053	185	4,789
DC	16	0	0	134	2	4	156
FL	25,101	17,087	24,727	18,333	47354	5,592	138,193
GA	66,679	16,192	27,220	14,909	23646	2,707	151,353
ID	70,798	111,704	23,347	3,671	1995	4,910	216,424
IL	21,931	1,046	100,911	16,820	2431	2,561	145,701
IN	21,172	1,746	58,217	9,963	1404	1,211	93,714
IA	10,079	7,038	113,778	10,804	2672	1,475	145,846
KS	7,854	78,968	111,169	10,999	1856	2,276	213,124
KY	54,518	4,690	34,250	7,742	1098	2,226	104,525
LA	26,934	11,695	27,107	8,337	33420	8,958	116,452
ME	52,764	7,096	2,960	2,575	9552	4,321	79,269
MD	7,860	443	7,376	4,174	2430	553	22,837
MA	9,974	281	1,208	4,544	2290	759	19,057
MI	50,115	7,815	38,689	14,788	26977	3,887	142,270
MN	42,324	9,612	97,584	12,299	41045	12,081	214,945
MS	47,539	15,914	31,472	7,780	17624	2,984	123,314
MO	66,404	3,626	91,529	12,451	3697	2,867	180,575
MT	82,486	219,480	60,644	5,476	5955	5,399	379,441
NE	3,984	107,993	74,063	7,263	4930	1,972	200,206
NV	31,134	237,307	3,094	2,868	1818	10,063	286,284
NH	17,942	715	936	1,796	1490	833	23,713
NJ	5,517	465	2,718	5,624	3862	667	18,854
NM	52,327	247,382	5,665	3,741	1166	3,899	314,180
NY	67,346	4,669	26,668	10,285	8459	4,196	121,622
NC	52,859	11,189	27,325	13,135	16652	2,221	123,382
ND	3,037	56,187	100,611	7,232	8392	6,696	182,155
OH	33,086	2,098	53,282	14,958	951	1,430	105,805
OK	38,585	73,185	53,393	10,967	1033	3,876	181,040
OR	90,256	123,072	19,976	6,519	2949	5,902	248,674
PA	70,203	2,343	26,631	14,107	1814	1,914	117,012
RI	1,083	43	89	640	284	99	2,239
SC	29,331	9,370	12,643	7,286	16783	2,450	77,864
SD	6,869	103,973	72,680	5,704	4265	6,267	199,759
TN	54,861	6,425	31,679	10,387	3184	2,645	109,181
TX	73,716	389,823	138,446	42,507	23088	10,703	678,283
UT	54,627	122,851	7,377	3,603	1415	24,467	214,340
VT	17,434	497	3,257	1,335	1139	1,024	24,685
VA	58,881	4,619	21,326	9,362	4535	1,459	100,183

WA	69,432	52,864	29,332	9,431	2864	6,622	170,545
WV	50,724	1,025	5,550	4,394	86	911	62,690
WI	51,240	4,042	53,044	10,419	19625	5,166	143,536
WY	31,656	203,158	7,599	2,186	4752	3,945	253,297
U.S.	1,987,270	2,881,799	1,785,013	432,651	393530	219,800	7,700,063

Table C7. Land area of the contiguous U.S. by region and LandFire/PHYS cover type, $km^2 \times 10^{-3}$.

Region	Forest	Rangeland	Agriculture	Developed	Riparian	Other	Total
East	267	2	61	69	31	16	447
South	683	16	297	187	153	41	1378
Midwest	315	12	562	168	84	32	1172
Plains	189	633	546	187	62	38	1655
West	811	1611	220	139	67	201	3048
U.S.	2265	2274	1686	750	397	328	7700

Table C8. Land area of the contiguous U.S. by WRR and LandFire/PHYS cover type, km^3.

WRR	Forest	Rangeland	Agriculture	Developed	Riparian	Other	Total
1	105,238	537	5,132	16,595	14409	6,532	148,443
2	147,516	1,363	48,563	47,602	10723	8,244	264,012
3	331,894	12,676	112,557	109,886	94428	17,143	678,583
4	109,763	3,559	85,740	41,108	40911	9,210	290,291
5	203,601	972	151,707	51,456	6583	7,456	421,775
6	64,002	387	24,194	12,391	1742	3,157	105,872
7	107,951	5,529	259,902	79,089	24069	14,907	491,447
8	76,238	1,138	90,788	28,136	48541	12,808	257,649
9	18,112	8,816	71,975	20,616	22329	8,387	150,234
10	126,804	605,890	399,709	114,229	40475	34,970	1,322,076
11	142,336	224,223	185,400	63,824	15061	11,296	642,141
12	114,398	129,736	114,291	66,696	25560	8,574	459,254
13	58,741	252,759	5,684	8,790	5183	9,087	340,243
14	91,052	152,748	6,214	5,815	5524	32,558	293,911
15	74,959	229,974	6,648	10,649	9760	28,610	360,599
16	68,143	241,099	10,002	8,007	2840	31,562	361,653
17	303,389	251,083	70,494	30,715	19147	28,154	702,981
18	120,438	151,585	36,896	34,379	9800	55,798	408,896
U.S.	2,264,576	2,274,075	1,685,893	749,980	397,084	328,452	7,700,060

Table C9. Land area of the contiguous U.S. by state and LandFire/PHYS cover type, km^2.

State	Forest	Rangeland	Agriculture	Developed	Riparian	Other	Total
AL	77,212	1,475	22,399	16,319	12217	3,580	133,203
AZ	52,746	195,771	5,851	8,968	7309	22,560	293,205
AR	64,807	919	45,060	12,762	10614	3,529	137,691
CA	113,519	149,205	36,080	34,190	9797	59,468	402,260
CO	85,607	120,601	33,456	18,297	3332	8,444	269,736
CT	6,958	7	549	3,515	1074	354	12,456
DE	985	53	1,825	1,198	470	259	4,789
DC	15	0	0	134	1	6	156
FL	48,567	2,642	23,550	26,717	31431	5,287	138,193
GA	80,017	1,680	24,274	25,608	16876	2,898	151,353
ID	76,580	94,488	24,061	6,222	5202	9,871	216,424
IL	21,007	758	99,821	18,711	2467	2,935	145,701
IN	20,550	219	56,757	12,967	1808	1,413	93,714
IA	12,353	1,462	95,616	31,701	3264	1,450	145,846
KS	8,871	55,891	123,418	18,059	4581	2,304	213,124
KY	55,175	275	34,965	9,937	1717	2,456	104,525
LA	33,353	733	25,805	13,626	33839	9,097	116,452
ME	59,102	418	2,331	3,736	9347	4,335	79,269
MD	8,193	144	6,228	6,264	1187	821	22,837
MA	10,117	21	773	5,404	2003	739	19,057
MI	53,966	2,793	36,723	19,656	24933	4,199	142,270
MN	52,319	3,977	80,532	31,742	33670	12,705	214,945
MS	54,680	1,255	30,713	15,750	17509	3,407	123,314
MO	63,819	1,527	91,382	17,170	3841	2,836	180,575
MT	85,836	197,422	47,674	25,697	12397	10,413	379,439
NE	4,520	94,158	72,262	17,879	9181	2,206	200,206
NV	42,298	212,890	2,689	3,967	3157	21,284	286,284
NH	18,484	78	591	2,378	1360	822	23,713
NJ	6,925	171	1,850	6,994	1909	1,004	18,854
NM	72,238	214,561	6,946	6,356	4063	10,017	314,180
NY	67,373	698	22,041	16,492	10756	4,262	121,622
NC	61,804	4,556	22,217	21,809	10764	2,231	123,382
ND	1,365	48,330	87,870	26,541	9561	8,487	182,154
OH	31,834	76	51,823	18,303	2254	1,516	105,805
OK	39,108	56,127	50,532	26,519	4451	4,303	181,040
OR	108,926	96,394	19,217	10,513	6448	7,176	248,674
PA	69,811	193	22,197	20,338	1876	2,597	117,012
RI	1,097	2	55	719	268	98	2,239
SC	39,679	739	12,084	11,932	11037	2,392	77,864
SD	7,008	92,842	70,037	17,643	4575	7,654	199,759
TN	56,743	355	32,258	13,682	3213	2,931	109,181
TX	127,948	285,728	141,859	80,146	29865	12,737	678,284
UT	59,306	107,454	7,262	6,256	2626	31,436	214,340
VT	17,819	15	2,876	1,980	975	1,021	24,685
VA	61,103	1,295	19,427	13,414	2820	2,124	100,183

WA	75,842	39,577	28,817	12,179	5967	8,162	170,545
WV	50,131	231	4,340	5,904	899	1,185	62,690
WI	59,069	817	49,180	17,826	11484	5,160	143,536
WY	37,794	183,050	7,618	5,860	6691	12,284	253,297
U.S.	2,264,576	2,274,075	1,685,893	749,980	397,084	328,452	7,700,060

D. Percent of Land Area

Table D1. Percent of land area of the contiguous U.S. by region and federal agency.*

Region	FS	BLM	NPS	Other fed	S&P
East	2.0	0.0	0.1	0.6	97.2
South	6.9	0.0	0.8	2.2	90.0
Midwest	5.7	0.0	0.2	0.7	93.4
Plains	2.3	0.1	0.4	1.2	96.1
West	20.9	23.1	2.7	3.7	49.6
U.S.	11.0	9.2	1.3	2.3	76.3

* Federal land designations taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S.

Table D2. Percent of land area of the contiguous U.S. by WRR and federal agency.*

WRR	FS	BLM	NPS	Other fed	S&P
1	3.3	0.0	0.0	0.4	96.3
2	4.2	0.0	0.6	0.8	94.4
3	4.4	0.0	1.0	2.3	92.2
4	9.7	0.0	0.2	0.6	89.6
5	6.7	0.0	0.3	1.1	92.0
6	16.3	0.0	2.0	3.5	78.2
7	2.2	0.0	0.2	0.8	96.8
8	4.2	0.0	0.0	2.1	93.7
9	6.5	0.0	0.2	1.2	92.1
10	8.0	5.3	0.9	1.3	84.6
11	5.7	0.4	0.2	1.5	92.2
12	1.5	0.0	0.1	1.0	97.3
13	10.3	13.8	1.7	4.5	69.7
14	19.9	38.6	3.3	0.9	37.4
15	17.1	25.0	3.6	6.2	48.1
16	13.5	57.2	0.4	7.3	21.7
17	34.1	16.6	2.2	2.0	45.0
18	24.9	14.3	7.4	5.4	48.0
U.S.	11.0	9.2	1.3	2.3	76.3

* Federal land designations taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S.

Table D3. Percent of land area of the contiguous U.S. by state and federal agency.*

State	FS	BLM	NPS	Other fed	S&P
AL	3.9	0.0	0.0	1.3	94.8
AZ	16.1	17.1	3.5	6.4	56.9
AR	10.1	0.0	0.3	2.2	87.4
CA	24.3	15.2	7.8	4.9	47.9
CO	25.7	12.2	1.1	1.0	60.0
CT	0.0	0.0	0.0	0.1	99.9
DE	0.0	0.0	0.0	1.3	98.7
DC	0.0	0.0	7.4	3.7	88.9
FL	3.7	0.0	4.6	2.7	89.0
GA	4.7	0.0	0.1	3.5	91.7
ID	40.1	22.0	0.9	2.0	35.0
IL	2.5	0.0	0.0	0.6	96.9
IN	2.7	0.0	0.0	1.1	96.2
IA	0.0	0.0	0.0	0.4	99.6
KS	0.2	0.0	0.0	0.8	98.9
KY	7.9	0.0	0.4	1.8	90.0
LA	3.2	0.0	0.1	2.8	93.9
ME	0.4	0.0	0.0	0.3	99.3
MD	0.0	0.0	0.9	1.6	97.5
MA	0.0	0.0	0.0	1.1	98.9
MI	13.2	0.0	0.2	0.7	85.8
MN	8.4	0.0	0.3	1.0	90.4
MS	7.7	0.0	0.0	1.3	91.0
MO	6.6	0.0	0.3	0.9	92.2
MT	20.2	8.2	1.3	1.6	68.7
NE	1.1	0.0	0.1	0.5	98.2
NV	8.8	68.1	0.9	8.8	13.4
NH	13.9	0.0	0.0	0.3	85.8
NJ	0.0	0.0	0.9	2.3	96.8
NM	13.4	18.2	0.5	4.8	63.0
NY	0.1	0.0	0.0	0.7	99.2
NC	9.6	0.0	1.0	2.4	87.0
ND	4.9	0.1	0.2	2.1	92.7
OH	3.3	0.0	0.1	0.4	96.2
OK	1.8	0.0	0.0	2.4	95.8
OR	28.4	25.2	0.3	1.3	44.8
PA	2.5	0.0	0.1	0.4	97.0
RI	0.0	0.0	0.0	0.1	99.9
SC	7.0	0.0	0.1	2.4	90.4
SD	6.8	0.4	0.6	1.3	90.9
TN	4.5	0.0	1.2	3.4	90.9
TX	1.3	0.0	0.6	0.8	97.2
UT	17.3	44.2	3.7	3.9	30.9
VT	10.3	0.0	0.0	0.8	88.9
VA	12.8	0.0	1.1	1.6	84.5

WA	23.5	0.7	4.5	3.3	68.0
WV	12.1	0.0	0.6	0.4	87.0
WI	5.6	0.0	0.2	0.7	93.5
WY	17.3	27.5	3.7	1.8	49.7
U.S.	11.0	9.2	1.3	2.3	76.3

* Federal land designations taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S.

Table D4. Percent of land area of the contiguous U.S. by region and NLCD cover type.

Region	Forest	Rangeland	Agriculture	Developed	Riparian	Other
East	57.7	3.8	16.7	10.9	7.5	3.3
South	43.6	8.8	22.6	8.7	13.5	2.8
Midwest	25.3	3.2	51.8	8.7	8.4	2.6
Plains	8.1	49.0	33.3	5.1	2.6	1.9
West	22.9	62.2	7.9	2.5	1.0	3.4
U.S.	25.8	37.4	23.2	5.6	5.1	2.9

Table D5. Percent of land area of the contiguous U.S. by WRR and NLCD cover type.

WRR	Forest	Range	Agriculture	Developed	Riparian	Other
1	66.0	5.8	4.8	8.7	10.2	4.4
2	54.9	2.4	21.4	12.9	5.8	2.5
3	39.0	12.0	18.1	9.8	18.7	2.4
4	34.2	4.7	31.9	10.0	16.2	3.0
5	48.6	2.8	37.0	9.5	0.6	1.5
6	57.9	6.0	23.2	8.8	1.4	2.7
7	20.1	3.4	58.8	8.6	6.2	2.9
8	26.2	7.0	36.2	6.7	19.2	4.8
9	10.0	7.4	55.7	4.1	17.8	5.0
10	9.0	52.0	32.0	3.2	2.0	1.7
11	20.9	43.0	28.1	4.8	1.5	1.6
12	14.2	47.1	24.4	7.9	4.7	1.8
13	11.2	83.5	1.6	1.5	0.6	1.6
14	28.4	61.3	2.6	0.9	1.1	5.8
15	17.4	76.3	1.6	2.2	0.4	2.1
16	15.7	73.0	2.8	1.3	0.7	6.4
17	38.5	44.5	10.3	2.9	1.2	2.6
18	24.8	51.7	10.2	6.3	0.8	6.1
U.S.	25.8	37.4	23.2	5.6	5.1	2.9

Table D6. Percent of land area of the contiguous U.S. by state and NLCD cover type.

State	Forest	Range	Agriculture	Developed	Riparian	Other
AL	52.6	12.9	17.2	7.1	7.8	2.3
AZ	15.1	77.9	1.8	2.2	0.4	2.6
AR	45.7	4.4	33.0	5.9	8.5	2.5
CA	23.5	52.9	10.1	6.4	0.7	6.3
CO	28.6	50.8	14.2	2.8	1.5	2.1
CT	56.0	1.7	7.6	22.7	9.0	3.0
DE	11.6	2.3	42.4	17.8	22.0	3.9
DC	10.4	0.2	0.1	85.7	1.1	2.6
FL	18.2	12.4	17.9	13.3	34.3	4.0
GA	44.1	10.7	18.0	9.9	15.6	1.8
ID	32.7	51.6	10.8	1.7	0.9	2.3
IL	15.1	0.7	69.3	11.5	1.7	1.8
IN	22.6	1.9	62.1	10.6	1.5	1.3
IA	6.9	4.8	78.0	7.4	1.8	1.0
KS	3.7	37.1	52.2	5.2	0.9	1.1
KY	52.2	4.5	32.8	7.4	1.1	2.1
LA	23.1	10.0	23.3	7.2	28.7	7.7
ME	66.6	9.0	3.7	3.2	12.1	5.5
MD	34.4	1.9	32.3	18.3	10.6	2.4
MA	52.3	1.5	6.3	23.8	12.0	4.0
MI	35.2	5.5	27.2	10.4	19.0	2.7
MN	19.7	4.5	45.4	5.7	19.1	5.6
MS	38.6	12.9	25.5	6.3	14.3	2.4
MO	36.8	2.0	50.7	6.9	2.0	1.6
MT	21.7	57.8	16.0	1.4	1.6	1.4
NE	2.0	53.9	37.0	3.6	2.5	1.0
NV	10.9	82.9	1.1	1.0	0.6	3.5
NH	75.7	3.0	3.9	7.6	6.3	3.5
NJ	29.3	2.5	14.4	29.8	20.5	3.5
NM	16.7	78.7	1.8	1.2	0.4	1.2
NY	55.4	3.8	21.9	8.5	7.0	3.5
NC	42.8	9.1	22.1	10.6	13.5	1.8
ND	1.7	30.8	55.2	4.0	4.6	3.7
OH	31.3	2.0	50.4	14.1	0.9	1.4
OK	21.3	40.4	29.5	6.1	0.6	2.1
OR	36.3	49.5	8.0	2.6	1.2	2.4
PA	60.0	2.0	22.8	12.1	1.6	1.6
RI	48.4	1.9	4.0	28.6	12.7	4.4
SC	37.7	12.0	16.2	9.4	21.6	3.1
SD	3.4	52.0	36.4	2.9	2.1	3.1
TN	50.2	5.9	29.0	9.5	2.9	2.4
TX	10.9	57.5	20.4	6.3	3.4	1.6
UT	25.5	57.3	3.4	1.7	0.7	11.4
VT	70.6	2.0	13.2	5.4	4.6	4.1
VA	58.8	4.6	21.3	9.3	4.5	1.5

WA	40.7	31.0	17.2	5.5	1.7	3.9
WV	80.9	1.6	8.9	7.0	0.1	1.5
WI	35.7	2.8	37.0	7.3	13.7	3.6
WY	12.5	80.2	3.0	0.9	1.9	1.6
U.S.	25.8	37.4	23.2	5.6	5.1	2.9

Table D7. Percent of land area of the contiguous U.S. by region and LandFire/PHYS cover type.

Region	Forest	Rangeland	Agriculture	Developed	Riparian	Other
East	59.7	0.4	13.7	15.5	7.0	3.7
South	49.6	1.2	21.6	13.6	11.1	3.0
Midwest	26.9	1.0	47.9	14.3	7.1	2.7
Plains	11.4	38.3	33.0	11.3	3.8	2.3
West	26.6	52.9	7.2	4.5	2.2	6.6
U.S.	29.4	29.5	21.9	9.7	5.2	4.3

Table D8. Percent of land area of the contiguous U.S. by WRR and LandFire/PHYS cover type.

WRR	Forest	Rangeland	Agriculture	Developed	Riparian	Other
1	70.9	0.4	3.5	11.2	9.7	4.4
2	55.9	0.5	18.4	18.0	4.1	3.1
3	48.9	1.9	16.6	16.2	13.9	2.5
4	37.8	1.2	29.5	14.2	14.1	3.2
5	48.3	0.2	36.0	12.2	1.6	1.8
6	60.5	0.4	22.9	11.7	1.6	3.0
7	22.0	1.1	52.9	16.1	4.9	3.0
8	29.6	0.4	35.2	10.9	18.8	5.0
9	12.1	5.9	47.9	13.7	14.9	5.6
10	9.6	45.8	30.2	8.6	3.1	2.6
11	22.2	34.9	28.9	9.9	2.3	1.8
12	24.9	28.2	24.9	14.5	5.6	1.9
13	17.3	74.3	1.7	2.6	1.5	2.7
14	31.0	52.0	2.1	2.0	1.9	11.1
15	20.8	63.8	1.8	3.0	2.7	7.9
16	18.8	66.7	2.8	2.2	0.8	8.7
17	43.2	35.7	10.0	4.4	2.7	4.0
18	29.5	37.1	9.0	8.4	2.4	13.6
U.S.	29.4	29.5	21.9	9.7	5.2	4.3

Table D9. Percent of land area of the contiguous U.S. by state and LandFire/PHYS cover type.

State	Forest	Rangeland	Agriculture	Developed	Riparian	Other
AL	58.0	1.1	16.8	12.3	9.2	2.7
AZ	18.0	66.8	2.0	3.1	2.5	7.7
AR	47.1	0.7	32.7	9.3	7.7	2.6
CA	28.2	37.1	9.0	8.5	2.4	14.8
CO	31.7	44.7	12.4	6.8	1.2	3.1
CT	55.9	0.1	4.4	28.2	8.6	2.8
DE	20.6	1.1	38.1	25.0	9.8	5.4
DC	9.4	0.1	0.0	86.2	0.5	3.8
FL	35.1	1.9	17.0	19.3	22.7	3.8
GA	52.9	1.1	16.0	16.9	11.2	1.9
ID	35.4	43.7	11.1	2.9	2.4	4.6
IL	14.4	0.5	68.5	12.8	1.7	2.0
IN	21.9	0.2	60.6	13.8	1.9	1.5
IA	8.5	1.0	65.6	21.7	2.2	1.0
KS	4.2	26.2	57.9	8.5	2.1	1.1
KY	52.8	0.3	33.5	9.5	1.6	2.3
LA	28.6	0.6	22.2	11.7	29.1	7.8
ME	74.6	0.5	2.9	4.7	11.8	5.5
MD	35.9	0.6	27.3	27.4	5.2	3.6
MA	53.1	0.1	4.1	28.4	10.5	3.9
MI	37.9	2.0	25.8	13.8	17.5	3.0
MN	24.3	1.9	37.5	14.8	15.7	5.9
MS	44.3	1.0	24.9	12.8	14.2	2.8
MO	35.3	0.8	50.6	9.5	2.1	1.6
MT	22.6	52.0	12.6	6.8	3.3	2.7
NE	2.3	47.0	36.1	8.9	4.6	1.1
NV	14.8	74.4	0.9	1.4	1.1	7.4
NH	78.0	0.3	2.5	10.0	5.7	3.5
NJ	36.7	0.9	9.8	37.1	10.1	5.3
NM	23.0	68.3	2.2	2.0	1.3	3.2
NY	55.4	0.6	18.1	13.6	8.8	3.5
NC	50.1	3.7	18.0	17.7	8.7	1.8
ND	0.7	26.5	48.2	14.6	5.2	4.7
OH	30.1	0.1	49.0	17.3	2.1	1.4
OK	21.6	31.0	27.9	14.6	2.5	2.4
OR	43.8	38.8	7.7	4.2	2.6	2.9
PA	59.7	0.2	19.0	17.4	1.6	2.2
RI	49.0	0.1	2.5	32.1	12.0	4.4
SC	51.0	0.9	15.5	15.3	14.2	3.1
SD	3.5	46.5	35.1	8.8	2.3	3.8
TN	52.0	0.3	29.5	12.5	2.9	2.7
TX	18.9	42.1	20.9	11.8	4.4	1.9
UT	27.7	50.1	3.4	2.9	1.2	14.7
VT	72.2	0.1	11.7	8.0	3.9	4.1
VA	61.0	1.3	19.4	13.4	2.8	2.1

WA	44.5	23.2	16.9	7.1	3.5	4.8
WV	80.0	0.4	6.9	9.4	1.4	1.9
WI	41.2	0.6	34.3	12.4	8.0	3.6
WY	14.9	72.3	3.0	2.3	2.6	4.8
U.S.	29.4	29.5	21.9	9.7	5.2	4.3

E. Forest Land and Water Supply

Table E1. Estimates of forest land area from three sources, and associated water supply, by region of the contiguous U.S.

Region	Land area ($km^2 \times 10^{-3}$)			Water volume per year ($m^3 \times 10^{-9}$)		
	NLCD	LandFire*	FIA	NLCD	LandFire*	FIA
East	258	267	293	160	165	183
South	600	683	904	307	340	442
Midwest	296	315	328	97	101	103
Plains	134	189	178	26	30	37
West	699	811	917	295	325	378
U.S.	1987	2265	2619	884	961	1143

* LandFire/PHYS.

Table E2. Estimates of forest land area from three sources, and associated water supply, by WRR of the contiguous U.S.

Region	Land area (km^2)			Water volume per year ($m^3 \times 10^{-6}$)		
	NLCD	LandFire*	FIA	NLCD	LandFire*	FIA
1	97,980	105,238	123,589	66,091	70,810	83,174
2	145,007	147,516	158,521	77,476	78,542	83,886
3	264,771	331,894	497,827	128,821	153,737	227,183
4	99,327	109,763	135,539	37,198	40,227	49,367
5	205,187	203,601	192,979	105,850	105,407	101,505
6	61,313	64,002	66,285	41,273	43,006	44,818
7	98,801	107,951	101,987	29,497	32,053	30,878
8	67,497	76,238	116,613	33,559	37,969	59,458
9	15,009	18,112	29,596	1,874	2,319	3,951
10	119,438	126,804	126,199	27,405	29,317	31,340
11	134,520	142,336	170,062	45,094	46,070	53,016
12	65,155	114,398	87,595	11,564	15,916	18,367
13	38,097	58,741	48,218	2,328	3,054	2,824
14	83,450	91,052	105,251	10,834	11,495	12,554
15	62,771	74,959	100,324	1,920	2,011	2,745
16	56,682	68,143	67,702	4,855	5,721	6,085
17	270,762	303,389	363,501	198,404	217,644	257,156
18	101,502	120,438	127,123	59,772	65,858	74,490
U.S.	1,987,270	2,264,576	2,618,911	883,814	961,156	1,142,797

* LandFire/PHYS.

Table E3. Estimates of forest land area from three sources, and associated water supply, by state in the contiguous U.S.

	Land area (km^2)			Water volume per year ($m^3 \times 10^{-6}$)		
State	**NLCD**	**LandFire***	**FIA**	**NLCD**	**LandFire***	**FIA**
AL	70,106	77,212	99,064	41,606	45,828	58,909
AZ	44,175	52,746	77,715	1,335	1,427	2,063
AR	62,931	64,807	75,223	29,703	30,526	35,569
CA	94,712	113,519	118,534	58,537	64,772	73,276
CO	77,136	85,607	94,200	11,370	12,594	13,271
CT	6,972	6,958	7,773	4,737	4,729	5,312
DE	557	985	1,184	228	390	458
DC	16	15	31	10	9	19
FL	25,101	48,567	73,616	9,114	15,942	25,637
GA	66,679	80,017	116,178	31,015	35,818	49,855
ID	70,798	76,580	94,219	32,131	33,467	42,361
IL	21,931	21,007	16,053	7,730	7,422	5,769
IN	21,172	20,550	14,791	8,972	8,708	6,486
IA	10,079	12,353	9,479	2,935	3,529	2,855
KS	7,854	8,871	6,950	1,665	1,387	1,456
KY	54,518	55,175	51,672	27,438	27,745	25,927
LA	26,934	33,353	61,000	13,301	16,480	31,537
ME	52,764	59,102	71,175	35,586	39,680	47,850
MD	7,860	8,193	8,696	3,563	3,657	3,814
MA	9,974	10,117	12,337	6,547	6,645	8,096
MI	50,115	53,966	71,633	15,333	16,540	22,041
MN	42,324	52,319	67,442	7,840	9,971	12,760
MS	47,539	54,680	79,991	26,197	30,142	44,484
MO	66,404	63,819	59,078	24,140	23,281	21,643
MT	82,486	85,836	96,350	26,585	27,833	33,092
NE	3,984	4,520	4,234	368	338	307
NV	31,134	42,298	36,813	1,597	2,247	1,845
NH	17,942	18,484	20,395	12,438	12,808	14,095
NJ	5,517	6,925	7,377	2,996	3,730	3,923
NM	52,327	72,238	68,043	1,690	1,979	2,051
NY	67,346	67,373	75,106	41,543	41,451	46,570
NC	52,859	61,804	98,479	29,166	32,546	48,554
ND	3,037	1,365	944	93	63	52
OH	33,086	31,834	26,120	13,188	12,683	10,598
OK	38,585	39,108	62,670	10,417	10,625	15,075
OR	90,256	108,926	124,647	72,364	81,808	91,120
PA	70,203	69,811	67,924	39,509	39,365	38,578
RI	1,083	1,097	1,413	759	768	991
SC	29,331	39,679	65,511	12,243	15,872	25,392
SD	6,869	7,008	6,389	273	274	257
TN	54,861	56,743	57,214	34,175	35,425	35,851
TX	73,716	127,948	96,344	13,342	17,565	20,114
UT	54,627	59,306	67,827	4,509	4,487	4,926

VT	17,434	17,819	19,578	11,893	12,151	13,311
VA	58,881	61,103	71,854	25,652	26,609	31,220
WA	69,432	75,842	95,769	74,505	81,845	99,402
WV	50,724	50,131	53,964	27,135	26,772	28,821
WI	51,240	59,069	63,173	16,446	18,867	20,421
WY	31,656	37,794	42,741	9,896	12,355	14,783
U.S.	1,987,270	2,264,576	2,618,911	883,814	961,156	1,142,797

* LandFire/PHYS.

F. Mean Annual 1981-2010 Water Supply and Land Area of the National Forest System

Table F1. National Forest System ownership land area, and associated mean annual water supply volume, by NFS region in the contiguous U.S.

NFS region	Land area ($km^2 \times 10^{-3}$)*	Water volume per year ($m^3 \times 10^{-9}$)
1. Northern	103	45
2. Rocky Mountain	91	19
3. Southwestern	83	3
4. Intermountain	129	33
5. Pacific Southwest	82	42
6. Pacific Northwest	101	87
8. Southern	55	30
9. Eastern	49	20
U.S.	693	280

* Land ownership taken from the November 2015 U.S. Forest Service Surface Ownership Parcels database.

Table F2. National Forest System land area according to two area designations, and associated mean annual water supply volume, by state in the contiguous U.S.*

State	Land area ($km^2 \times 10^{-3}$)		Water volume per year ($m^3 \times 10^{-9}$)	
	Proclamation	Ownership	Proclamation	Ownership
AL	5,160	2711	3,270	1717
AZ	47,168	45343	1,462	1414
AR	13,884	10494	7,407	5642
CA	97,873	84034	51,719	43565
CO	69,220	58684	14,265	13364
CT	0	0	0	0
DE	0	0	0	0
DC	0	0	0	0
FL	5,170	4842	1,989	1854
GA	7,175	3514	5,523	2874
ID	86,756	82841	38,650	37442
IL	3,574	1232	1,773	592
IN	2,546	824	1,189	388
IA	0	0	0	0
KS	520	442	12	11
KY	8,209	3311	4,361	1774
LA	3,775	2463	1,870	1230
ME	314	219	232	160
MD	0	0	0	0
MA	0	0	0	0

MI	18,838	11623	5,912	3635
MN	17,960	11509	3,250	2076
MS	9,492	4823	5,325	2741
MO	11,978	6094	4,892	2520
MT	76,677	69531	28,774	26862
NE	2,252	1913	54	47
NV	25,180	23286	2,217	2074
NH	3,300	3028	3,043	2859
NJ	0	0	0	0
NM	42,153	37353	1,540	1443
NY	84	66	36	29
NC	11,887	5073	10,122	4570
ND	8,964	4460	128	67
OH	3,456	988	1,515	428
OK	3,198	1623	816	694
OR	70,612	63776	48,163	45053
PA	2,901	2079	1,873	1341
RI	0	0	0	0
SC	5,443	2563	2,519	1186
SD	13,577	8771	387	277
TN	4,929	2919	3,039	1865
TX	9,013	3663	2,136	902
UT	37,044	32914	4,901	4244
VT	2,544	1660	2,255	1516
VA	12,837	6748	5,571	2907
WA	40,074	37704	44,200	41944
WV	7,579	4226	5,021	2755
WI	8,021	6170	2,709	2082
WY	43,938	37569	12,398	12202
U.S.	845,276	693,087	336,518	280,349

* NFS proclamation boundaries taken from the 2005 Federal Lands of the United States database of the National Atlas of the U.S. NFS land ownership boundaries taken from the November 2015 U.S. Forest Service Surface Ownership Parcels database.

Table F3. National Forest System ownership land area, and associated mean annual water supply volume, by unit of the NFS in the contiguous U.S.*

NFS unit	Area (km2)#	Water volume per year (m^3 x 10^{-6})
Allegheny NF	2079	1341.2
Angeles NF	2688	474.0
Apache-Sitgreaves NFs	8160	235.8
Arapaho and Roosevelt NFs	5686	1399.3
Ashley NF	5578	900.6
Beaverhead-Deerlodge NF	13728	3776.5
Bighorn NF	4473	1271.9
Bitterroot NF	6453	3106.5
Black Hills NF	5062	197.6
Black Kettle NG	134	2.7
Boise NF	8918	3864.2
Bridger-Teton NF	13842	5558.8
Buffalo Gap NG	2648	54.1
Butte Valley NG	79	3.1
Caddo NG	277	91.5
Caribou-Targhee NF	11538	3528.0
Carson NF	6039	304.8
Cedar River NG	27	0.5
Chattahoochee-Oconee NFs	3510	2870.5
Chequamegon-Nicolet NF	6166	2081.1
Cherokee NF	2660	1719.2
Chippewa NF	2719	490.2
Cibola NF	6542	97.4
Cimarron NG	442	10.7
Cleveland NF	1724	95.9
Coconino NF	7493	306.9
Columbia River Gorge NSA	333	414.1
Colville NF	4464	1645.6
Comanche NG	1799	16.4
Coronado NF	6956	159.8
Crooked River NG	703	50.5
Curlew NG	302	10.2
Custer NF	4787	1173.4
Dakota Prairie Grasslands	3	0.05
Daniel Boone NF	2878	1535.8
Deschutes NF	6524	2421.5
Dixie NF	6604	348.9
Eldorado NF	2458	1997.7
Fishlake NF	6904	501.6
Flathead NF	9767	5747.9
Fort Pierre NG	846	29.1
Francis Marion and Sumter NFs	2559	1183.9
Fremont-Winema NFs	9121	1767.3

Gallatin NF	7512	3630.3
George Washington and Jefferson NF	7252	3095.0
Gifford Pinchot NF	5493	9529.7
Gila NF	13232	451.0
Grand Mesa, Uncompahgre and Gunnison NFs	11995	2437.6
Grand River NG	626	10.0
Green Mountain and Finger Lakes NFs	1726	1544.6
Helena NF	3976	760.8
Hiawatha NF	3633	1200.3
Hoosier NF	824	387.9
Humboldt-Toiyabe NF	25314	2983.3
Huron-Manistee NF	3961	1145.8
Idaho Panhandle NFs	10109	5924.6
Inyo NF	8029	1760.1
Kaibab NF	6317	231.2
Kiowa NG	583	3.0
Kisatchie NF	2463	1230.3
Klamath NF	6008	3767.0
Kootenai NF	9078	3706.6
Lake Tahoe Basin Management Unit	615	263.2
Land Between the Lakes NRA	693	387.3
Lassen NF	4668	2668.4
Lewis and Clark NF	7574	1979.4
Lincoln NF	4433	120.4
Little Missouri NG	4150	58.4
Lolo NF	8938	3964.9
Los Padres NF	7200	1058.9
Lyndon B. Johnson NG	467	44.3
Malheur NF	6969	1406.7
Manti-La Sal NF	5421	630.5
Mark Twain NF	6094	2520.2
McClellan Creek NG	6	0.2
Medicine Bow-Routt NF	9468	2652.7
Mendocino NF	3706	3208.9
Midewin National Tallgrass Prairie	74	22.9
Modoc NF	6796	729.4
Monongahela NF	3725	2567.8
Mt. Baker-Snoqualmie NF	7129	12369.1
Mt. Hood NF	4111	5287.4
National Forests in Alabama	2714	1718.7
National Forests in Florida	4839	1852.7
National Forests in Mississippi	4823	2741.4
National Forests in North Carolina	5077	4572.3
National Forests in Texas	2588	763.5
Nebraska NF	1046	28.0
Nez Perce-Clearwater NF	15926	11240.9
Ochoco NF	2484	422.4
Oglala NG	874	18.9

Okanogan-Wenatchee NF	16187	12496.1
Olympic NF	2560	5241.0
Ottawa NF	4034	1290.5
Ouachita NF	7226	4011.9
Ozark-St. Francis NF	4696	2320.9
Pawnee NG	843	11.6
Payette NF	9346	4591.5
Pike and San Isabel NFs	8922	1055.0
Plumas NF	4875	3216.4
Prescott NF	5087	153.9
Rio Grande NF	7434	1761.9
Rita Blanca NG	381	3.2
Rogue River-Siskiyou NFs	6956	11550.5
Salmon-Challis NF	17620	5574.7
San Bernardino NF	2723	420.8
San Juan NF	7546	1748.9
Santa Fe NF	6256	460.5
Sawtooth NF	8541	2749.5
Sequoia NF	4511	1055.0
Shasta-Trinity NF	8613	7064.4
Shawnee NF	1158	569.2
Sheyenne NG	284	8.1
Shoshone NF	9871	3405.8
Sierra NF	5327	3043.6
Siuslaw NF	2539	4134.8
Six Rivers NF	4722	5603.4
Stanislaus NF	3636	2681.3
Superior NF	8790	1586.1
Tahoe NF	3402	3202.7
Thunder Basin NG	2534	32.0
Tonto NF	11601	332.6
Uinta-Wasatch-Cache NF	8725	1858.8
Umatilla NF	5680	1208.4
Umpqua NF	3991	4037.2
Wallowa-Whitman NF	9723	3427.5
Wayne NF	988	428.0
White Mountain NF	3247	3018.7
White River NF	9259	3171.3
Willamette NF	6840	9935.6
U.S.	693,087	280,349

* NF = National Forest; NG = National Grassland; NRA = National Recreation Area; NSA = National Scenic Area.

Land ownership taken from the November 2015 U.S. Forest Service Surface Ownership Parcels database.

G. Mean Annual 1981-2010 Water Supply and Land Area of Designated Wilderness Areas

Table G1. Wilderness land area and associated mean annual water supply volume, by federal agency and state of the contiguous U.S.

Region	Land area (km^2)*					Water volume per year ($m^3 \times 10^{-6}$)				
	FS	BLM	NPS	FWS	Total	FS	BLM	NPS	FWS	Total
AL	171	0	0	0	171	111	0	0	0	111
AZ	5,344	5,723	1,748	5,515	18,330	155	44	14	21	234
AR	470	0	140	9	619	256	0	65	5	326
CA	20,711	16,472	24,658	39	61,880	10,545	830	4,341	0	15,716
CO	12,876	834	1,414	10	15,134	5,173	50	643	4	5,870
CT	0	0	0	0	0	0	0	0	0	0
DE	0	0	0	0	0	0	0	0	0	0
DC	0	0	0	0	0	0	0	0	0	0
FL	300	0	3,223	98	3,622	135	0	966	40	1,141
GA	474	0	0	1,433	1,906	455	0	0	613	1,068
ID	17,045	2,278	174	0	19,497	8,882	122	15	0	9,018
IL	115	0	0	17	133	57	0	0	10	67
IN	51	0	0	0	51	23	0	0	0	23
IA	0	0	0	0	0	0	0	0	0	0
KS	0	0	0	0	0	0	0	0	0	0
KY	70	0	0	0	70	36	0	0	0	36
LA	35	0	0	13	49	17	0	0	8	24
ME	45	0	0	30	76	32	0	0	23	55
MD	0	0	0	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0	0	0	0
MI	378	0	719	109	1,206	127	0	240	36	403
MN	4,430	0	0	29	4,459	743	0	0	3	746
MS	25	0	0	0	25	15	0	0	0	15
MO	260	0	0	32	292	106	0	0	14	120
MT	13,668	26	0	258	13,952	8,352	1	0	48	8,402
NE	32	0	0	19	50	0	0	0	1	1
NV	4,599	8,439	933	0	13,970	575	258	9	0	842
NH	560	0	0	0	560	661	0	0	0	661
NJ	0	0	0	35	35	0	0	0	16	16
NM	5,793	716	227	163	6,899	439	6	3	1	449
NY	0	0	0	0	0	0	0	0	0	0
NC	416	0	0	34	450	375	0	0	17	392
ND	0	0	122	39	161	0	0	1	1	2
OH	0	0	0	0	0	0	0	0	0	0
OK	64	0	0	40	104	40	0	0	2	42
OR	9,034	1,016	0	20	10,070	10,319	285	0	35	10,639
PA	36	0	0	0	36	23	0	0	0	23

RI	0	0	0	0	0	0	0	0	0	0
SC	68	0	61	96	225	32	0	25	38	96
SD	55	0	250	0	305	2	0	3	0	5
TN	269	0	0	0	269	188	0	0	0	188
TX	156	0	187	0	343	51	0	3	0	54
UT	3,129	1,066	503	0	4,698	962	16	12	0	991
VT	408	0	0	0	408	392	0	0	0	392
VA	556	0	333	0	889	262	0	148	0	410
WA	11,073	29	7,018	6	18,126	15,004	2	15,092	12	30,110
WV	482	0	0	0	482	345	0	0	0	345
WI	191	0	0	0	191	62	0	0	0	62
WY	12,418	0	0	0	12,418	5,492	0	0	0	5,492
U.S.	125,809	36,598	41,711	8,044	212,162	70,447	1,614	21,582	946	94,588

* Land area from the database of the Wilderness Institute at the University of Montana's College of Forestry and Conservation, October 2015.

NEW MEXICO WATER QUALITY CONTROL COMMISSION
NOTICE OF PUBLIC RULEMAKING HEARING

The New Mexico Water Quality Control Commission (Commission) will hold a public hearing on December 10, 2024, at 9:00 a.m. in Room 321 of the State Capitol Building, 490 Old Santa Fe Trail, Santa Fe, New Mexico 87501. A virtual participation option will be provided via WebEx with meeting links and details provided in the events calendar at https://www.env.nm.gov/events-calendar. The hearing may continue thereafter as necessary at the Commission's discretion.

The purpose of the hearing is to consider the matter of WQCC 24-46 (R) to amend Subsection D of 20.6.4.9 NMAC, *Standards for Interstate and Intrastate Surface Waters*, to designate nominated waters as Outstanding National Resource Waters (ONRW). The waters qualify for ONRW designation as significant attributes of a Special Trout Water; a designated wild and scenic river; a national or state park, monument, or wildlife refuge; or a designated Wilderness area. ONRWs are entitled to the highest protection from pollution under the Commission's antidegradation policy and surface water quality standards at 20.6.4 NMAC. The proponent of this regulatory adoption and revision is the New Mexico Environment Department (NMED).

The hearing will be conducted in accordance with the Water Quality Act, Sections 74-6-4 and 74-6-6 NMSA 1978, the State Rules Act, Section 14-4-5.3 NMSA 1978, 20.1.6 NMAC, *Rulemaking Procedures – Water Quality Control Commission*, and other applicable procedures and authorities. The Commission may make a decision on the proposed amended rule at the conclusion of the hearing, or they may convene a meeting after the hearing to consider action on the proposal.

All interested persons will be given reasonable opportunity at the hearing to submit data, views or arguments orally or in writing, and examine witnesses testifying at the hearing. Persons wishing to present technical testimony must file with the Commission a written notice of intent to do so. The notice of intent shall:

(1) identify the person for whom the witness(es) will testify;
(2) identify each technical witness the person intends to present and state the qualifications of that witness, including a description of their educational and work background;
(3) include a copy of the direct testimony of each technical witness in narrative form, and state the estimated duration of the direct oral testimony of that witness;
(4) include the text of any recommended modifications to the proposed regulatory change; and
(5) list and attach all exhibits anticipated to be offered by that person at the hearing, including any proposed statement of reasons for adoption of rules.

Notices of intent for the hearing must be received in the Office of Public Facilitation not later than 5:00 pm on November 20, 2024, and should reference the docket number, WQCC 24-46 (R) and the date of the hearing. Notices of intent to present technical testimony should be submitted to:

Pamela Jones, Board Administrator
Water Quality Control Commission
P.O. Box 5469
Santa Fe, NM 87502
(505) 660-4305
pamela.jones@env.nm.gov

Any member of the general public may testify at the hearing. No prior notification is required to present non-technical testimony at the hearing. Any such member may also offer exhibits in connection with that testimony, so long as the exhibit is not unduly repetitious of the testimony.

A member of the general public who wishes to submit a written statement for the record, in lieu of providing oral testimony at the hearing, shall file the written statement prior to the hearing, or submit it at the hearing. Please submit written comments regarding the proposed amended rule via the Smart Comment Portal at https://nmed.commentinput.com/comment/search or by email with reference to WQCC 24-46 (R) to pamela.jones@env.nm.gov by December 9, 2024.

The proposed rule and supporting technical information may be reviewed during regular business hours at the NMED Surface Water Quality Bureau, 1190 St. Frances Dr., Suite N2000, Santa Fe, NM 87505, on NMED's web site at https://www.env.nm.gov/surface-water-quality/wqs, on the Commission's docketed matters web site at https://www.env.nm.gov/opf/docketed-matters, or by contacting Michael Baca at (505) 470-1652 or michael.baca1@state.nm.us.

Persons requiring assistance, an interpreter, or any other form of auxiliary aid or service (i.e., reader, amplifier, qualified sign language interpreter, etc.) to attend or participate in the hearing should contact Pamela Jones no later than November 26, 2024, at (505) 660-4305 or pamela.jones@env.nm.gov.

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Parts 5 and 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non- discrimination programs, policies or procedures, you may contact: Kate Cardenas, NMED Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 or nd.coordinator@env.nm.gov. If you believe that you have been discriminated against with respect to a NMED program or activity, please contact the Non-Discrimination Coordinator.

COMISIÓN DE CONTROL DE CALIDAD DEL AGUA DE NUEVO MÉXICO
AVISO DE AUDIENCIA PÚBLICA PARA LA ELABORACIÓN DE NORMAS

La Comisión de Control de Calidad del Agua de Nuevo México (Comisión) llevará a cabo una audiencia pública el 10 de diciembre de 2024 a las 9:00 a. m. en la Sala 321 del Edificio del Capitolio Estatal, 490 Old Santa Fe Trail, Santa Fe, Nuevo México 87501. Se proporcionará una opción de participación virtual a través de WebEx con enlaces a reuniones y detalles proporcionados en el calendario de eventos en https://www.env.nm.gov/events-calendar. La audiencia puede continuar después según sea necesario a discreción de la Comisión.

El propósito de la audiencia es considerar el asunto de WQCC 24-46 (R) para enmendar la Subsección D de 20.6.4.9 NMAC, *Estándares para Aguas Superficiales Interestatales y Estatales*, para designar aguas nominadas como Aguas de Recursos Nacionales Sobresalientes (ONRW, por sus siglas en inglés). Las aguas califican para la designación ONRW como atributos significativos de un Agua Especial de Truchas; un río designado salvaje y escénico; un parque nacional o estatal, monumento o refugio de vida silvestre; o un área designada silvestre. Las ONRW tienen derecho a la máxima protección contra la contaminación según la política contra la degradación de la Comisión y los estándares de calidad de las aguas superficiales en 20.6.4 NMAC. El proponente de esta adopción y revisión reglamentaria es el Departamento de Medio Ambiente de Nuevo México (NMED, por sus siglas en inglés).

La audiencia se llevará a cabo de conformidad con la Ley de Calidad del Agua, Secciones 74-6-4 y 74-6-6 NMSA 1978, la Ley de Normas Estatales, Sección 14-4-5.3 NMSA 1978, 20.1.6 NMAC*, Procedimientos de Elaboración de Normas - Comisión de Control de Calidad del Agua* y otros procedimientos y autoridades aplicables. La Comisión puede tomar una decisión sobre la norma enmendada propuesta al concluir la audiencia, o puede convocar una reunión después de la audiencia para considerar la acción sobre la propuesta.

A todas las personas interesadas se les dará una oportunidad razonable en la audiencia para presentar datos, puntos de vista o argumentos en forma oral o por escrito, y para interrogar a los testigos que testifiquen en la audiencia. Las personas que deseen presentar testimonio técnico deben presentar ante la Comisión un aviso por escrito de su intención de hacerlo. El aviso de intención deberá:

(1) identificar a la persona para la cual testificarán los testigos;
(2) identificar a cada testigo técnico que la persona pretende presentar y establecer las calificaciones de ese testigo, incluida una descripción de su historial académico y laboral;
(3) incluir una copia del testimonio directo de cada testigo técnico en forma narrativa y establecer la duración estimada del testimonio oral directo de ese testigo;
(4) incluir el texto de cualquier modificación recomendada al cambio reglamentario propuesto; y
(5) enumerar y adjuntar todas las pruebas instrumentales que se prevé que esa persona presente en la audiencia, incluida cualquier declaración propuesta de motivos para la adopción de normas.

Los avisos de intención de asistir a la audiencia deben recibirse en la Oficina de Facilitación Pública a más tardar a las 5:00 p. m. del 20 de noviembre de 2024 y deben hacer referencia al número de expediente, WQCC 24-46 (R) y la fecha de la audiencia. Los avisos de intención de presentar testimonio técnico deben enviarse a:

Pamela Jones, administradora de la Junta
Comisión de Control de Calidad del Agua
P.O. Box 5469
Santa Fe, NM 87502
(505) 660-4305
pamela.jones@env.nm.gov

Cualquier miembro del público puede testificar en la audiencia. No se requiere aviso previo para presentar un testimonio no técnico en la audiencia. Cualquier miembro de este tipo también puede ofrecer pruebas en relación con ese testimonio, siempre que la prueba no sea indebidamente repetitiva del testimonio.

Todo miembro del público que desee presentar una declaración por escrito para el registro, en lugar de brindar testimonio oral en la audiencia, deberá presentar la declaración por escrito antes de la audiencia o presentarla en la audiencia. Envíe comentarios por escrito sobre la norma enmendada propuesta a través del Portal de comentarios

inteligentes en https://nmed.commentinput.com/comment/search o por correo electrónico con referencia a WQCC 24-46 (R) a pamela.jones@env.nm.gov a más tardar hasta el 9 de diciembre de 2024.

La norma propuesta y la información técnica complementaria se pueden revisar durante el horario normal de oficina en la Oficina de Calidad de Aguas Superficiales de NMED, 1190 St. Frances Dr., Suite N2000, Santa Fe, NM 87505, en el sitio web de NMED en https://www.env.nm.gov/surface-water-quality/wqs, en el sitio web de asuntos archivados de la Comisión en https://www.env.nm.gov/opf/docketed-matters, o comunicándose con Michael Baca llamando al (505) 470-1652 o por correo electrónico a michael.baca1@state.nm.us.

Las personas que necesiten asistencia, un intérprete o cualquier otra forma de ayuda o servicio auxiliar (es decir, lector, amplificador, intérprete de lenguaje de señas calificado, etc.) para asistir o participar en la audiencia deben comunicarse con Pamela Jones a más tardar hasta el 26 de noviembre de 2024 llamando al (505) 660-4305 o en pamela.jones@env.nm.gov.

El NMED no discrimina por motivos de raza, color, origen nacional, discapacidad, edad o sexo en la administración de sus programas o actividades, como lo exigen las leyes y regulaciones aplicables. NMED es responsable de la coordinación de los esfuerzos de cumplimiento y la recepción de consultas relacionadas con los requisitos de no discriminación implementados por 40 C.F.R. Partes 5 y 7, incluido el Título VI de la Ley de Derechos Civiles de 1964, en su forma enmendada; la Sección 504 de la Ley de Rehabilitación de 1973; la Ley de Discriminación por Edad de 1975, el Título IX de las Enmiendas de Educación de 1972 y la Sección 13 de las Enmiendas de la Ley Federal de Control de la Contaminación del Agua de 1972. Si tiene alguna pregunta sobre este aviso o cualquiera de los programas, políticas o procedimientos de no discriminación de NMED, puede comunicarse con: Kate Cardenas, coordinadora de no discriminación de NMED, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 o nd.coordinator@env.nm.gov. Si cree que ha sido objeto de discriminación con respecto a un programa o actividad de NMED, comuníquese con la coordinadora de no discriminación.

NEW MEXICO
State Records Center and Archives
COMMISSION OF PUBLIC RECORDS
Your Access to Public Information

Affidavit of Publication in New Mexico Register

I, Matthew Ortiz, certify that the agency noted on Invoice # 7830 has published legal notice of rulemaking or rules in the NEW MEXICO REGISTER, VOLUME XXXV, that payment has been assessed for said legal notice of rulemaking or rules, which appears on the publication date and in the issue number noted on Invoice # 7830, and that Invoice # 7830 has been sent electronically to the person(s) listed on the *Billing Information Sheet* provided by the agency.

Affiant: Matthew Ortiz

Subscribed, sworn and acknowledged before me this 9th day of ~~September~~ October, 2024.

Notary Public:
My Commission Expires: 1/22/2024

PAMELA ANNE LUJAN Y VIGIL
Notary Public
State of New Mexico
Comm. # 2001927
My Comm. Exp. Jan 22, 2028

NMED Exhibit 13

NEW MEXICO WATER QUALITY CONTROL COMMISSION
NOTICE OF PUBLIC RULEMAKING HEARING

The New Mexico Water Quality Control Commission (Commission) will hold a public hearing on December 10, 2024, at 9:00 a.m. in Room 321 of the State Capitol Building, 490 Old Santa Fe Trail, Santa Fe, New Mexico 87501. A virtual participation option will be provided via WebEx with meeting links and details provided in the events calendar at https://www.env.nm.gov/events-calendar. The hearing may continue thereafter as necessary at the Commission's discretion.

The purpose of the hearing is to consider the matter of WQCC 24-46 (R) to amend Subsection D of 20.6.4.9 NMAC, *Standards for Interstate and Intrastate Surface Waters*, to designate nominated waters as Outstanding National Resource Waters (ONRW). The waters qualify for ONRW designation as significant attributes of a Special Trout Water; a designated wild and scenic river; a national or state park, monument, or wildlife refuge; or a designated Wilderness area. ONRWs are entitled to the highest protection from pollution under the Commission's antidegradation policy and surface water quality standards at 20.6.4 NMAC. The proponent of this regulatory adoption and revision is the New Mexico Environment Department (NMED).

The hearing will be conducted in accordance with the Water Quality Act, Sections 74-6-4 and 74-6-6 NMSA 1978, the State Rules Act, Section 14-4-5.3 NMSA 1978, 20.1.6 NMAC, *Rulemaking Procedures – Water Quality Control Commission*, and other applicable procedures and authorities. The Commission may make a decision on the proposed amended rule at the conclusion of the hearing, or they may convene a meeting after the hearing to consider action on the proposal.

All interested persons will be given reasonable opportunity at the hearing to submit data, views or arguments orally or in writing, and examine witnesses testifying at the hearing. Persons wishing to present technical testimony must file with the Commission a written notice of intent to do so. The notice of intent shall:

(1) identify the person for whom the witness(es) will testify;
(2) identify each technical witness the person intends to present and state the qualifications of that witness, including a description of their educational and work background;
(3) include a copy of the direct testimony of each technical witness in narrative form, and state the estimated duration of the direct oral testimony of that witness;
(4) include the text of any recommended modifications to the proposed regulatory change; and
(5) list and attach all exhibits anticipated to be offered by that person at the hearing, including any proposed statement of reasons for adoption of rules.

Notices of intent for the hearing must be received in the Office of Public Facilitation not later than 5:00 pm on November 20, 2024, and should reference the docket number, WQCC 24-46 (R) and the date of the hearing. Notices of intent to present technical testimony should be submitted to:

Pamela Jones, Board Administrator
Water Quality Control Commission
P.O. Box 5469
Santa Fe, NM 87502
(505) 660-4305
pamela.jones@env.nm.gov

Any member of the general public may testify at the hearing. No prior notification is required to present non-technical testimony at the hearing. Any such member may also offer exhibits in connection with that testimony, so long as the exhibit is not unduly repetitious of the testimony.

A member of the general public who wishes to submit a written statement for the record, in lieu of providing oral testimony at the hearing, shall file the written statement prior to the hearing, or submit it at the hearing. Please

submit written comments regarding the proposed amended rule via the Smart Comment Portal at https://nmed.commentinput.com/comment/search or by email with reference to WQCC 24-46 (R) to pamela.jones@env.nm.gov by December 9, 2024.

The proposed rule and supporting technical information may be reviewed during regular business hours at the NMED Surface Water Quality Bureau, 1190 St. Frances Dr., Suite N2000, Santa Fe, NM 87505, on NMED's web site at https://www.env.nm.gov/surface-water-quality/wqs, on the Commission's docketed matters web site at https://www.env.nm.gov/opf/docketed-matters, or by contacting Michael Baca at (505) 470-1652 or michael.baca1@state.nm.us.

Persons requiring assistance, an interpreter, or any other form of auxiliary aid or service (i.e., reader, amplifier, qualified sign language interpreter, etc.) to attend or participate in the hearing should contact Pamela Jones no later than November 26, 2024, at (505) 660-4305 or pamela.jones@env.nm.gov.

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Parts 5 and 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non- discrimination programs, policies or procedures, you may contact: Kate Cardenas, NMED Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 or nd.coordinator@env.nm.gov. If you believe that you have been discriminated against with respect to a NMED program or activity, please contact the Non-Discrimination Coordinator.

COMISIÓN DE CONTROL DE CALIDAD DEL AGUA DE NUEVO MÉXICO
AVISO DE AUDIENCIA PÚBLICA PARA LA ELABORACIÓN DE NORMAS

La Comisión de Control de Calidad del Agua de Nuevo México (Comisión) llevará a cabo una audiencia pública el 10 de diciembre de 2024 a las 9:00 a. m. en la Sala 321 del Edificio del Capitolio Estatal, 490 Old Santa Fe Trail, Santa Fe, Nuevo México 87501. Se proporcionará una opción de participación virtual a través de WebEx con enlaces a reuniones y detalles proporcionados en el calendario de eventos en https://www.env.nm.gov/events-calendar. La audiencia puede continuar después según sea necesario a discreción de la Comisión.

El propósito de la audiencia es considerar el asunto de WQCC 24-46 (R) para enmendar la Subsección D de 20.6.4.9 NMAC, Estándares para Aguas Superficiales Interestatales y Estatales, para designar aguas nominadas como Aguas de Recursos Nacionales Sobresalientes (ONRW, por sus siglas en inglés). Las aguas califican para la designación ONRW como atributos significativos de un Agua Especial de Truchas; un río designado salvaje y escénico; un parque nacional o estatal, monumento o refugio de vida silvestre; o un área designada silvestre. Las ONRW tienen derecho a la máxima protección contra la contaminación según la política contra la degradación de la Comisión y los estándares de calidad de las aguas superficiales en 20.6.4 NMAC. El proponente de esta adopción y revisión reglamentaria es el Departamento de Medio Ambiente de Nuevo México (NMED, por sus siglas en inglés).

La audiencia se llevará a cabo de conformidad con la Ley de Calidad del Agua, Secciones 74-6-4 y 74-6-6 NMSA 1978, la Ley de Normas Estatales, Sección 14-4-5.3 NMSA 1978, 20.1.6 NMAC, Procedimientos de Elaboración de Normas - Comisión de Control de Calidad del Agua y otros procedimientos y autoridades aplicables. La Comisión puede tomar una decisión sobre la norma enmendada propuesta al concluir la audiencia, o puede convocar una reunión después de la audiencia para considerar la acción sobre la propuesta.

A todas las personas interesadas se les dará una oportunidad razonable en la audiencia para presentar datos, puntos de vista o argumentos en forma oral o por escrito, y para interrogar a los testigos que testifiquen en la audiencia. Las personas que deseen presentar testimonio técnico deben presentar ante la Comisión un aviso por escrito de su intención de hacerlo. El aviso de intención deberá:

(1) identificar a la persona para la cual testificarán los testigos;
(2) identificar a cada testigo técnico que la persona pretende presentar y establecer las calificaciones de ese testigo, incluida una descripción de su historial académico y laboral;
(3) incluir una copia del testimonio directo de cada testigo técnico en forma narrativa y establecer la duración estimada del testimonio oral directo de ese testigo;
(4) incluir el texto de cualquier modificación recomendada al cambio reglamentario propuesto; y
(5) enumerar y adjuntar todas las pruebas instrumentales que se prevé que esa persona presente en la audiencia, incluida cualquier declaración propuesta de motivos para la adopción de normas.

Los avisos de intención de asistir a la audiencia deben recibirse en la Oficina de Facilitación Pública a más tardar a las 5:00 p. m. del 20 de noviembre de 2024 y deben hacer referencia al número de expediente, WQCC 24-46 (R) y la fecha de la audiencia. Los avisos de intención de presentar testimonio técnico deben enviarse a:

Pamela Jones, administradora de la Junta
Comisión de Control de Calidad del Agua
P.O. Box 5469
Santa Fe, NM 87502
(505) 660-4305
pamela.jones@env.nm.gov

Cualquier miembro del público puede testificar en la audiencia. No se requiere aviso previo para presentar un testimonio no técnico en la audiencia. Cualquier miembro de este tipo también puede ofrecer pruebas en relación con ese testimonio, siempre que la prueba no sea indebidamente repetitiva del testimonio.

Todo miembro del público que desee presentar una declaración por escrito para el registro, en lugar de brindar testimonio oral en la audiencia, deberá presentar la declaración por escrito antes de la audiencia o presentarla en la audiencia. Envíe comentarios por escrito sobre la norma enmendada propuesta a través del Portal de comentarios inteligentes en https://nmed.commentinput.com/comment/search o por correo electrónico con referencia a WQCC 24-46 (R) a pamela.jones@env.nm.gov a más tardar hasta el 9 de diciembre de 2024.

La norma propuesta y la información técnica complementaria se pueden revisar durante el horario normal de oficina en la Oficina de Calidad de Aguas Superficiales de NMED, 1190 St. Frances Dr., Suite N2000, Santa Fe, NM 87505, en el sitio web de NMED en https://www.env.nm.gov/surface-water-quality/wqs, en el sitio web de asuntos archivados de la Comisión en https://www.env.nm.gov/opf/docketed-matters, o comunicándose con Michael Baca llamando al (505) 470-1652 o por correo electrónico a michael.baca1@state.nm.us.

Las personas que necesiten asistencia, un intérprete o cualquier otra forma de ayuda o servicio auxiliar (es decir, lector, amplificador, intérprete de lenguaje de señas calificado, etc.) para asistir o participar en la audiencia deben comunicarse con Pamela Jones a más tardar hasta el 26 de noviembre de 2024 llamando al (505) 660-4305 o en pamela.jones@env.nm.gov.

El NMED no discrimina por motivos de raza, color, origen nacional, discapacidad, edad o sexo en la administración de sus programas o actividades, como lo exigen las leyes y regulaciones aplicables. NMED es responsable de la coordinación de los esfuerzos de cumplimiento y la recepción de consultas relacionadas con los requisitos de no discriminación implementados por 40 C.F.R. Partes 5 y 7, incluido el Título VI de la Ley de Derechos Civiles de 1964, en su forma enmendada; la Sección 504 de la Ley de Rehabilitación de 1973; la Ley de Discriminación por Edad de 1975, el Título IX de las Enmiendas de Educación de 1972 y la Sección 13 de las Enmiendas de la Ley Federal de Control de la Contaminación del Agua de 1972. Si tiene alguna pregunta sobre este aviso o cualquiera de los programas, políticas o procedimientos de no discriminación de NMED, puede comunicarse con: Kate Cardenas, coordinadora de no discriminación de NMED, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 o nd.coordinator@env.nm.gov. Si cree que ha sido objeto de discriminación con respecto a un programa o actividad de NMED, comuníquese con la coordinadora de no discriminación.

SANTA FE NEW MEXICAN

Founded 1849

NMED SURFACE WATER
PO BOX 5469
SANTA FE, NM 87502-5469

ACCOUNT:	S2004
AD NUMBER:	82416
TAG LINE	LEGAL #93087
P.O.#:	66700-0000043564
1 TIME(S)	$344.08
AFFIDAVIT	10.00
TAX	28.99
TOTAL	383.07

AFFIDAVIT OF PUBLICATION

RECEIVED
OCT 18 2024
SURFACE WATER
QUALITY BUREAU

STATE OF NEW MEXICO
COUNTY OF SANTA FE

I, Alejandra Molina, being first duly sworn declare and say that I am Legal Advertising Representative of THE SANTA FE NEW MEXICAN, a daily newspaper published in the English language, and having a general circulation in the Counties of Santa Fe, Rio Arriba, San Miguel, and Los Alamos, State of New Mexico and being a newspaper duly qualified to publish legal notices and advertisements under the provisions of Chapter 167 on Session Laws of 1937; that the Legal No 93087 a copy of which is hereto attached was published in said newspaper 1 day(s) between 10/08/2024 and 10/08/2024 and that the notice was published in the newspaper proper and not in any supplement; the first date of publication being on the 08th day of October, 2024 and that the undersigned has personal knowledge of the matter and things set forth in this affidavit.

ISI _____

LEGAL ADVERTISEMENT RESPRESENTATIVE

Subscribed and sworn to before me on this 8th day of October, 2024

Notary _____

Commission Expires: March 14, 2027

NATHANIEL CRISTOFER MARTINEZ
Notary Public - State of New Mexico
Commission # 1139927
My Comm. Expires Mar 14, 2027

LEGAL #82416

LEGAL #93087

COMISIÓN DE CONTROL DE CALIDAD DEL AGUA DE NUEVO MÉXICO
AVISO DE AUDIENCIA PÚBLICA PARA LA ELABORACIÓN DE NORMAS

La Comisión de Control de Calidad del Agua de Nuevo México (Comisión) llevará a cabo una audiencia pública el 10 de dic. de 2024 a las 9:00 AM en la Sala 321 del Edificio del Capitolio Estatal, 490 Old Santa Fe Trail, Santa Fe, Nuevo México 87501. Se proporcionará una opción de participación virtual a través de WebEx con enlaces a reuniones y detalles proporcionados en el calendario de eventos en https://www.env.nm.gov/events-calendar. La audiencia puede continuar después según sea necesario a discreción de la Comisión.

El propósito de la audiencia es considerar el asunto de WQCC 24-46 (R) para enmendar la Subsección D de 20.6.4.9 NMAC, ***Estándares para Aguas Superficiales Interestatales y Estatales,*** para designar aguas nominadas como Aguas de Recursos Nacionales Sobresalientes (ONRW, por sus siglas en inglés). Las aguas califican para la designación ONRW como atributos significativos de un Agua Especial de Truchas; un río designado salvaje y escénico; un parque nacional o estatal, monumento o refugio de vida silvestre; o un área designada silvestre. Las ONRW

tienen derecho a la máxima protección contra la contaminación según la política contra la degradación de la Comisión y los estándares de calidad de las aguas superficiales en 20.6.4 NMAC. El proponente de esta adopción y revisión reglamentaria es el Departamento de Medio Ambiente de Nuevo México (NMED, por sus siglas en inglés).

La audiencia se llevará a cabo de conformidad con la Ley de Calidad del Agua, Secciones 74-6-4 y 74-6-6 NMSA 1978, la Ley de Normas Estatales, Sección 14-4-5.3 NMSA 1978, 20.1.6 NMAC, Procedimientos de Elaboración de Normas - Comisión de Control de Calidad del Agua y otros procedimientos y autoridades aplicables. La Comisión puede tomar una decisión sobre la norma enmendada propuesta al concluir la audiencia, o puede convocar una reunión después de la audiencia para considerar la acción sobre la propuesta.

A todas las personas interesadas se les dará una oportunidad razonable en la audiencia para presentar datos, puntos de vista o argumentos en forma oral o por escrito, y para interrogar a los testigos que testifiquen en la audiencia. Las personas que deseen presentar testimonio técnico deben presentar ante la Comisión un aviso por escrito de su intención de hacerlo. El aviso de intención deberá:

(1) identificar a la persona para la cual testificarán los testigos;
(2) identificar a cada

testigo técnico que la persona pretende presentar y establecer las calificaciones de ese testigo, incluida una descripción de su historial académico y laboral;
(3) Incluir una copia del testimonio directo de cada testigo técnico en forma narrativa y establecer la duración estimada del testimonio oral directo de ese testigo;
(4) Incluir el texto de cualquier modificación recomendada al cambio reglamentario propuesto; y
(5) Enumerar y adjuntar todas las pruebas instrumentales que se prevé que esa persona presente en la audiencia, incluida cualquier declaración propuesta de motivos para la adopción de normas.

Los avisos de intención de asistir a la audiencia deben recibirse en la Oficina de Facilitación Pública a más tardar a las 5:00 PM del 20 de nov. de 2024 y deben hacer referencia al número de expediente, WQCC 24-46 (R) y la fecha de la audiencia. Los avisos de intención de presentar testimonio técnico deben enviarse a:

Pamela Jones, administradora de la Junta
Comisión de Control de Calidad del Agua
P.O. Box 5469
Santa Fe, NM 87502
(505) 660-4305
pamela.jones@env.nm.gov

Cualquier miembro del público puede testificar en la audiencia. No se requiere aviso previo para presentar un testimonio no técnico en la audiencia. Cualquier miembro de este tipo también puede ofrecer pruebas

en relación con ese testimonio, siempre que la prueba no sea indebidamente repetitiva del testimonio.

Todo miembro del público que desee presentar una declaración por escrito para el registro, en lugar de brindar testimonio oral en la audiencia, deberá presentar la declaración por escrito antes de la audiencia o presentarla en la audiencia. Envíe comentarios por escrito sobre la norma enmendada propuesta a través del Portal de comentarios inteligentes en https://nmed.commentinput.com/comment/search o por correo electrónico con referencia a WQCC 24-46 (R) a pamela.jones@env.nm.gov a más tardar hasta el 9 de dic. de 2024.

La norma propuesta y la información técnica complementaria se pueden revisar durante el horario normal de oficina en la Oficina de Calidad de Aguas Superficiales de NMED, 1190 St. Frances Dr., Suite N2000, Santa Fe, NM 87505, en el sitio web de NMED en https://www.env.nm.gov/surface-water-quality/wqs, en el sitio web de asuntos archivados de la Comisión en https://www.env.nm.gov/opf/docketed-matters, o comunicándose con Michael Baca llamando al (505) 470-1652 o por correo electrónico a michael.baca1@state.nm.us.

Las personas que necesiten asistencia, un intérprete o cualquier otra forma de ayuda o servicio auxiliar (es decir, los-

auxiliar (es decir, lector, amplificador, intérprete de lenguaje de señas calificado, etc.) para asistir o participar en la audiencia deben comunicarse con Pamela Jones a más tardar hasta el 26 de nov. de 2024 llamando al (505) 660-4305 o en pamela.jones@env.nm.gov.

El NMED no discrimina por motivos de raza, color, origen nacional, discapacidad, edad o sexo en la administración de sus programas o actividades, como lo exigen las leyes y regulaciones aplicables. NMED es responsable de la coordinación de los esfuerzos de cumplimiento y la recepción de consultas relacionadas con los requisitos de no discriminación implementados por 40 C.F.R. Partes 5 y 7, incluido el Título VI de la Ley de Derechos Civiles de 1964, en su forma enmendada; la Sección 504 de la Ley de Rehabilitación de 1973; la Ley de Discriminación por Edad de 1975, el Título IX de las Enmiendas de Educación de 1972 y la Sección 13 de las Enmiendas de la Ley Federal de Control de la Contaminación del Agua de 1972. Si tiene alguna pregunta sobre este aviso o cualquiera de los programas, políticas o procedimientos de no discriminación de NMED, puede comunicarse con: Kate Cardenas, coordinadora de no discriminación de NMED, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 o nd.coordinator@env.nm.gov. Si cree que ha sido objeto de discriminación con respecto a

un programa o activi-
dad de NMED, co-
muníquese con la
coordinadora de no
discriminación.

PUB: Oct. 08, 2024.

SANTA FE NEW MEXICAN

Founded 1849

NMED SURFACE WATER
PO BOX 5469
SANTA FE, NM 87502-5469

ACCOUNT:	S2004
AD NUMBER:	82411
TAG LINE	LEGAL #93086
P.O.#:	66700-0000043564
1 TIME(S)	$299.88
AFFIDAVIT	10.00
TAX	25.37
TOTAL	335.25

AFFIDAVIT OF PUBLICATION

RECEIVED
OCT 18 2024
SURFACE WATER
QUALITY BUREAU

STATE OF NEW MEXICO
COUNTY OF SANTA FE

I, Alejandra Molina, being first duly sworn declare and say that I am Legal Advertising Representative of THE SANTA FE NEW MEXICAN, a daily newspaper published in the English language, and having a general circulation in the Counties of Santa Fe, Rio Arriba, San Miguel, and Los Alamos, State of New Mexico and being a newspaper duly qualified to publish legal notices and advertisements under the provisions of Chapter 167 on Session Laws of 1937; that the Legal No 93086 a copy of which is hereto attached was published in said newspaper 1 day(s) between 10/08/2024 and 10/08/2024 and that the notice was published in the newspaper proper and not in any supplement; the first date of publication being on the 08th day of October, 2024 and that the undersigned has personal knowledge of the matter and things set forth in this affidavit.

ISI _____
LEGAL ADVERTISEMENT RESPRESENTATIVE

Subscribed and sworn to before me on this 8th day of October, 2024

Notary _____

Commission Expires: March 14, 2027

NATHANIEL CRISTOFER MARTINEZ
Notary Public - State of New Mexico
Commission # 1139927
My Comm. Expires Mar 14, 2027

LEGAL #82411

LEGAL #93086

NEW MEXICO WATER QUALITY CONTROL COMMISSION NOTICE OF PUBLIC RULEMAKING HEARING

The New Mexico Water Quality Control Commission (Commission) will hold a public hearing on Dec. 10, 2024, at 9:00 AM in Room 321 of the State Capitol Building, 490 Old Santa Fe Trail, Santa Fe, New Mexico 87501. A virtual participation option will be provided via WebEx with meeting links and details provided in the events calendar at https://www.env.nm.gov/events-calendar. The hearing may continue thereafter as necessary at the Commission's discretion.

The purpose of the hearing is to consider the matter of WQCC 24-46 (R) to amend Subsection D of 20.6.4.9 NMAC, Standards for Interstate and Intrastate Surface Waters, to designate nominated waters as Outstanding National Resource Waters (ONRW). The waters qualify for ONRW designation as significant attributes of a Special Trout Water; a designated wild and scenic river; a national or state park, monument, or wildlife refuge; or a designated Wilderness area. ONRWs are entitled to the highest protection from pollution under the Commission's antidegradation policy and surface water quality standards at 20.6.4 NMAC. The proponent of this regulatory adoption and revision is the New

Mexico Environment Department (NMED).

The hearing will be conducted in accordance with the Water Quality Act, Sections 74-6-4 and 74-6-6 NMSA 1978, the State Rules Act, Section 14-4-5.3 NMSA 1978, 20.1.6 NMAC, Rulemaking Procedures – Water Quality Control Commission, and other applicable procedures and authorities. The Commission may make a decision on the proposed amended rule at the conclusion of the hearing, or they may convene a meeting after the hearing to consider action on the proposal.

All interested persons will be given reasonable opportunity at the hearing to submit data, views or arguments orally or in writing, and examine witnesses testifying at the hearing. Persons wishing to present technical testimony must file with the Commission a written notice of intent to do so. The notice of intent shall:

(1) identify the person for whom the witness(es) will testify;
(2) identify each technical witness the person intends to present and state the qualifications of that witness, including a description of their educational and work background;
(3) include a copy of the direct testimony of each technical witness in narrative form, and state the estimated duration of the direct oral testimony of that witness;
(4) include the text of any recommended modifications to the proposed regulatory change; and

(5) List and attach all exhibits anticipated to be offered by that person at the hearing, including any proposed statement of reasons for adoption of rules.

Notices of intent for the hearing must be received in the Office of Public Facilitation not later than 5:00 PM on Nov. 20, 2024, and should reference the docket number, WQCC 24-46 (R) and the date of the hearing. Notices of intent to present technical testimony should be submitted to:

Pamela Jones, Board Administrator
Water Quality Control Commission
P.O. Box 5469
Santa Fe, NM 87502
505-660-4305
pamela.jones@env.nm.gov

Any member of the general public may testify at the hearing. No prior notification is required to present non-technical testimony at the hearing. Any such member may also offer exhibits in connection with that testimony, so long as the exhibit is not unduly repetitious of the testimony.

A member of the general public who wishes to submit a written statement for the record, in lieu of providing oral testimony at the hearing, shall file the written statement prior to the hearing, or submit it at the hearing. Please submit written comments regarding the proposed amended rule via the Smart Comment Portal at https://nmed.commentinput.com/comment/search or by email with reference to WQCC 24-46 (R) to

pamela.jones@env.nm.gov by Dec. 9, 2024.

The proposed rule and supporting technical information may be reviewed during regular business hours at the NMED Surface Water Quality Bureau, 1190 St. Frances Dr., Suite N2000, Santa Fe, NM 87505, on NMED's web site at https://www.env.nm.gov/surface-water-quality/wqs, on the Commission's docketed matters web site at https://www.env.nm.gov/opf/docketed-matters, or by contacting Michael Baca at 505-470-1652 or michael.baca1@state.nm.us.

Persons requiring assistance, an interpreter, or any other form of auxiliary aid or service (i.e., reader, amplifier, qualified sign language interpreter, etc.) to attend or participate in the hearing should contact Pamela Jones no later than Nov. 26, 2024, at 505-660-4305 or pamela.jones@env.nm.gov.

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Parts 5 and 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of

Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non-discrimination programs, policies or procedures, you may contact: Kate Cardenas, NMED Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, 505-827-2855 or nd.coordinator@env.nm.gov. If you believe that you have been discriminated against with respect to a NMED program or activity, please contact the Non-Discrimination Coordinator.

PUB: Oct. 08, 2024.

Affidavit of Publication

STATE OF NEW MEXICO } SS
COUNTY OF BERNALILLO }

Ad Cost:	$297.73
Ad Number:	118120
Account Number:	1009628
Classification:	GOVERNMENT LEGALS

I, Bernadette Gonzales, the undersigned, Legal Representative of the Albuquerque Journal, on oath, state that this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 3, chapter 167, Session Laws of 1937, and payment of fees has been made of assessed and a copy of which is hereto attached, was published in said publication in the daily edition, 1 times(s) on the following date(s):

October 8, 2024

That said newspaper was regularly issued and circulated on those dates.
SIGNED:

Legal Representative

Subscribed to and sworn to me this 18th day of November 2024.

David Lindsey Montoya
Notary Public

_____ County Bernalillo
ID#: 1140229
My commission expires: 04-26-2027

STATE OF NEW MEXICO
NOTARY PUBLIC
DAVID LINDSEY MONTOYA
COMMISSION NUMBER 1140229
EXPIRATION DATE 04-26-2027

NM DEPT OF ENVIRONMENT
SURFACE WATER QUALITY BUREAU
PO BOX 5469
SANTA FE, NM 87502

NEW MEXICO WATER QUALITY CONTROL COMMISSION
NOTICE OF PUBLIC RULEMAKING HEARING

The New Mexico Water Quality Control Commission (Commission) will hold a public hearing on December 10, 2024, at 9:00 a.m. in Room 321 of the State Capitol Building, 490 Old Santa Fe Trail, Santa Fe, New Mexico 87501. A virtual participation option will be provided via WebEx with meeting links and details provided in the events calendar at https://www.env.nm.gov/events-calendar. The hearing may continue thereafter as necessary at the Commission's discretion.

The purpose of the hearing is to consider the matter of WQCC 24-46 (R) to amend Subsection D of 20.6.4.9 NMAC, Standards for Interstate and Intrastate Surface Waters, to designate nominated waters as Outstanding National Resource Waters (ONRW). The waters qualify for ONRW designation as significant attributes of a Special Trout Water; a designated wild and scenic river; a national or state park, monument, or wildlife refuge; or a designated Wilderness area. ONRWs are entitled to the highest protection from pollution under the Commission's antidegradation policy and surface water quality standards at 20.6.4 NMAC. The proponent of this regulatory adoption and revision is the New Mexico Environment Department (NMED).

The hearing will be conducted in accordance with the Water Quality Act, Sections 74-6-4 and 74-6-6 NMSA 1978, the State Rules Act, Section 14-4-5.3 NMSA 1978, 20.1.6 NMAC, Rulemaking Procedures Water Quality Control Commission, and other applicable procedures and authorities. The Commission may make a decision on the proposed amended rule at the conclusion of the hearing, or they may convene a meeting after the hearing to consider action on the proposal.

All interested persons will be given reasonable opportunity at the hearing to submit data, views or arguments orally or in writing, and examine witnesses testifying at the hearing. Persons wishing to present technical testimony must file with the Commission a written notice of intent to do so. The notice of intent shall:

(1) identify the person for whom the witness(es) will testify;
(2) identify each technical witness the person intends to present and state the qualifications of that witness, including a description of their educational and work background;
(3) include a copy of the direct testimony of each technical witness in narrative form, and state the estimated duration of the direct oral testimony of that witness;
(4) include the text of any recommended modifications to the proposed regulatory change; and
(5) list and attach all exhibits anticipated to be offered by that person at the hearing, including any proposed statement of reasons for adoption of rules.

Notices of intent for the hearing must be received in the Office of Public Facilitation not later than 5:00 pm on November 20, 2024, and should reference the docket number, WQCC 24-46 (R) and the date of the hearing. Notices of intent to present technical testimony should be submitted to:

Pamela Jones, Board Administrator
Water Quality Control Commission
P.O. Box 5469
Santa Fe, NM 87502
(505) 660-4305
pamela.jones@env.nm.gov

Any member of the general public may testify at the hearing. No prior notification is required to present non-technical testimony at the hearing. Any such member may also offer exhibits in connection with that testimony, so long as the exhibit is not unduly repetitious of the testimony.

A member of the general public who wishes to submit a written statement for the record, in lieu of providing oral testimony at the hearing, shall file the written statement prior to the hearing, or submit it at the hearing. Please submit written comments regarding the proposed amended rule via the Smart Comment Portal at https://nmed.commentinput.com/comment/search or by email with reference to WQCC 24-46 (R) to pamela.jones@env.nm.gov by December 9, 2024.

The proposed rule and supporting technical information may be reviewed during regular business hours at the NMED Surface Water Quality Bureau, 1190 St. Frances Dr., Suite N2000, Santa Fe, NM 87505, on NMED's web site at https://www.env.nm.gov/surface-water-quality/wqs, on the Commission's docketed matters web site at https://www.env.nm.gov/opf/docketed-matters, or by contacting Michael Baca at (505) 470-1652 or michael.baca1@state.nm.us.

Persons requiring assistance, an interpreter, or any other form of auxiliary aid or service (i.e., reader, amplifier, qualified sign language interpreter, etc.) to attend or participate in the hearing should contact Pamela Jones no later than November 26, 2024, at (505) 660-4305 or pamela.jones@env.nm.gov.

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Parts 5 and 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non- discrimination programs, policies or procedures, you may contact: Kate Cardenas, NMED Non-Discrimination Coordinator, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 or nd.coordinator@env.nm.gov. If you believe that you have been discriminated against with respect to a NMED program or activity, please contact the Non-Discrimination Coordinator.

Journal: October 8, 2024

Affidavit of Publication

STATE OF NEW MEXICO } SS
COUNTY OF BERNALILLO }

Ad Cost:	$335.14
Ad Number:	118130
Account Number:	1009628
Classification:	GOVERNMENT LEGALS

I, Bernadette Gonzales, the undersigned, Legal Representative of the Albuquerque Journal, on oath, state that this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 3, chapter 167, Session Laws of 1937, and payment of fees has been made of assessed and a copy of which is hereto attached, was published in said publication in the daily edition, 1 times(s) on the following date(s):

October 8, 2024

That said newspaper was regularly issued and circulated on those dates.
SIGNED:

Legal Representative

Subscribed to and sworn to me this 18th day of November 2024.

David Lindsey Montoya
Notary Public
_____ County Bernalillo
ID#: 1140229
My commission expires: 04-26-2027

STATE OF NEW MEXICO
NOTARY PUBLIC
DAVID LINDSEY MONTOYA
COMMISSION NUMBER 1140229
EXPIRATION DATE 04-26-2027

NM DEPT OF ENVIRONMENT
SURFACE WATER QUALITY BUREAU
PO BOX 5469
SANTA FE, NM 87502

COMISIÓN DE CONTROL DE CALIDAD DEL AGUA DE NUEVO MÉXICO
AVISO DE AUDIENCIA PÚBLICA PARA LA ELABORACIÓN DE NORMAS

La Comisión de Control de Calidad del Agua de Nuevo México (Comisión) llevará a cabo una audiencia pública el 10 de diciembre de 2024 a las 9:00 a. m. en la Sala 321 del Edificio del Capitolio Estatal, 490 Old Santa Fe Trail, Santa Fe, Nuevo México 87501. Se proporcionará una opción de participación virtual a través de WebEx con enlaces a reuniones y detalles proporcionados en el calendario de eventos en https://www.env.nm.gov/events-calendar. La audiencia puede continuar después según sea necesario a discreción de la Comisión.

El propósito de la audiencia es considerar el asunto de WQCC 24-46 (R) para enmendar la Subsección D de 20.6.4.9 NMAC, Estándares para Aguas Superficiales Interestatales y Estatales, para designar aguas nominadas como Aguas de Recursos Nacionales Sobresalientes (ONRW, por sus siglas en inglés). Las aguas califican para la designación ONRW como atributos significativos de un Agua Especial de Truchas; un río designado salvaje y escénico; un parque nacional o estatal, monumento o refugio de vida silvestre; o un área designada silvestre. Las ONRW tienen derecho a la máxima protección contra la contaminación según la política contra la degradación de la Comisión y los estándares de calidad de las aguas superficiales en 20.6.4 NMAC. El proponente de esta adopción y revisión reglamentaria es el Departamento de Medio Ambiente de Nuevo México (NMED, por sus siglas en inglés).

La audiencia se llevará a cabo de conformidad con la Ley de Calidad del Agua, Secciones 74-6-4 y 74-6-6 NMSA 1978, la Ley de Normas Estatales, Sección 14-4-5.3 NMSA 1978, 20.1.6 NMAC, Procedimientos de Elaboración de Normas - Comisión de Control de Calidad del Agua y otros procedimientos y autoridades aplicables. La Comisión puede tomar una decisión sobre la norma enmendada propuesta al concluir la audiencia, o puede convocar una reunión después de la audiencia para considerar la acción sobre la propuesta.

A todas las personas interesadas se les dará una oportunidad razonable en la audiencia para presentar datos, puntos de vista o argumentos en forma oral o por escrito, y para interrogar a los testigos que testifiquen en la audiencia. Las personas que deseen presentar testimonio técnico deben presentar ante la Comisión un aviso por escrito de su intención de hacerlo. El aviso de intención deberá:

(1) identificar a la persona para la cual testificarán los testigos;
(2) identificar a cada testigo técnico que la persona pretende presentar y establecer las calificaciones de ese testigo, incluida una descripción de su historial académico y laboral;
(3) incluir una copia del testimonio directo de cada testigo técnico en forma narrativa y establecer la duración estimada del testimonio oral directo de ese testigo;
(4) incluir el texto de cualquier modificación recomendada al cambio reglamentario propuesto; y
(5) enumerar y adjuntar todas las pruebas instrumentales que se prevé que esa persona presente en la audiencia, incluida cualquier declaración propuesta de motivos para la adopción de normas.

Los avisos de intención de asistir a la audiencia deben recibirse en la Oficina de Facilitación Pública a más tardar a las 5:00 p. m. del 20 de noviembre de 2024 y deben hacer referencia al número de expediente, WQCC 24-46 (R) y la fecha de la audiencia. Los avisos de intención de presentar testimonio técnico deben enviarse a:

Pamela Jones, administradora de la Junta
Comisión de Control de Calidad del Agua
P.O. Box 5469
Santa Fe, NM 87502
(505) 660-4305
pamela.jones@env.nm.gov

Cualquier miembro del público puede testificar en la audiencia. No se requiere aviso previo para presentar un testimonio no técnico en la audiencia. Cualquier miembro de este tipo también puede ofrecer pruebas en relación con ese testimonio, siempre que la prueba no sea indebidamente repetitiva del testimonio.

Todo miembro del público que desee presentar una declaración por escrito para el registro, en lugar de brindar testimonio oral en la audiencia, deberá presentar la declaración por escrito antes de la audiencia o presentarla en la audiencia. Envíe comentarios por escrito sobre la norma enmendada propuesta a través del Portal de comentarios inteligentes en https://nmed.commentinput.com/comment/search o por correo electrónico con referencia a WQCC 24-46 (R) a pamela.jones@env.nm.gov a más tardar hasta el 9 de diciembre de 2024.

La norma propuesta y la información técnica complementaria se pueden revisar durante el horario normal de oficina en la Oficina de Calidad de Aguas Superficiales de NMED, 1190 St. Frances Dr., Suite N2000, Santa Fe, NM 87505, en el sitio web de NMED en https://www.env.nm.gov/surface-water-quality/wqs, en el sitio web de asuntos archivados de la Comisión en https://www.env.nm.gov/opf/docketed-matters, o comunicándose con Michael Baca llamando al (505) 470-1652 o por correo electrónico a michael.baca1@state.nm.us.

Las personas que necesiten asistencia, un intérprete o cualquier otra forma de ayuda o servicio auxiliar (es decir, lector, amplificador, intérprete de lenguaje de señas calificado, etc.) para asistir o participar en la audiencia deben comunicarse con Pamela Jones a más tardar hasta el 26 de noviembre de 2024 llamando al (505) 660-4305 o en
pamela.jones@env.nm.gov.

El NMED no discrimina por motivos de raza, color, origen nacional, discapacidad, edad o sexo en la administración de sus programas o actividades, como lo exigen las leyes y regulaciones aplicables. NMED es responsable de la coordinación de los esfuerzos de cumplimiento y la recepción de consultas relacionadas con los requisitos de no discriminación implementados por 40 C.F.R. Partes 5 y 7, incluido el Título VI de la Ley de Derechos Civiles de 1964, en su forma enmendada; la Sección 504 de la Ley de Rehabilitación de 1973; la Ley de Discriminación por Edad de 1975, el Título IX de las Enmiendas de Educación de 1972 y la Sección 13 de las Enmiendas de la Ley Federal de Control de la Contaminación del Agua de 1972. Si tiene alguna pregunta sobre este aviso o cualquiera de los programas, políticas o procedimientos de no discriminación de NMED, puede comunicarse con: Kate Cardenas, coordinadora de no discriminación de NMED, NMED, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855 o nd.coordinator@env.nm.gov. Si cree que ha sido objeto de discriminación con respecto a un programa o actividad de NMED, comuníquese con la coordinadora de no discriminación.

Journal: October 8, 2024

Figure 1. Screenshot of the WQCC's Docketed Matters webpage with links to the hearing notice in English and Spanish (www.env.nm.gov/opf/docketed-matters/).

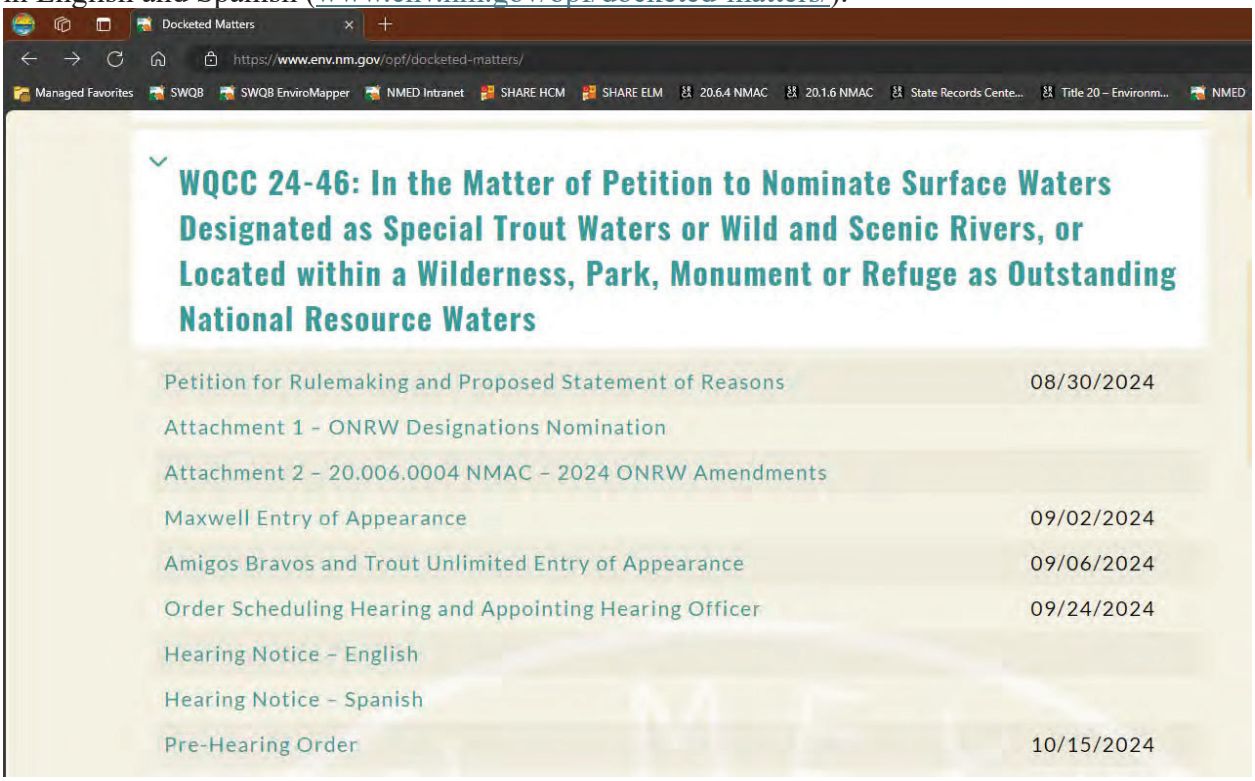


Figure 2. Screenshot of the SWQB's 2024 ONRW webpage with links to the hearing notice in English and Spanish (www.env.nm.gov/surface-water-quality/2024onrw/).

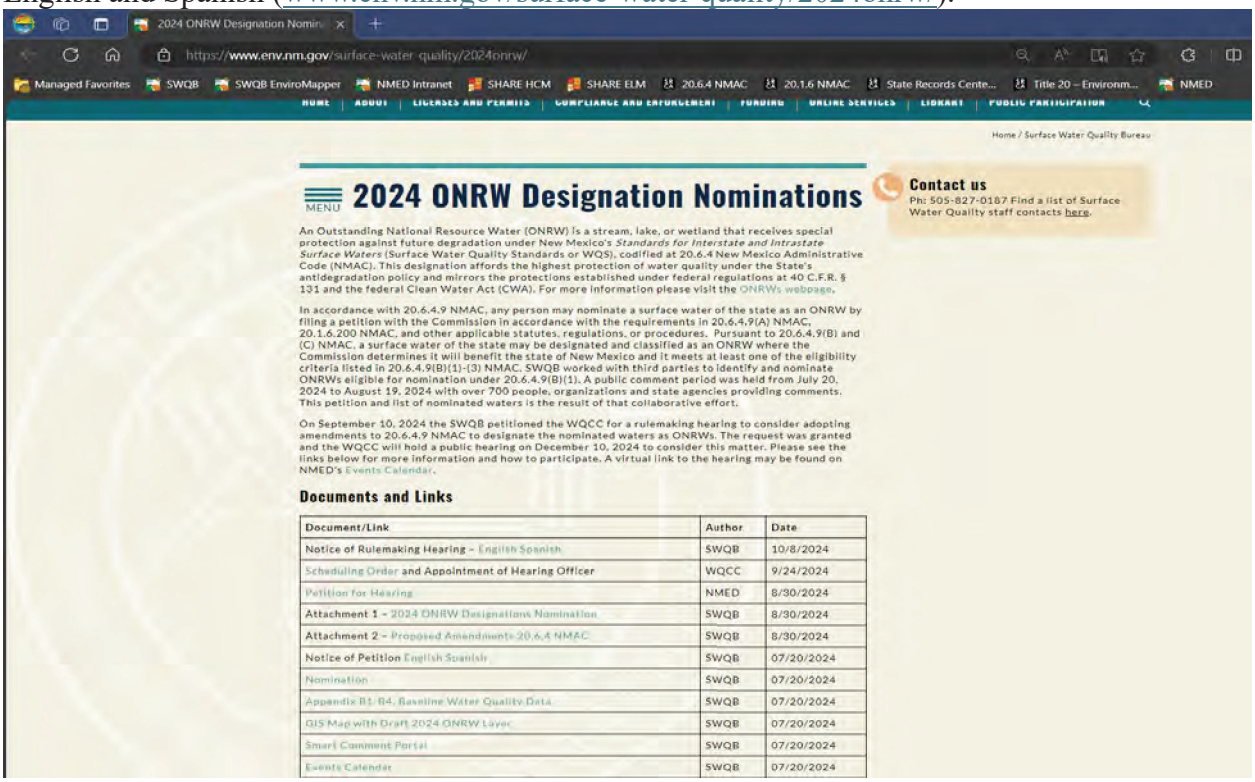


Figure 3. Screenshot of NMED's Public Notices webpage with links to the hearing notice in English and Spanish (www.env.nm.gov/public-notices/).

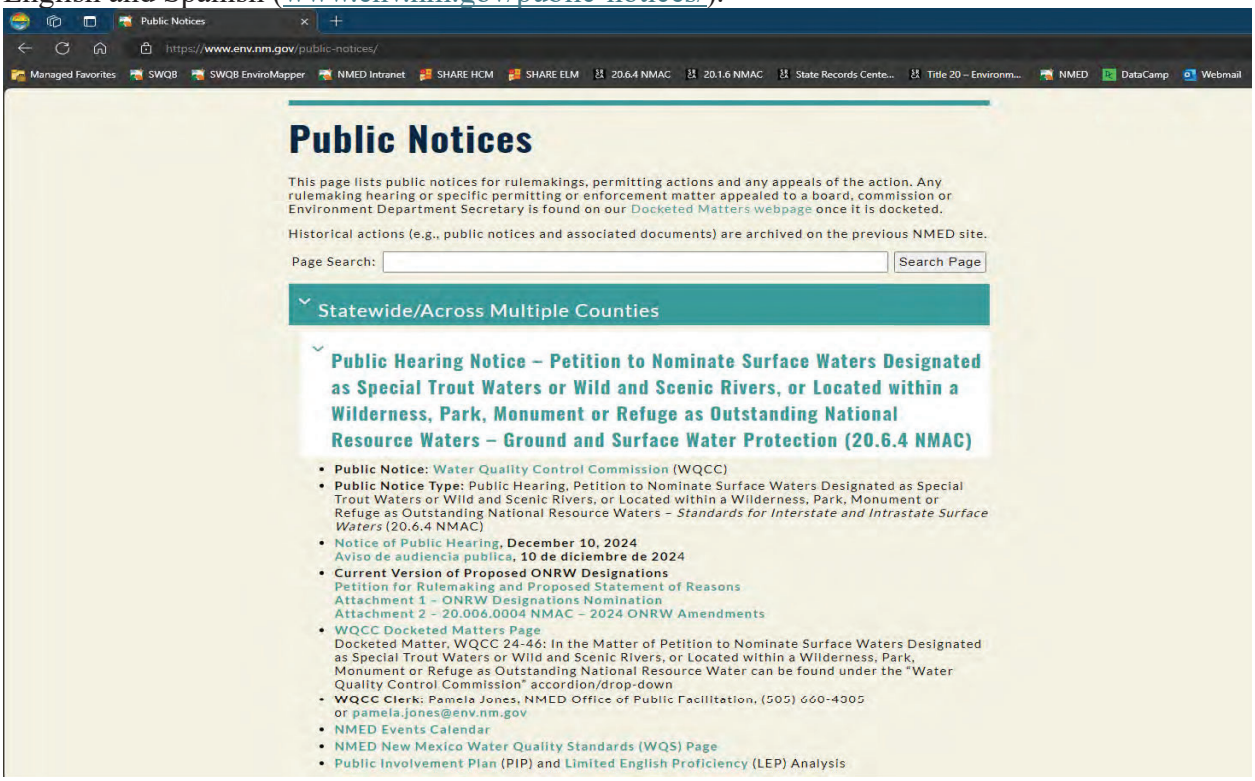


Figure 4. Screenshot of NMED's Events Calendar for December 10, 2024 with the hearing notices and link to participate in the hearing via WebEx (www.env.nm.gov/events-calendar/?trumbaEmbed=view%3Devent%26eventid%3D178577454).

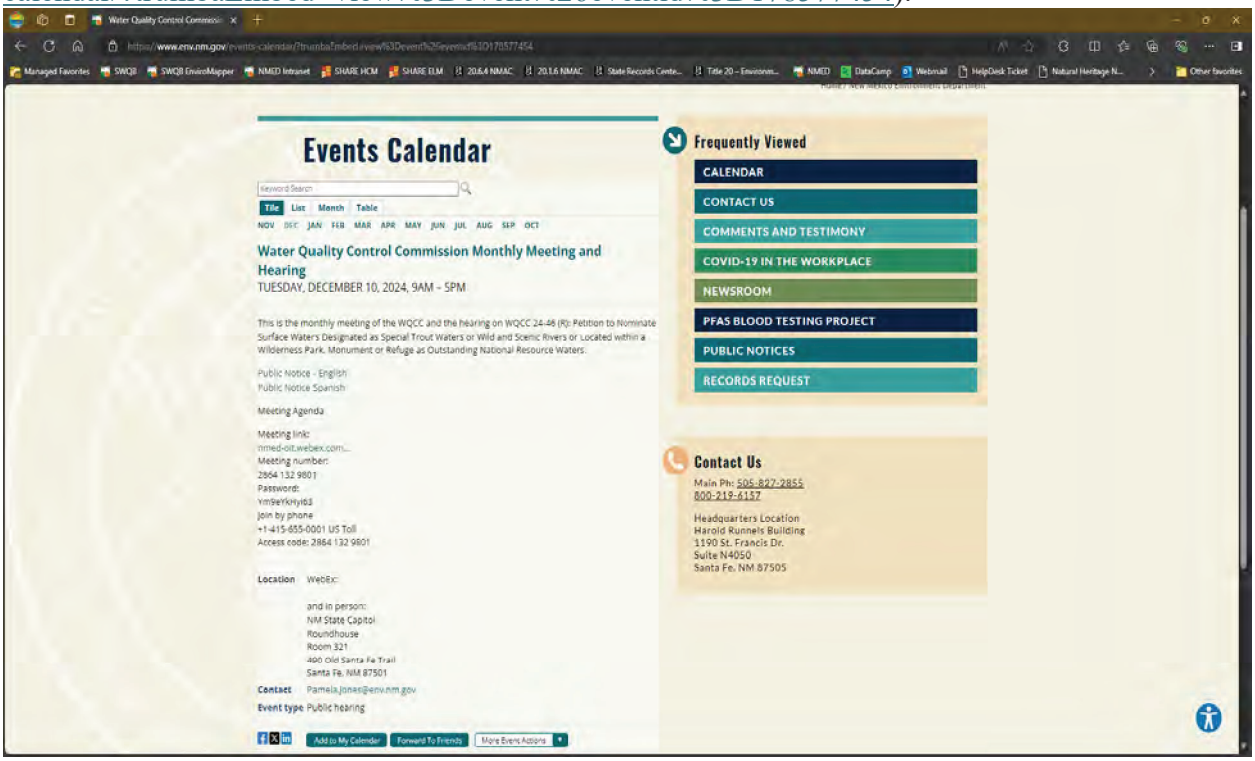


Figure 5. Screenshot of the hearing notice provided on the New Mexico Sunshine Portal (statenm.my.salesforce-sites.com/public/SSP_RuleHearingSearchPublic).

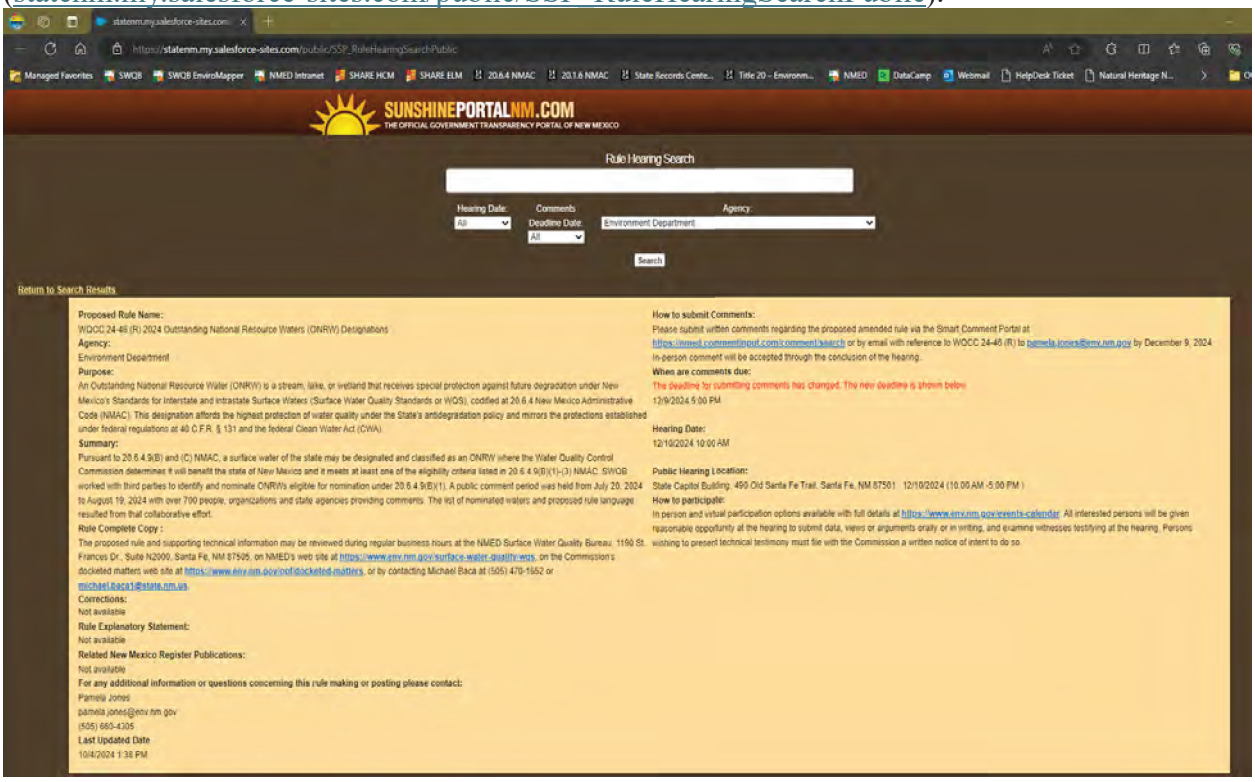


Figure 6. NMED emails for the distribution and posting of the public notice in field offices.

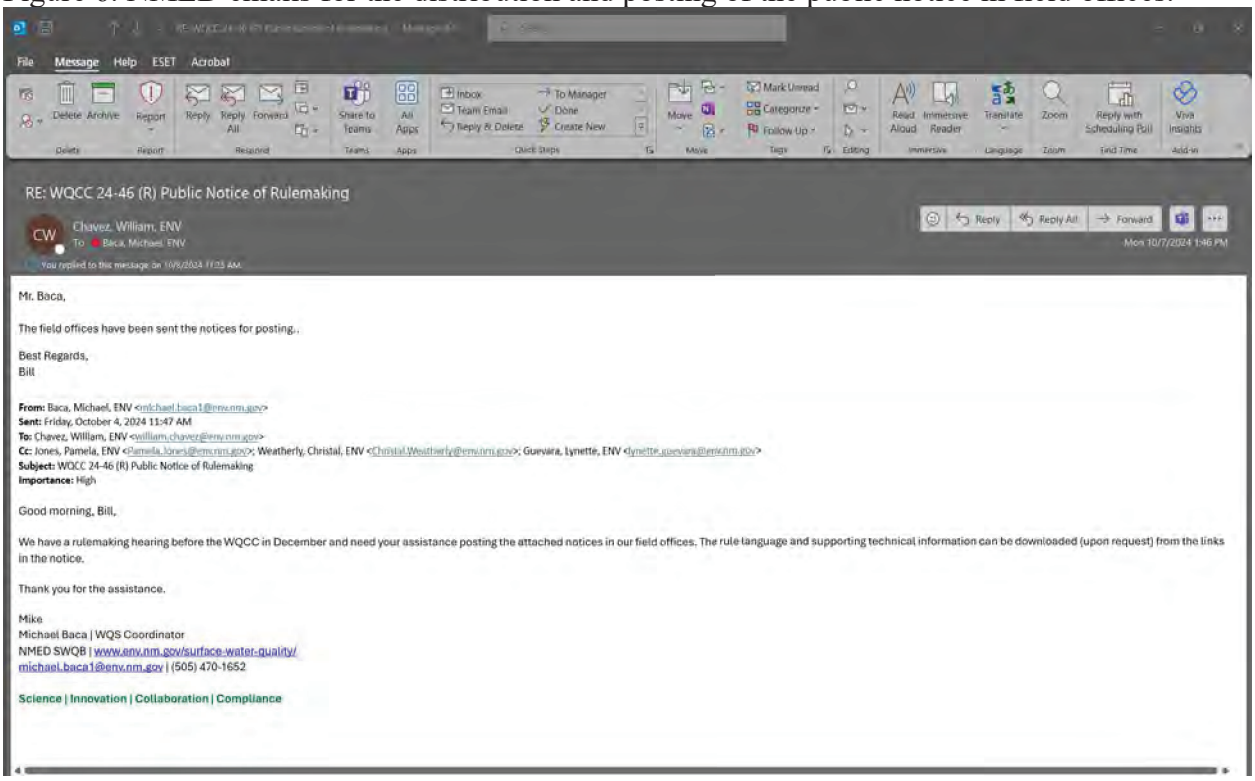


Figure 7. Listserv email (English and Spanish) sent to 3,313 subscribers for SWQB topics.

Surface Water Quality Bureau

Our mission is to preserve, protect, and improve New Mexico's surface water quality for present and future generations.

Oficina de Calidad de Aguas Superficiales

Nuestra misión es preservar, proteger y mejorar la calidad de las aguas superficiales de Nuevo México para las generaciones presentes y futuras.

The New Mexico Water Quality Control Commission (Commission) will hold a public hearing on December 10, 2024, at 9:00 a.m. in Room 321 of the State Capitol Building, 490 Old Santa Fe Trail, Santa Fe, New Mexico 87501. A virtual participation option will be provided via WebEx with meeting links and participation details provided in the events calendar at https://www.env.nm.gov/events-calendar. The hearing may continue thereafter as necessary at the Commission's discretion. All interested persons will be given reasonable opportunity at the hearing to submit data, views or arguments orally or in writing, and examine witnesses testifying at the hearing. Please see the hearing notice for full participation details and public comment instructions.

The purpose of the hearing is to consider the matter of WQCC 24-46 (R) to amend Subsection D of 20.6.4.9 NMAC, *Standards for Interstate and Intrastate Surface Waters*, to designate nominated waters as Outstanding National Resource Waters (ONRW). The waters qualify for ONRW designation as significant attributes of a Special Trout Water, a designated wild and scenic river, a national or state park, monument, or wildlife refuge, or a designated Wilderness area. ONRWs are entitled to the highest protection from pollution under the Commission's antidegradation policy and surface water quality standards at 20.6.4 NMAC. The proponent of this regulatory adoption and revision is the New Mexico Environment Department.

The proposed rule and supporting technical information may be reviewed during regular business hours at the NMED Surface Water Quality Bureau, 1190 St. Francis Dr., Suite N2050, Santa Fe, NM 87505, on NMED's web site at https://www.env.nm.gov/surface-water-quality/wqs, on the Commission's docketed matters web site at https://www.env.nm.gov/opf/docketed-matters, or by contacting Michael Baca at (505) 470-1652 or michael.baca1@state.nm.us.

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Parts 5 and 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non-discrimination programs, policies or procedures, you may contact:

Kate Cardenas, Non-Discrimination Coordinator
New Mexico Environment Department
1190 St. Francis Dr., Suite N4050
P.O. Box 5469
Santa Fe, NM 87502
(505) 827-2855
nd.coordinator@env.nm.gov
https://www.env.nm.gov/general/environmental-justice-in-new-mexico/

If you believe that you have been discriminated against with respect to a NMED program or activity, you may contact the Non-Discrimination Coordinator identified above.

La Comisión de Control de Calidad del Agua de Nuevo México (Comisión) llevará a cabo una audiencia pública el 10 de diciembre de 2024 a las 9:00 a. m. en la Sala 321 del Edificio del Capitolio Estatal, 490 Old Santa Fe Trail, Santa Fe, Nuevo México 87501. Se proporcionará una opción de participación virtual a través de WebEx con enlaces a reuniones y detalles proporcionados en el calendario de eventos en https://www.env.nm.gov/events-calendar. La audiencia puede continuar después según sea necesario a discreción de la Comisión. A todas las personas interesadas se les dará una oportunidad razonable en la audiencia para presentar datos, puntos de vista o argumentos en forma oral o por escrito, y para interrogar a los testigos que testifiquen en la audiencia.

El propósito de la audiencia es considerar el asunto de WQCC 24-46 (R) para enmendar la Subsección D de 20.6.4.9 NMAC, *Estándares para Aguas Superficiales Interestatales y Estatales*, para designar aguas nominadas como Aguas de Recursos Nacionales Sobresalientes (ONRW, por sus siglas en inglés). Las aguas calificarán para la designación ONRW como atributos significativos de un Agua Especial de Truchas; un río designado salvaje y escénico; un parque nacional o estatal, monumento o refugio de vida silvestre; o un área designada silvestre. Las ONRW tienen derecho a la máxima protección contra la contaminación según la política contra la degradación de la Comisión y los estándares de calidad de las aguas superficiales en 20.6.4 NMAC. El proponente de esta adopción y revisión reglamentaria es el Departamento de Medio Ambiente de Nuevo México.

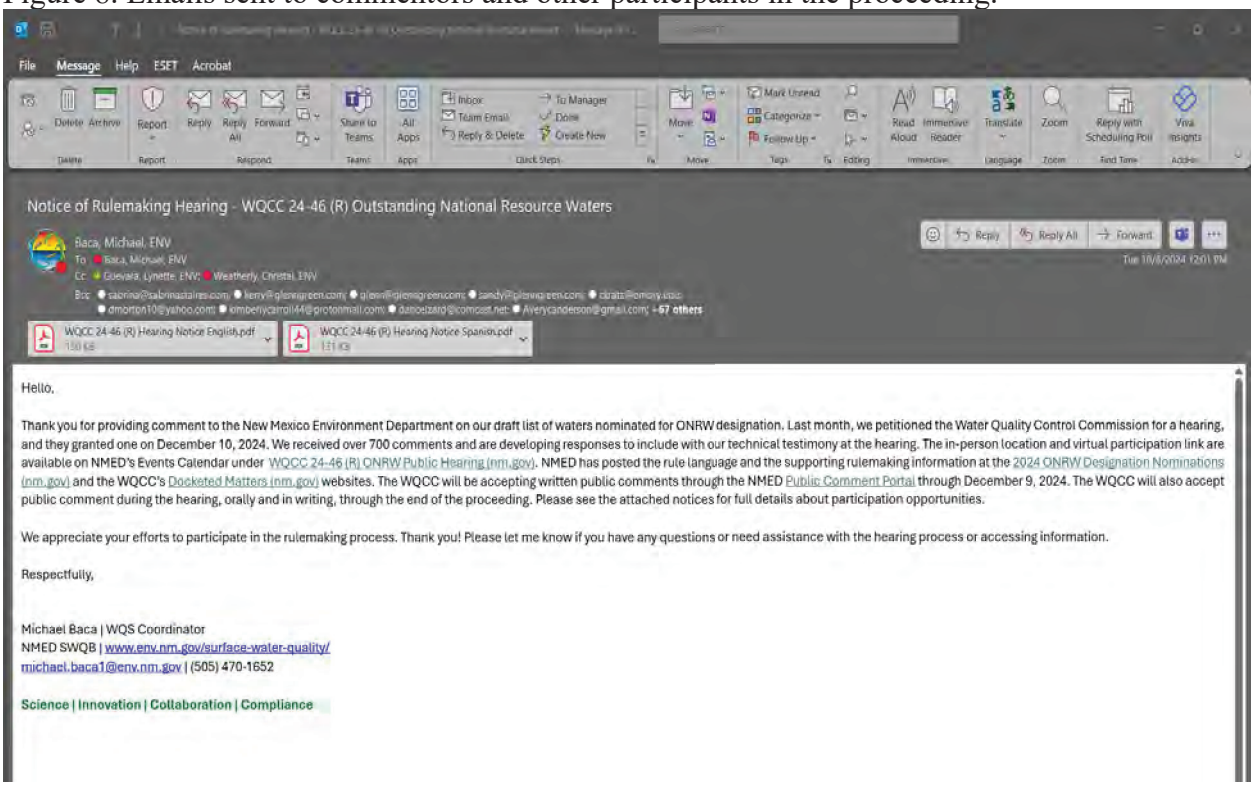
La norma propuesta y la información técnica complementaria se pueden revisar durante el horario normal de oficina en la Oficina de Calidad de Aguas Superficiales de NMED, 1190 St. Frances Dr., Suite N2000, Santa Fe, NM 87505, en el sitio web de NMED en https://www.env.nm.gov/surface-water-quality/wqcc, en el sitio web de asuntos archivados de la Comisión en https://www.env.nm.gov/opf/docketed-matters, o comunicándose con Michael Baca llamando al (505) 470-1852 o por correo electrónico a michael.baca1@state.nm.us.

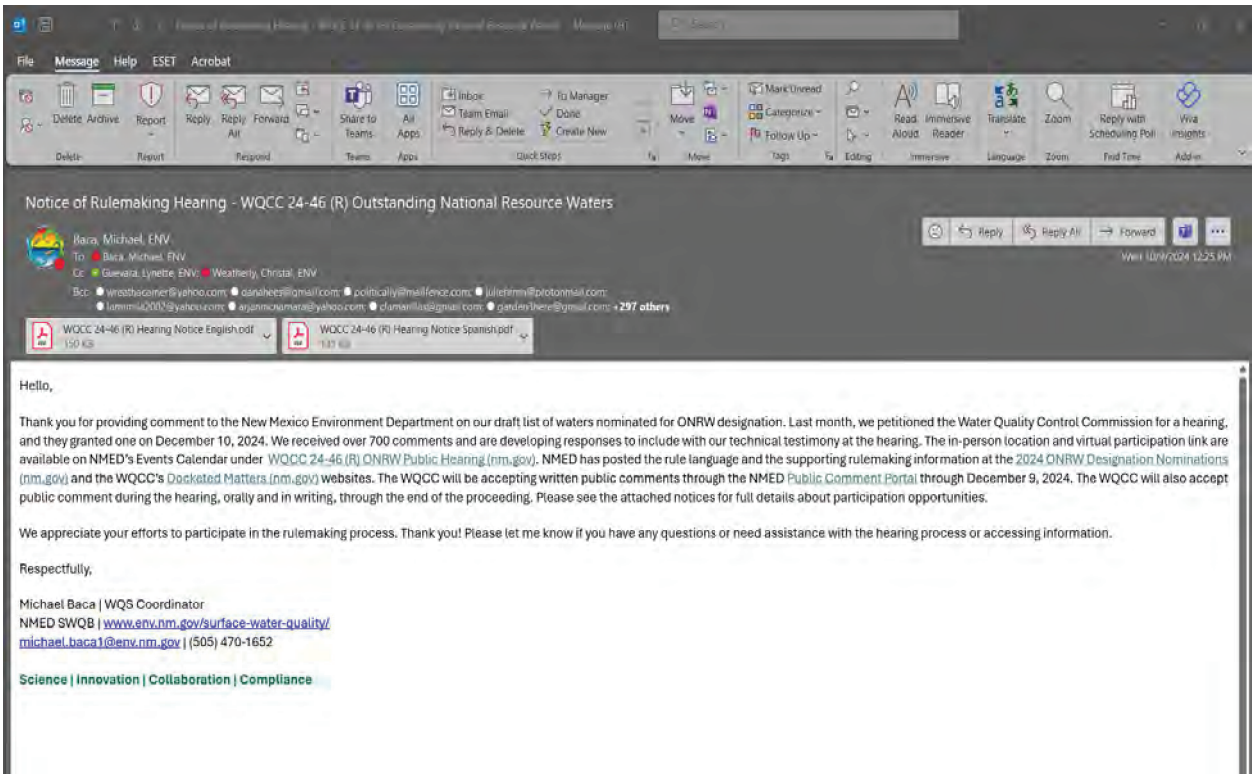
NMED no discrimina por motivos de raza, color, origen nacional, discapacidad, edad o sexo en la administración de sus programas o actividades, según lo exigen las leyes y regulaciones aplicables. NMED es responsable de la coordinación de los esfuerzos de cumplimiento y la recepción de consultas sobre los requisitos de no discriminación implementados por 40 C.F.R. Partes 5 y 7, incluido el Título VI de la Ley de Derechos Civiles de 1964, según enmendada; Sección 504 de la Ley de Rehabilitación de 1973; la Ley de Discriminación por Edad de 1975, el Título IX de las Enmiendas de Educación de 1972 y la Sección 13 de las Enmiendas de la Ley de Control de la Contaminación del Agua de 1972. Si tiene alguna pregunta sobre este aviso o alguno de los programas, políticas o procedimientos de no discriminación de NMED o si cree que ha sido discriminado con respecto a un programa o actividad de NMED, puede comunicarse con:

Kate Cardenas, coordinadora de no discriminación, NMED
1190 St. Francis Dr.
Suite N4050, P.O. Box 5469
Santa Fe, NM 87502
teléfono (505) 827-2855
correo electrónico nd.coordinator@env.nm.gov

También puede visitar nuestro sitio web en https://www.env.nm.gov/general/environmental-justice-in-new-mexico/ para saber cómo y dónde presentar una queja de discriminación.

Figure 8. Emails sent to commentors and other participants in the proceeding.





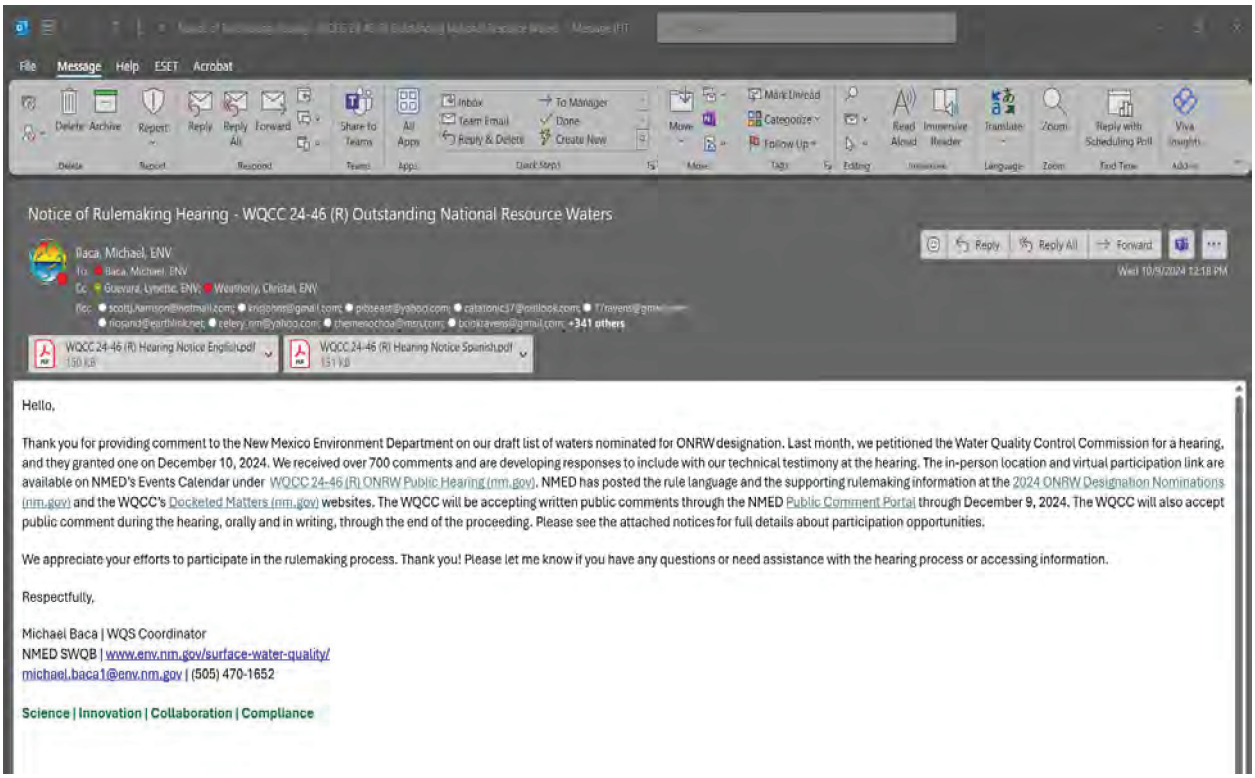

File Message Help ESET Acrobat
Notice of Rulemaking Hearing - WQCC 24-46 (R) Outstanding National Resource Waters
Baca, Michael, ENV
To: Baca, Michael, ENV
Cc: Guevara, Lynette, ENV; Weatherly, Christal, ENV
Reply
Reply All
Forward
Wed 10/9/2024 12:18 PM
WQCC 24-46 (R) Hearing Notice English.pdf
150 KB
WQCC 24-46 (R) Hearing Notice Spanish.pdf
131 KB
Hello,
Thank you for providing comment to the New Mexico Environment Department on our draft list of waters nominated for ONRW designation. Last month, we petitioned the Water Quality Control Commission for a hearing, and they granted one on December 10, 2024. We received over 700 comments and are developing responses to include with our technical testimony at the hearing. The in-person location and virtual participation link are available on NMED's Events Calendar under WQCC 24-46 (R) ONRW Public Hearing (nm.gov). NMED has posted the rule language and the supporting rulemaking information at the 2024 ONRW Designation Nominations (nm.gov) and the WQCC's Docketed Matters (nm.gov) websites. The WQCC will be accepting written public comments through the NMED Public Comment Portal through December 9, 2024. The WQCC will also accept public comment during the hearing, orally and in writing, through the end of the proceeding. Please see the attached notices for full details about participation opportunities.
We appreciate your efforts to participate in the rulemaking process. Thank you! Please let me know if you have any questions or need assistance with the hearing process or accessing information.
Respectfully,
Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 470-1652
Science | Innovation | Collaboration | Compliance

Figure 9. Letter sent to the Legislative Council Service providing public notice of hearing.

MICHELLE LUJAN GRISHAM
GOVERNOR

JAMES C. KENNEY
CABINET SECRETARY

October 8, 2024

Via Email

Joanne Montague, Senior Legislative Librarian
Legislative Council Service
Joanne.Montague@nmlegis.gov
lcs@nmlegisl.gov

Re: Proposed Outstanding National Resource Waters Nomination, 20.6.4 NMAC

Dear Ms. Montague and Legislative Council Service,

The New Mexico Environment Department is proposing a change to 20.6.4 NMAC, to classify surface waters of the state that are designated as special trout waters, or wild and scenic rivers, or located within a wilderness, park, monument or refuge as outstanding national resource waters (ONRWs).

An ONRW is a stream, lake, or wetland that receives special protection against future degradation, under New Mexico's Surface Water Quality Standards, which affords the highest protection of water quality under the State's antidegradation policy and mirrors the protections established under the Clean Water Act and its corresponding regulations.

The Department held a public comment period on the ONRW nomination between July 20-August 19, 2024, and received over 700 comments, primarily in support of the proposed nomination. The Department then petitioned the Water Quality Control Commission for a hearing, which was granted and is scheduled for December 10, 2024.

Pursuant to Section 14-4-2(E) of the NM State Rules Act and 20.1.6.201(A) NMAC, I have included a copy of the entire rule, including the proposed regulatory change at 20.6.4.9(D)8-11 NMAC, as well as the public notice for rulemaking in both English and Spanish. Note that NMED may amend this proposal as the rulemaking process moves forward. Rulemaking information and supporting documents are available on the Department's website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Sincerely,

Christal Weatherly

Christal Weatherly
Assistant General Counsel
New Mexico Environment Department
505-490-0681
Christal.Weatherly@env.nm.gov

From: Becker, Kathryn, ENV
To: aduran@pojoaque.org; cmartinez@taospueblo.com; clarice.madalena@jemezpueblo.org; clint.lente@isletapueblo.com; cltecube@yahoo.com; dinoc@santaclarapueblo.org; dmartinez@poamail.org; doug.mckenna@santaana-nsn.gov; environment@picurispueblo.org; eymartinez@sanipueblo.org; ecruz@ydsp-nsn.gov; fmartinez@poamail.org; gjojola@pol-nsn.gov; gtortalita@ziapueblo.org; gkaufman@sandiapueblo.nsn.us; jennifer.heminokeky@fortsillapache-nsn.gov; kcmanwell@yahoo.com; kevin.montoya@kewa-nsn.us; larry.phillips; Lisa Hopinkah; mvigil@taospueblo.com; mchavez@enipc.org; naomi.archuleta@ohkay.org; Stout, Pinu"u; administrativeassistantppe@picurispueblo.org; rmartinez@sanipueblo.org; rswazohinds@pueblooftesuque.org; s.etsitty@navajo-nsn.gov; sagem@pueblooftesuque.org; Tenorio, Shannon; tbelone@enipc.org; tammy.parker@ashiwi.org; thora; vatencio@nambepueblo.org; Yazza, Wayne; Woodrow "Cody" Crumbo; ybenton@ziapueblo.org
Cc: Baca, Michael, ENV
Subject: Upcoming hearing before the WQCC: NMED letter to Tribal Environmental Directors re: Outstanding National Resource Waters nomination
Date: Monday, October 7, 2024 3:50:50 PM

Good afternoon, TEDs!
In late July I sent out the email below about the ONRW nomination and now the Department is preparing to go to hearing in December. Please see the hearing notice:
WQCC 24-46 (R) Hearing Notice English.pdf
The full rulemaking information can be found at https://www.env.nm.gov/surface-water-quality/wqs/2024ONRW or on the WQCC's website at https://www.env.nm.gov/opf/docketed-matters/.
If you have any questions or concerns, please contact Mike Baca directly at:
michael.baca1@env.nm.gov | (505) 470-1652
Best!

KATHRYN S. BECKER
ASSISTANT GENERAL COUNSEL
TRIBAL LIAISON
OFFICE OF GENERAL COUNSEL
P.O. BOX 5469
SANTA FE, NM 87502-5469
505-231-9983
KATHRYN.BECKER@ENV.NM.GOV
WWW.ENV.NM.GOV

Subject: NMED letter to Tribal Environmental Directors re: Outstanding National Resource Waters nomination

Greetings Tribal Environmental Directors and Natural Resource Managers,

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) is nominating certain surface waters of the state as Outstanding National Resource Waters (ONRWs). Many of these waters are in upstream portions of watersheds located within designated Wilderness areas, national or state parks or monuments, wildlife refuges, or they are Special Trout Waters identified by the New Mexico Department of Game and Fish or designated as a wild and scenic river. We are reaching out to make you aware of the process and the public comment period, as well as how to access materials, ask questions, request a meeting, or contact us to learn more.

ONRWs are streams, lakes and wetlands that receive enhanced protection against degradation under New Mexico's Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC

(Water Quality Standards or WQS) and the federal Clean Water Act (CWA). Degradation of baseline or existing water quality is not allowed in ONRWs except under limited circumstances such as emergency response actions and activities due to health and safety concerns, restoration activities, or acequia operation, maintenance, and repairs. Pre-existing land use activities can continue if best management practices (BMPs) are implemented to protect water quality, and no new water quality degradation results from the activity. Any future new point source activities or discharges would be reviewed during the permitting process and may be allowed if no degradation would occur to existing water quality.

A water of the state can be designated as an ONRW by filing a petition with the Water Quality Control Commission (WQCC) in accordance with the requirements under 20.6.4.9(B) NMAC and 20.1.6 NMAC. The petition must include the elements prescribed in 20.6.4.9(A)(1)-(6) NMAC, provide a demonstration of eligibility, and set forth sufficient justification for the proposed designation. As with any change to the State's Water Quality Standards, public notice of the petition must be provided, and a public hearing must be held before the WQCC. Following the public hearing, the WQCC deliberates and decides on the petition to designate the water(s) as an ONRW.

The WQCC last designated waters as ONRWs in 2023. Since that time, the SWQB continued to work with several non-profit organizations to identify waters eligible for ONRW nomination resulting in the attached nomination with tables and maps of waters. A GIS map of the proposed waters is also available at https://gis.web.env.nm.gov/oem/?map=swqb. Numerous GIS layers are available to visualize spatial relationships and data including: GIS linework for the proposed and previously designated ONRWs, Tribal Lands, point source discharges, amongst others. Please clear the maps' default layers (water quality stations and active fire perimeters) before activating additional layers to more easily visualize the proposed waters.

The SWQB is holding a public comment period from July 20 through August 19 and a full copy of the nomination and supporting documents is available on our website (https://www.env.nm.gov/surface-water-quality/wqs/). We also plan on holding at least one public meeting regarding this action. At the conclusion of the public comment period, the SWQB will petition the WQCC for a hearing to designate waters as ONRWs. We anticipate petitioning the WQCC in September for a December 2024 hearing.

Please note: *this action is separate from NMED SWQB efforts to develop a state permitting program*. If you have any questions or would like to schedule a meeting to discuss this ONRW action, please do not hesitate to email or call. If you would like to stay informed regarding this or other SWQB actions or projects, please subscribe to our email list at: https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

Sincerely,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 470-1652

All the best!
Kathryn S. Becker

Assistant General Counsel
Tribal Liaison
Office of General Counsel
P.O. Box 5469
Santa Fe, NM 87502-5469
505-231-9983
Kathryn.becker@env.nm.gov
www.env.nm.gov

From:	Baca, Michael, ENV
To:	micael.t.albonico@usace.army.mil; christopher.j.mcgibbon@usace.army.mil
Cc:	Guevara, Lynette, ENV; Weatherly, Christal, ENV
Subject:	RE: 2024 ONRW Designation Nominations
Date:	Friday, October 4, 2024 2:00:00 PM
Attachments:	WQCC 24-46 (R) Hearing Notice English.pdf 2024 ONRW Designations Nomination (Petition Draft) .pdf Appendix B1-B4.pdf

Good Afternoon,

As indicated below, the NMED petitioned the WQCC and was granted a hearing on December 10, 2024. Please see the attached public notice and NMED's Events Calendar for full participation details. Rulemaking information and supporting documents are available on our website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Please let me know if you have any questions or concerns.

Regards,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 470-1652

Science | Innovation | Collaboration | Compliance

From: Baca, Michael, ENV
Sent: Friday, July 19, 2024 4:34 PM
To: micael.t.albonico@usace.army.mil; christopher.j.mcgibbon@usace.army.mil
Cc: Kamm, Nathaniel, ENV <nathaniel.kamm@env.nm.gov>; Guevara, Lynette, ENV <lynette.guevara@env.nm.gov>
Subject: 2024 ONRW Designation Nominations

Greetings,

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) is nominating certain surface waters of the state as Outstanding National Resource Waters (ONRWs). Many of these waters are in upstream portions of watersheds located within designated Wilderness areas, national or state parks or monuments, wildlife refuges, or they are Special Trout Waters identified by the New Mexico Department of Game and Fish or designated as a wild and scenic river. We are reaching out to make you aware of the process and the public comment period, as well as how to access materials, ask questions, request a meeting, or contact us to learn more. If you are not the correct person to contact for this action, please let me know whom to contact.

ONRWs are streams, lakes and wetlands that receive enhanced protection against degradation under New Mexico's Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC (Water Quality Standards or WQS) and the federal Clean Water Act (CWA). Degradation of baseline or existing water quality is not allowed in ONRWs except under limited circumstances such as emergency response actions and activities due to health and safety concerns, restoration activities, or acequia operation, maintenance, and repairs. Pre-existing land use activities can continue if best management practices (BMPs) are implemented to protect water quality, and no new water quality degradation results from the activity. Any future new point source activities or discharges would be reviewed during the permitting process and may be allowed if no degradation would occur to existing water quality.

A water of the state can be designated as an ONRW by filing a petition with the Water Quality Control Commission (WQCC) in accordance with the requirements under 20.6.4.9(B) NMAC and 20.1.6 NMAC. The petition must include the elements prescribed in 20.6.4.9(A)(1)-(6) NMAC, provide a demonstration of eligibility, and set forth sufficient justification for the proposed designation. As with any change to the State's Water Quality Standards, public notice of the petition must be provided, and a public hearing must be held before the WQCC. Following the public hearing, the WQCC deliberates and decides on the petition to designate the water(s) as an ONRW.

The WQCC last designated waters as ONRWs in 2023. Since that time, the SWQB continued to work with several non-profit organizations to identify waters eligible for ONRW nomination resulting in the attached nomination with tables and maps of waters. A GIS map of the proposed waters is also available at https://gis.web.env.nm.gov/oem/?map=swqb. The SWQB is holding a public comment period from July 20 through August 19 and a full copy of the nomination and supporting documents is available on our website (https://www.env.nm.gov/surface-water-quality/wqs/). We also plan on holding at least one public meeting regarding this action. Comments may be submitted by replying to this email or through our Smart Comment Portal (https://nmed.commentinput.com/comment/search). At the conclusion of the public comment period, the SWQB will petition the WQCC for a hearing to designate waters as ONRWs. We anticipate petitioning the WQCC in September for a December 2024 hearing.

If you have any questions or would like to schedule a meeting to discuss this action, please do not hesitate to email or call. If you would like to stay informed regarding this or other SWQB actions or projects, please subscribe to our email list at: https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

Sincerely,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 629-6976

Science | Innovation | Collaboration | Compliance

From:	Baca, Michael, ENV
To:	Ruhl, Michael, DGF
Cc:	Guevara, Lynette, ENV; Weatherly, Christal, ENV
Subject:	RE: 2024 ONRW Designation Nominations - Public Comment Period
Date:	Friday, October 4, 2024 2:21:00 PM
Attachments:	WQCC 24-46 (R) Hearing Notice English.pdf 2024 ONRW Designations Nomination (Petition Draft) .pdf Appendix B1-B4.pdf

Good Afternoon, Mike.

Thank you for providing suggested revisions and feedback on our draft nominations. Last month, NMED petitioned the WQCC and was granted a hearing on December 10, 2024. Please see the attached public notice and NMED's Events Calendar for full participation details. Rulemaking information and supporting documents are available on our website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Please let me know if you have any questions or concerns.

Regards,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 470-1652

Science | Innovation | Collaboration | Compliance

From: Baca, Michael, ENV
Sent: Friday, July 19, 2024 4:31 PM
To: Patten, Kirk, DGF <kirk.patten@dgf.nm.gov>
Cc: Guevara, Lynette, ENV <lynette.guevara@env.nm.gov>; Kamm, Nathaniel, ENV <nathaniel.kamm@env.nm.gov>
Subject: 2024 ONRW Designation Nominations - Public Comment Period
Importance: High

Greetings,

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) is nominating certain surface waters of the state as Outstanding National Resource Waters (ONRWs). Many of these waters are in upstream portions of watersheds located within designated Wilderness areas, national or state parks or monuments, wildlife refuges, or they are Special Trout Waters or designated as a wild and scenic river. We are reaching out to make you aware of the process and the public comment period, as well as how to access materials, ask questions, request a meeting, or contact us to learn more.

ONRWs are streams, lakes and wetlands that receive enhanced protection against degradation under New Mexico's Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC (Water Quality Standards or WQS) and the federal Clean Water Act (CWA). Degradation of baseline or existing water quality is not allowed in ONRWs except under limited circumstances such as emergency response actions and activities due to health and safety concerns, restoration activities, or acequia operation, maintenance, and repairs. Pre-existing land use activities can continue if best management practices (BMPs) are implemented to protect water quality, and no new water quality degradation results from the activity. Any future new point source activities or discharges would be reviewed during the permitting process and may be allowed if no degradation would occur to existing water quality.

A water of the state can be designated as an ONRW by filing a petition with the Water Quality Control Commission (WQCC) in accordance with the requirements under 20.6.4.9(B) NMAC and 20.1.6 NMAC. The petition must include the elements prescribed in 20.6.4.9(A)(1)-(6) NMAC, provide a demonstration of eligibility, and set forth sufficient justification for the proposed designation. As with any change to the State's Water Quality Standards, public notice of the petition must be provided, and a public hearing must be held before the WQCC. Following the public hearing, the WQCC deliberates and decides on the petition to designate the water(s) as an ONRW.

The WQCC last designated waters as ONRWs in 2023. Since that time, the SWQB continued to work with several non-profit organizations to identify waters eligible for ONRW nomination resulting in the attached nomination with tables and maps of waters. A GIS map of the proposed waters is also available at https://gis.web.env.nm.gov/oem/?map=swqb. The SWQB is holding a public comment period from July 20 through August 19 and a full copy of the nomination and supporting documents is available on our website (https://www.env.nm.gov/surface-water-quality/wqs/). We also plan on holding at least one public meeting regarding this action. Comments may be submitted by replying to this email or through our Smart Comment Portal (https://nmed.commentinput.com/comment/search). At the conclusion of the public comment period, the SWQB will petition the WQCC for a hearing to designate waters as ONRWs. We anticipate petitioning the WQCC in September for a December 2024 hearing.

If you have any questions or would like to schedule a meeting to discuss this action, please do not hesitate to email or call. If you would like to stay informed regarding this or other SWQB actions or projects, please subscribe to our email list at: https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

Sincerely,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 629-6976

From:	Baca, Michael, ENV
To:	sdunn@blm.gov
Cc:	Guevara, Lynette, ENV; Weatherly, Christal, ENV
Subject:	RE: 2024 ONRW Designation Nominations
Date:	Friday, October 4, 2024 2:1 :00 PM
Attachments:	WQCC 24-46 (R) Hearing Notice English.pdf 2024 ONRW Designations Nomination (Petition Draft) .pdf Appendix B1-B4.pdf

Good Afternoon,

As indicated below, the NMED petitioned the WQCC and was granted a hearing on December 10, 2024. Please see the attached public notice and NMED's Events Calendar for full participation details. Rulemaking information and supporting documents are available on our website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Please let me know if you have any questions or concerns.

Regards,

Michael Baca | WQS Coordinator | NMED SWQB
michael.baca1@env.nm.gov | (505) 470-1652

From: Baca, Michael, ENV
Sent: Friday, July 19, 2024 4:33 PM
To: sdunn@blm.gov
Cc: Kamm, Nathaniel, ENV <nathaniel.kamm@env.nm.gov>; Guevara, Lynette, ENV <lynette.guevara@env.nm.gov>
Subject: 2024 ONRW Designation Nominations

Greetings,

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) is nominating certain surface waters of the state as Outstanding National Resource Waters (ONRWs). Many of these waters are in upstream portions of watersheds located within designated Wilderness areas, national or state parks or monuments, wildlife refuges, or they are Special Trout Waters identified by the New Mexico Department of Game and Fish or designated as a wild and scenic river. We are reaching out to make you aware of the process and the public comment period, as well as how to access materials, ask questions, request a meeting, or contact us to learn more.

ONRWs are streams, lakes and wetlands that receive enhanced protection against degradation under New Mexico's Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC (Water Quality Standards or WQS) and the federal Clean Water Act (CWA). Degradation of baseline or

existing water quality is not allowed in ONRWs except under limited circumstances such as emergency response actions and activities due to health and safety concerns, restoration activities, or acequia operation, maintenance, and repairs. Pre-existing land use activities can continue if best management practices (BMPs) are implemented to protect water quality, and no new water quality degradation results from the activity. Any future new point source activities or discharges would be reviewed during the permitting process and may be allowed if no degradation would occur to existing water quality.

A water of the state can be designated as an ONRW by filing a petition with the Water Quality Control Commission (WQCC) in accordance with the requirements under 20.6.4.9(B) NMAC and 20.1.6 NMAC. The petition must include the elements prescribed in 20.6.4.9(A)(1)-(6) NMAC, provide a demonstration of eligibility, and set forth sufficient justification for the proposed designation. As with any change to the State's Water Quality Standards, public notice of the petition must be provided, and a public hearing must be held before the WQCC. Following the public hearing, the WQCC deliberates and decides on the petition to designate the water(s) as an ONRW.

The WQCC last designated waters as ONRWs in 2023. Since that time, the SWQB continued to work with several non-profit organizations to identify waters eligible for ONRW nomination resulting in the attached nomination with tables and maps of waters. A GIS map of the proposed waters is also available at https://gis.web.env.nm.gov/oem/?map=swqb. The SWQB is holding a public comment period from July 20 through August 19 and a full copy of the nomination and supporting documents is available on our website (https://www.env.nm.gov/surface-water-quality/wqs/). We also plan on holding at least one public meeting regarding this action. Comments may be submitted by replying to this email or through our Smart Comment Portal (https://nmed.commentinput.com/comment/search). At the conclusion of the public comment period, the SWQB will petition the WQCC for a hearing to designate waters as ONRWs. We anticipate petitioning the WQCC in September for a December 2024 hearing.

If you have any questions or would like to schedule a meeting to discuss this action, please do not hesitate to email or call. If you would like to stay informed regarding this or other SWQB actions or projects, please subscribe to our email list at: https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

Sincerely,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 629-6976

Science | Innovation | Collaboration | Compliance

From:	Baca, Michael, ENV
To:	Bayliss, Randolph, EMNRD
Cc:	Guevara, Lynette, ENV; Weatherly, Christal, ENV
Subject:	RE: 2024 ONRW Designation Nominations
Date:	Friday, October 4, 2024 2:1 :00 PM
Attachments:	WQCC 24-46 (R) Hearing Notice English.pdf 2024 ONRW Designations Nomination (Petition Draft) .pdf Appendix B1-B4.pdf

Good Afternoon,

As indicated below, the NMED petitioned the WQCC and was granted a hearing on December 10, 2024. Please see the attached public notice and NMED's Events Calendar for full participation details. Rulemaking information and supporting documents are available on our website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Please let me know if you have any questions or concerns.

Regards,

Michael Baca | WQS Coordinator | NMED SWQB
michael.baca1@env.nm.gov | (505) 470-1652

From: Baca, Michael, ENV
Sent: Friday, July 19, 2024 4:32 PM
To: Bayliss, Randolph, EMNRD <Randolph.Bayliss@emnrd.nm.gov>
Cc: Kamm, Nathaniel, ENV <nathaniel.kamm@env.nm.gov>; Guevara, Lynette, ENV <lynette.guevara@env.nm.gov>
Subject: 2024 ONRW Designation Nominations

Greetings,

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) is nominating certain surface waters of the state as Outstanding National Resource Waters (ONRWs). Many of these waters are in upstream portions of watersheds located within designated Wilderness areas, national or state parks or monuments, wildlife refuges, or they are Special Trout Waters identified by the New Mexico Department of Game and Fish or designated as a wild and scenic river. We are reaching out to make you aware of the process and the public comment period, as well as how to access materials, ask questions, request a meeting, or contact us to learn more.

ONRWs are streams, lakes and wetlands that receive enhanced protection against degradation under New Mexico's Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC (Water Quality Standards or WQS) and the federal Clean Water Act (CWA). Degradation of baseline or

existing water quality is not allowed in ONRWs except under limited circumstances such as emergency response actions and activities due to health and safety concerns, restoration activities, or acequia operation, maintenance, and repairs. Pre-existing land use activities can continue if best management practices (BMPs) are implemented to protect water quality, and no new water quality degradation results from the activity. Any future new point source activities or discharges would be reviewed during the permitting process and may be allowed if no degradation would occur to existing water quality.

A water of the state can be designated as an ONRW by filing a petition with the Water Quality Control Commission (WQCC) in accordance with the requirements under 20.6.4.9(B) NMAC and 20.1.6 NMAC. The petition must include the elements prescribed in 20.6.4.9(A)(1)-(6) NMAC, provide a demonstration of eligibility, and set forth sufficient justification for the proposed designation. As with any change to the State's Water Quality Standards, public notice of the petition must be provided, and a public hearing must be held before the WQCC. Following the public hearing, the WQCC deliberates and decides on the petition to designate the water(s) as an ONRW.

The WQCC last designated waters as ONRWs in 2023. Since that time, the SWQB continued to work with several non-profit organizations to identify waters eligible for ONRW nomination resulting in the attached nomination with tables and maps of waters. A GIS map of the proposed waters is also available at https://gis.web.env.nm.gov/oem/?map=swqb. The SWQB is holding a public comment period from July 20 through August 19 and a full copy of the nomination and supporting documents is available on our website (https://www.env.nm.gov/surface-water-quality/wqs/). We also plan on holding at least one public meeting regarding this action. Comments may be submitted by replying to this email or through our Smart Comment Portal (https://nmed.commentinput.com/comment/search). At the conclusion of the public comment period, the SWQB will petition the WQCC for a hearing to designate waters as ONRWs. We anticipate petitioning the WQCC in September for a December 2024 hearing.

If you have any questions or would like to schedule a meeting to discuss this action, please do not hesitate to email or call. If you would like to stay informed regarding this or other SWQB actions or projects, please subscribe to our email list at: https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

Sincerely,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 629-6976

Science | Innovation | Collaboration | Compliance

From:	Baca, Michael, ENV
To:	Diaz Lopez, asmin
Cc:	Guevara, Lynette, ENV; Weatherly, Christal, ENV
Subject:	RE: 2024 ONRW Designation Nominations
Date:	Friday, October 4, 2024 2:14:00 PM
Attachments:	WQCC 24-46 (R) Hearing Notice English.pdf

Good Afternoon, Jasmin

We petitioned and were granted a hearing before the WQCC on December 10, 2024 for this matter. Please see the attached public notice and NMED's Events Calendar for full participation details. Rulemaking information and supporting documents are available on our website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Please let me know if you have any questions or concerns.

Regards,

Michael Baca | WQS Coordinator | NMED SWQB
michael.baca1@env.nm.gov | (505) 470-1652

From: Baca, Michael, ENV
Sent: Friday, July 19, 2024 3:38 PM
To: Diaz Lopez, Jasmin <DiazLopez.Jasmin@epa.gov>
Subject: 2024 ONRW Designation Nominations
Importance: High

Hi Jasmin,

Please find a draft nomination for designating waters as ONRWs attached. As you may recall, we have been working with the NGOs (from the last round of third-party ONRWs 2022-23) to create this list and supporting information. A GIS Layer of the proposed waters is available on our mapper at https://gis.web.env.nm.gov/oem/?map=swqb. We are taking early public comment starting tomorrow through August 19. We plan to petition the commission for a rulemaking hearing at their September meeting.

FYI - we have to respond to comments and file our petition before August 30. Please let me know if you have any comments, questions, or concerns with this action. We are also available to meet at any time, just let me know.

Thank you,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 629-6976

Science | Innovation | Collaboration | Compliance

From:	Baca, Michael, ENV
To:	Colonius, Carl, EDD
Cc:	Armijo, Karina, EDD; Guevara, Lynette, ENV; Weatherly, Christal, ENV
Subject:	RE: 2024 ONRW Designation Nominations
Date:	Friday, October 4, 2024 2:11:00 PM
Attachments:	WQCC 24-46 (R) Hearing Notice English.pdf 2024 ONRW Designations Nomination (Petition Draft) .pdf Appendix B1-B4.pdf

Good Afternoon,

As indicated below, the NMED petitioned the WQCC and was granted a hearing on December 10, 2024. Please see the attached public notice and NMED's Events Calendar for full participation details. Rulemaking information and supporting documents are available on our website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Please let me know if you have any questions or concerns.

Regards,

Michael Baca | WQS Coordinator | NMED SWQB
michael.baca1@env.nm.gov | (505) 470-1652

From: Colonius, Carl, EDD <carl.colonius@edd.nm.gov>
Sent: Friday, July 26, 2024 10:58 AM
To: Baca, Michael, ENV <michael.baca1@env.nm.gov>
Cc: Kamm, Nathaniel, ENV <nathaniel.kamm@env.nm.gov>; Armijo, Karina, EDD <karina.armijo@edd.nm.gov>
Subject: Re: 2024 ONRW Designation Nominations

Michael, congratulations on this compilation and the efforts to create protections for New Mexico waters. Very exciting to scan what looks like a very comprehensive list!

I have included the Director of the New Mexico Outdoor Recreation Division, Karina Armijo in this communication.

Awesome.

Carl

Carl Colonius

He/him
Outdoor Recreation Planner
Outdoor Recreation Division
Economic Development Department
505.570.7846 cell
Carl.Colonius@edd.nm.gov

From: Baca, Michael, ENV <michael.baca1@env.nm.gov>
Sent: Friday, July 26, 2024 10:21:02 AM
To: Colonius, Carl, EDD <carl.colonius@edd.nm.gov>
Cc: Kamm, Nathaniel, ENV <nathaniel.kamm@env.nm.gov>
Subject: 2024 ONRW Designation Nominations

Greetings,

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) is nominating certain surface waters of the state as Outstanding National Resource Waters (ONRWs). Many of these waters are in upstream portions of watersheds located within designated Wilderness areas, national or state parks or monuments, wildlife refuges, or they are Special Trout Waters identified by the New Mexico Department of Game and Fish or designated as a wild and scenic river. We have published notice of the nomination in newspapers and sent out an email to our listserv. As a recent petitioner for ONRW designations, we are reaching out to your agency to make sure you aware of the process and the public comment period, as well as how to access materials, ask questions, request a meeting, or contact us to learn more. If you are not the correct person to contact for this action, please let me know whom to contact.

ONRWs are streams, lakes and wetlands that receive enhanced protection against degradation under New Mexico's Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC (Water Quality Standards or WQS) and the federal Clean Water Act (CWA). Degradation of baseline or existing water quality is not allowed in ONRWs except under limited circumstances such as emergency response actions and activities due to health and safety concerns, restoration activities, or acequia operation, maintenance, and repairs. Pre-existing land use activities can continue if best management practices (BMPs) are implemented to protect water quality, and no new water quality degradation results from the activity. Any future new point source activities or discharges would be reviewed during the permitting process and may be allowed if no degradation would occur to existing water quality.

A water of the state can be designated as an ONRW by filing a petition with the Water Quality Control Commission (WQCC) in accordance with the requirements under 20.6.4.9(B) NMAC and 20.1.6 NMAC. The petition must include the elements prescribed in 20.6.4.9(A)(1)-(6) NMAC, provide a demonstration of eligibility, and set forth sufficient justification for the proposed designation. As with any change to the State's Water Quality Standards, public notice of the petition must be provided, and a public hearing must be held before the WQCC. Following the public hearing, the WQCC deliberates and decides on the petition to designate the water(s) as an ONRW.

The WQCC last designated waters as ONRWs in 2022. Since that time, the SWQB continued to work with several non-profit organizations to identify waters eligible for ONRW nomination resulting in the attached nomination with tables and maps of waters. A GIS map of the proposed waters is also available at https://gis.web.env.nm.gov/oem/?map=swqb. The SWQB is holding a public comment period from July 20 through August 19 and a full copy of the nomination and supporting documents is available on our website (https://www.env.nm.gov/surface-water-quality/wqs/). We also plan on holding at least one public meeting regarding this action. Comments may be submitted by replying to this email or through our Smart Comment Portal (https://nmed.commentinput.com/comment/search). At the conclusion of the public comment period, the SWQB will petition the WQCC for a hearing to designate waters as ONRWs. We anticipate petitioning the WQCC in September for a December 2024 hearing.

If you have any questions or would like to schedule a meeting to discuss this action, please do not hesitate to email or call. If you would like to stay informed regarding this or other SWQB actions or projects, please subscribe to our email list at: https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

Sincerely,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 470-1652

Science | Innovation | Collaboration | Compliance

From:	Baca, Michael, ENV
To:	jbachus@usbr.gov
Cc:	Guevara, Lynette, ENV; Weatherly, Christal, ENV
Subject:	RE: 2024 ONRW Designation Nominations
Date:	Friday, October 4, 2024 2:07:00 PM
Attachments:	WQCC 24-46 (R) Hearing Notice English.pdf 2024 ONRW Designations Nomination (Petition Draft) .pdf Appendix B1-B4.pdf

Good Afternoon,

As indicated below, the NMED petitioned the WQCC and was granted a hearing on December 10, 2024. Please see the attached public notice and NMED's Events Calendar for full participation details. Rulemaking information and supporting documents are available on our website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Please let me know if you have any questions or concerns.

Regards,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 470-1652

Science | Innovation | Collaboration | Compliance

From: Baca, Michael, ENV
Sent: Friday, July 19, 2024 4:34 PM
To: jbachus@usbr.gov
Cc: Kamm, Nathaniel, ENV <nathaniel.kamm@env.nm.gov>; Guevara, Lynette, ENV <lynette.guevara@env.nm.gov>
Subject: 2024 ONRW Designation Nominations

Greetings,

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) is nominating certain surface waters of the state as Outstanding National Resource Waters (ONRWs). Many of these waters are in upstream portions of watersheds located within designated Wilderness areas, national or state parks or monuments, wildlife refuges, or they are Special Trout Waters identified by the New Mexico Department of Game and Fish or designated as a wild and scenic river. We are reaching out to make you aware of the process and the public comment period, as well as how to access materials, ask questions, request a meeting, or contact us to learn more.

ONRWs are streams, lakes and wetlands that receive enhanced protection against degradation

under New Mexico's Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC (Water Quality Standards or WQS) and the federal Clean Water Act (CWA). Degradation of baseline or existing water quality is not allowed in ONRWs except under limited circumstances such as emergency response actions and activities due to health and safety concerns, restoration activities, or acequia operation, maintenance, and repairs. Pre-existing land use activities can continue if best management practices (BMPs) are implemented to protect water quality, and no new water quality degradation results from the activity. Any future new point source activities or discharges would be reviewed during the permitting process and may be allowed if no degradation would occur to existing water quality.

A water of the state can be designated as an ONRW by filing a petition with the Water Quality Control Commission (WQCC) in accordance with the requirements under 20.6.4.9(B) NMAC and 20.1.6 NMAC. The petition must include the elements prescribed in 20.6.4.9(A)(1)-(6) NMAC, provide a demonstration of eligibility, and set forth sufficient justification for the proposed designation. As with any change to the State's Water Quality Standards, public notice of the petition must be provided, and a public hearing must be held before the WQCC. Following the public hearing, the WQCC deliberates and decides on the petition to designate the water(s) as an ONRW.

The WQCC last designated waters as ONRWs in 2023. Since that time, the SWQB continued to work with several non-profit organizations to identify waters eligible for ONRW nomination resulting in the attached nomination with tables and maps of waters. A GIS map of the proposed waters is also available at https://gis.web.env.nm.gov/oem/?map=swqb. The SWQB is holding a public comment period from July 20 through August 19 and a full copy of the nomination and supporting documents is available on our website (https://www.env.nm.gov/surface-water-quality/wqs/). We also plan on holding at least one public meeting regarding this action. Comments may be submitted by replying to this email or through our Smart Comment Portal (https://nmed.commentinput.com/comment/search). At the conclusion of the public comment period, the SWQB will petition the WQCC for a hearing to designate waters as ONRWs. We anticipate petitioning the WQCC in September for a December 2024 hearing.

If you have any questions or would like to schedule a meeting to discuss this action, please do not hesitate to email or call. If you would like to stay informed regarding this or other SWQB actions or projects, please subscribe to our email list at: https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

Sincerely,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 629-6976

Science | Innovation | Collaboration | Compliance

From:	Baca, Michael, ENV
To:	SM.FS.sfnfpao@usda.gov; zachary.behrens@usda.gov
Cc:	Guevara, Lynette, ENV; Weatherly, Christal, ENV; emison, Roy - FS, NM; ones, Kerry - FS, SANTA FE, NM
Subject:	RE: 2024 ONRW Designation Nominations
Date:	Friday, October 4, 2024 2:05:00 PM
Attachments:	WQCC 24-46 (R) Hearing Notice English.pdf 2024 ONRW Designations Nomination (Petition Draft) .pdf Appendix B1-B4.pdf

Good Afternoon,

As indicated below, the NMED petitioned the WQCC and was granted a hearing on December 10, 2024. Please see the attached public notice and NMED's Events Calendar for full participation details. Rulemaking information and supporting documents are available on our website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Please let me know if you have any questions or concerns.

Regards,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 470-1652

Science | Innovation | Collaboration | Compliance

From: Baca, Michael, ENV
Sent: Friday, July 19, 2024 4:34 PM
To: Jemison, Roy - FS, NM <roy.jemison@usda.gov>; Jones, Kerry - FS, SANTA FE, NM <Kerry.Jones@usda.gov>
Cc: Kamm, Nathaniel, ENV <nathaniel.kamm@env.nm.gov>; Guevara, Lynette, ENV <lynette.guevara@env.nm.gov>
Subject: 2024 ONRW Designation Nominations

Greetings,

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) is nominating certain surface waters of the state as Outstanding National Resource Waters (ONRWs). Many of these waters are in upstream portions of watersheds located within designated Wilderness areas, national or state parks or monuments, wildlife refuges, or they are Special Trout Waters identified by the New Mexico Department of Game and Fish or designated as a wild and scenic river. We are reaching out to make you aware of the process and the public comment period, as well as how to access materials, ask questions, request a meeting, or contact us to learn more.

ONRWs are streams, lakes and wetlands that receive enhanced protection against degradation under New Mexico's Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC (Water Quality Standards or WQS) and the federal Clean Water Act (CWA). Degradation of baseline or existing water quality is not allowed in ONRWs except under limited circumstances such as emergency response actions and activities due to health and safety concerns, restoration activities, or acequia operation, maintenance, and repairs. Pre-existing land use activities can continue if best management practices (BMPs) are implemented to protect water quality, and no new water quality degradation results from the activity. Any future new point source activities or discharges would be reviewed during the permitting process and may be allowed if no degradation would occur to existing water quality.

A water of the state can be designated as an ONRW by filing a petition with the Water Quality Control Commission (WQCC) in accordance with the requirements under 20.6.4.9(B) NMAC and 20.1.6 NMAC. The petition must include the elements prescribed in 20.6.4.9(A)(1)-(6) NMAC, provide a demonstration of eligibility, and set forth sufficient justification for the proposed designation. As with any change to the State's Water Quality Standards, public notice of the petition must be provided, and a public hearing must be held before the WQCC. Following the public hearing, the WQCC deliberates and decides on the petition to designate the water(s) as an ONRW.

The WQCC last designated waters as ONRWs in 2023. Since that time, the SWQB continued to work with several non-profit organizations to identify waters eligible for ONRW nomination resulting in the attached nomination with tables and maps of waters. A GIS map of the proposed waters is also available at https://gis.web.env.nm.gov/oem/?map=swqb. The SWQB is holding a public comment period from July 20 through August 19 and a full copy of the nomination and supporting documents is available on our website (https://www.env.nm.gov/surface-water-quality/wqs/). We also plan on holding at least one public meeting regarding this action. Comments may be submitted by replying to this email or through our Smart Comment Portal (https://nmed.commentinput.com/comment/search). At the conclusion of the public comment period, the SWQB will petition the WQCC for a hearing to designate waters as ONRWs. We anticipate petitioning the WQCC in September for a December 2024 hearing.

If you have any questions or would like to schedule a meeting to discuss this action, please do not hesitate to email or call. If you would like to stay informed regarding this or other SWQB actions or projects, please subscribe to our email list at: https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

Sincerely,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 629-6976

From:	Baca, Michael, ENV
To:	steven_zanoni@nps.gov
Cc:	Kamm, Nathaniel, ENV; Guevara, Lynette, ENV
Subject:	RE: 2024 ONRW Designation Nominations
Date:	Friday, October 4, 2024 2:01:00 PM
Attachments:	WQCC 24-46 (R) Hearing Notice English.pdf 2024 ONRW Designations Nomination (Petition Draft) .pdf Appendix B1-B4.pdf

Good Afternoon,

As indicated below, the NMED petitioned the WQCC and was granted a hearing on December 10, 2024. Please see the attached public notice and NMED's Events Calendar for full participation details. Rulemaking information and supporting documents are available on our website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Please let me know if you have any questions or concerns.

Regards,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 470-1652

Science | Innovation | Collaboration | Compliance

From: Baca, Michael, ENV
Sent: Friday, July 19, 2024 4:34 PM
To: 'steven_zanoni@nps.gov' <steven_zanoni@nps.gov>
Cc: Kamm, Nathaniel, ENV <nathaniel.kamm@env.nm.gov>; Guevara, Lynette, ENV <lynette.guevara@env.nm.gov>
Subject: 2024 ONRW Designation Nominations

Greetings,

The New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB) is nominating certain surface waters of the state as Outstanding National Resource Waters (ONRWs). Many of these waters are in upstream portions of watersheds located within designated Wilderness areas, national or state parks or monuments, wildlife refuges, or they are Special Trout Waters identified by the New Mexico Department of Game and Fish or designated as a wild and scenic river. We are reaching out to make you aware of the process and the public comment period, as well as how to access materials, ask questions, request a meeting, or contact us to learn more. If you are not the correct person to contact for this action, please let me know whom to contact.

ONRWs are streams, lakes and wetlands that receive enhanced protection against degradation under New Mexico's Standards for Interstate and Intrastate Surface Waters, 20.6.4 NMAC (Water Quality Standards or WQS) and the federal Clean Water Act (CWA). Degradation of baseline or existing water quality is not allowed in ONRWs except under limited circumstances such as emergency response actions and activities due to health and safety concerns, restoration activities, or acequia operation, maintenance, and repairs. Pre-existing land use activities can continue if best management practices (BMPs) are implemented to protect water quality, and no new water quality degradation results from the activity. Any future new point source activities or discharges would be reviewed during the permitting process and may be allowed if no degradation would occur to existing water quality.

A water of the state can be designated as an ONRW by filing a petition with the Water Quality Control Commission (WQCC) in accordance with the requirements under 20.6.4.9(B) NMAC and 20.1.6 NMAC. The petition must include the elements prescribed in 20.6.4.9(A)(1)-(6) NMAC, provide a demonstration of eligibility, and set forth sufficient justification for the proposed designation. As with any change to the State's Water Quality Standards, public notice of the petition must be provided, and a public hearing must be held before the WQCC. Following the public hearing, the WQCC deliberates and decides on the petition to designate the water(s) as an ONRW.

The WQCC last designated waters as ONRWs in 2023. Since that time, the SWQB continued to work with several non-profit organizations to identify waters eligible for ONRW nomination resulting in the attached nomination with tables and maps of waters. A GIS map of the proposed waters is also available at https://gis.web.env.nm.gov/oem/?map=swqb. The SWQB is holding a public comment period from July 20 through August 19 and a full copy of the nomination and supporting documents is available on our website (https://www.env.nm.gov/surface-water-quality/wqs/). We also plan on holding at least one public meeting regarding this action. Comments may be submitted by replying to this email or through our Smart Comment Portal (https://nmed.commentinput.com/comment/search). At the conclusion of the public comment period, the SWQB will petition the WQCC for a hearing to designate waters as ONRWs. We anticipate petitioning the WQCC in September for a December 2024 hearing.

If you have any questions or would like to schedule a meeting to discuss this action, please do not hesitate to email or call. If you would like to stay informed regarding this or other SWQB actions or projects, please subscribe to our email list at: https://public.govdelivery.com/accounts/NMED/subscriber/new?topic_id=NMED_4.

Sincerely,

Michael Baca | WQS Coordinator
NMED SWQB | www.env.nm.gov/surface-water-quality/
michael.baca1@env.nm.gov | (505) 629-6976

Science | Innovation | Collaboration | Compliance

October 8, 2024

Via Email

Small Business Regulatory Advisory Council
New Mexico Economic Development Department
1100 S. St. Francis Drive
Santa Fe, New Mexico 87505-4147

Re: Proposed Outstanding National Resource Waters Nomination, 20.6.4 NMAC

Dear Council Members,

The New Mexico Environment Department is proposing a change to 20.6.4 NMAC, to classify surface waters of the state that are designated as special trout waters, or wild and scenic rivers, or located within a wilderness, park, monument or refuge as outstanding national resource waters (ONRWs).

An ONRW is a stream, lake, or wetland that receives special protection against future degradation, under New Mexico's Surface Water Quality Standards, which affords the highest protection of water quality under the State's antidegradation policy and mirrors the protections established under the Clean Water Act and its corresponding regulations.

The Department held a public comment period on the ONRW nomination between July 20-August 19, 2024, and received over 700 comments, primarily in support of the proposed nomination. The Department then petitioned the Water Quality Control Commission for a hearing, which was granted and is scheduled for December 10, 2024. Please see the attached public notice for participation details in both English and Spanish. Rulemaking information and supporting documents are available on the Department's website at https://www.env.nm.gov/surface-water-quality/2024onrw/.

Pursuant to Section 14-4A-4 of the New Mexico Small Business Regulatory Relief Act, I have included a copy of the entire rule, including the proposed regulatory change at 20.6.4.9(D)8-11 NMAC, as proposed in the petition to the Water Quality Control Commission. Note that NMED may amend this proposal as the rulemaking process moves forward. Please let me know if SBRAC has any concerns or questions regarding the proposed rule change or would like to have further discussions with NMED concerning this ONRW.

Sincerely,

Christal Weatherly

Christal Weatherly
Assistant General Counsel

New Mexico Environment Department
Surface Water Quality Bureau

Standards and Outreach Team
2024 Outstanding National Resource Water Designation Nominations
October 29, 2024

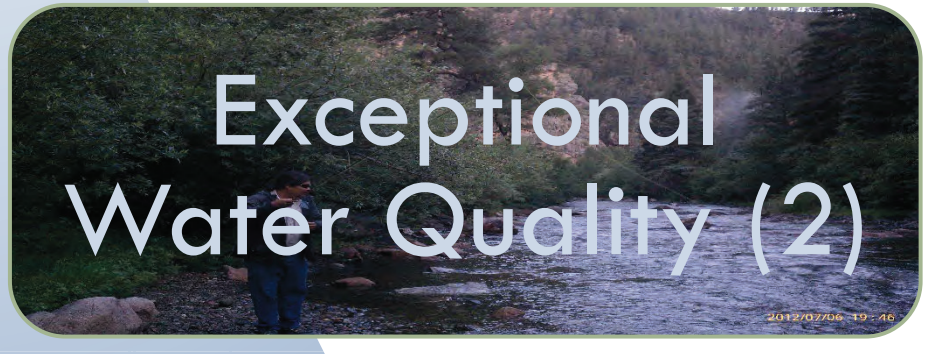
Photo credit Rhett Zyla #IamNMED

NMED Exhibit 17

What is an Outstanding National Resource Water (ONRW)?

- Designated by the Water Quality Control Commission (WQCC)
  - Public Comment and Rulemaking process
  - Designated uses and water quality criteria remain unchanged
- Highest Level of Water Quality Protection
  - i.e., CWA Antidegradation - Tier 3 Water
- EPA acknowledges and supports protections

Antidegradation (Tier)



Outstanding National Resource Waters

Prohibited

- Discharges that would cause degradation to ONRW
- Restoration activities that would not result in enhanced chemical, physical or biological integrity of the ONRW
- Temporary and short-term activities not necessary for public health and safety

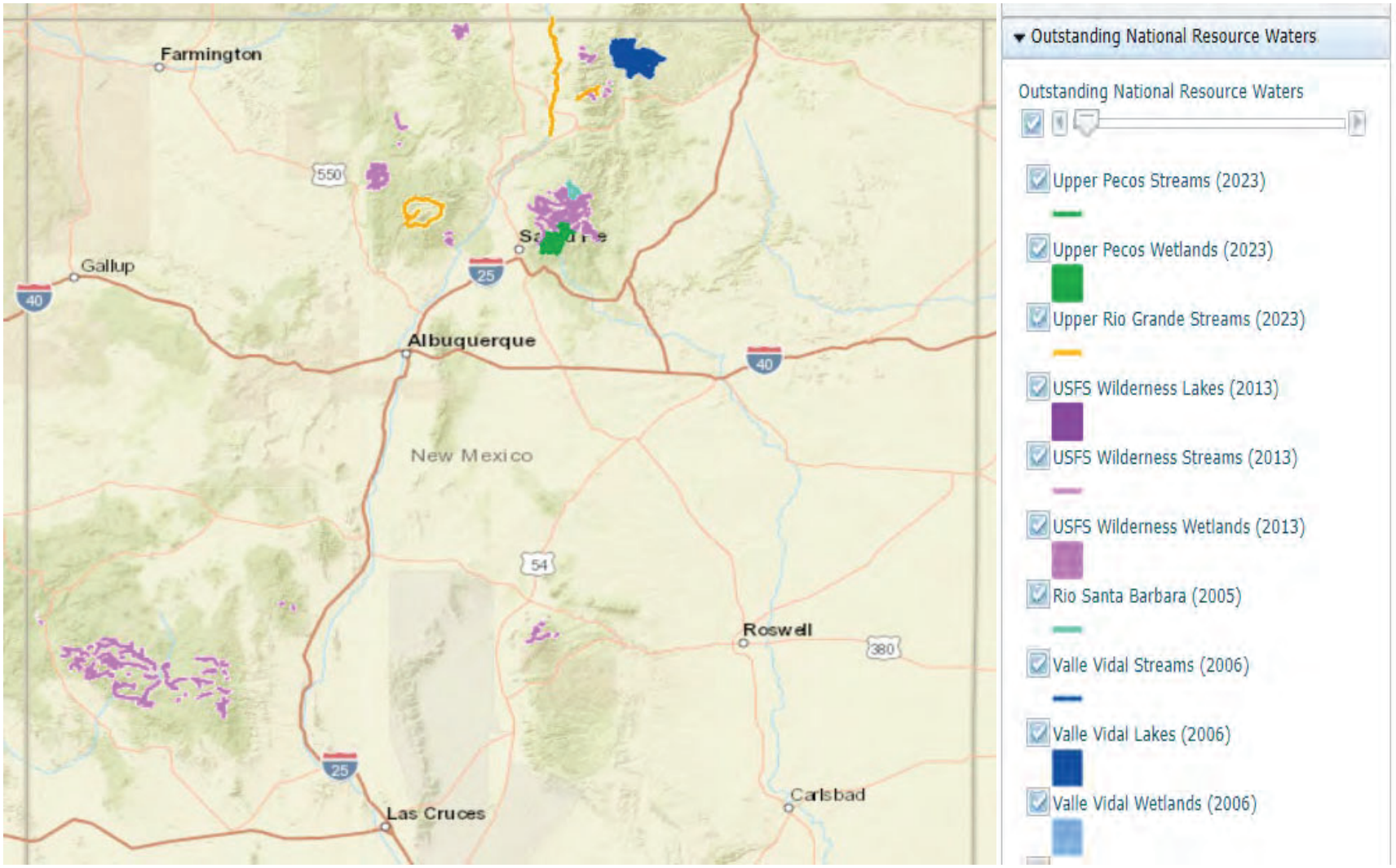
Permitted

- Discharges that do not degrade the ONRW (existing or baseline conditions)
- Activities that will result in restoration of the chemical, physical or biological integrity of the ONRW
- Temporary and short-term activities that are necessary to accommodate public health or safety
- Pre-existing land use activities that are controlled by best management practices
- Acequia operation, maintenance and repairs

Nominating an ONRW

- Any person may nominate an ONRW by petitioning the WQCC
- Can be petitioned at any time
- ONRW Designation is a rulemaking
- Must include elements and demonstration (20.6.4.9 NMAC)

Previously Designated ONRWs



NMED Exhibit 17

Outstanding National Resource Waters

Eligible Criteria (20.6.4.9(B) NMAC):

- Beneficial to the State

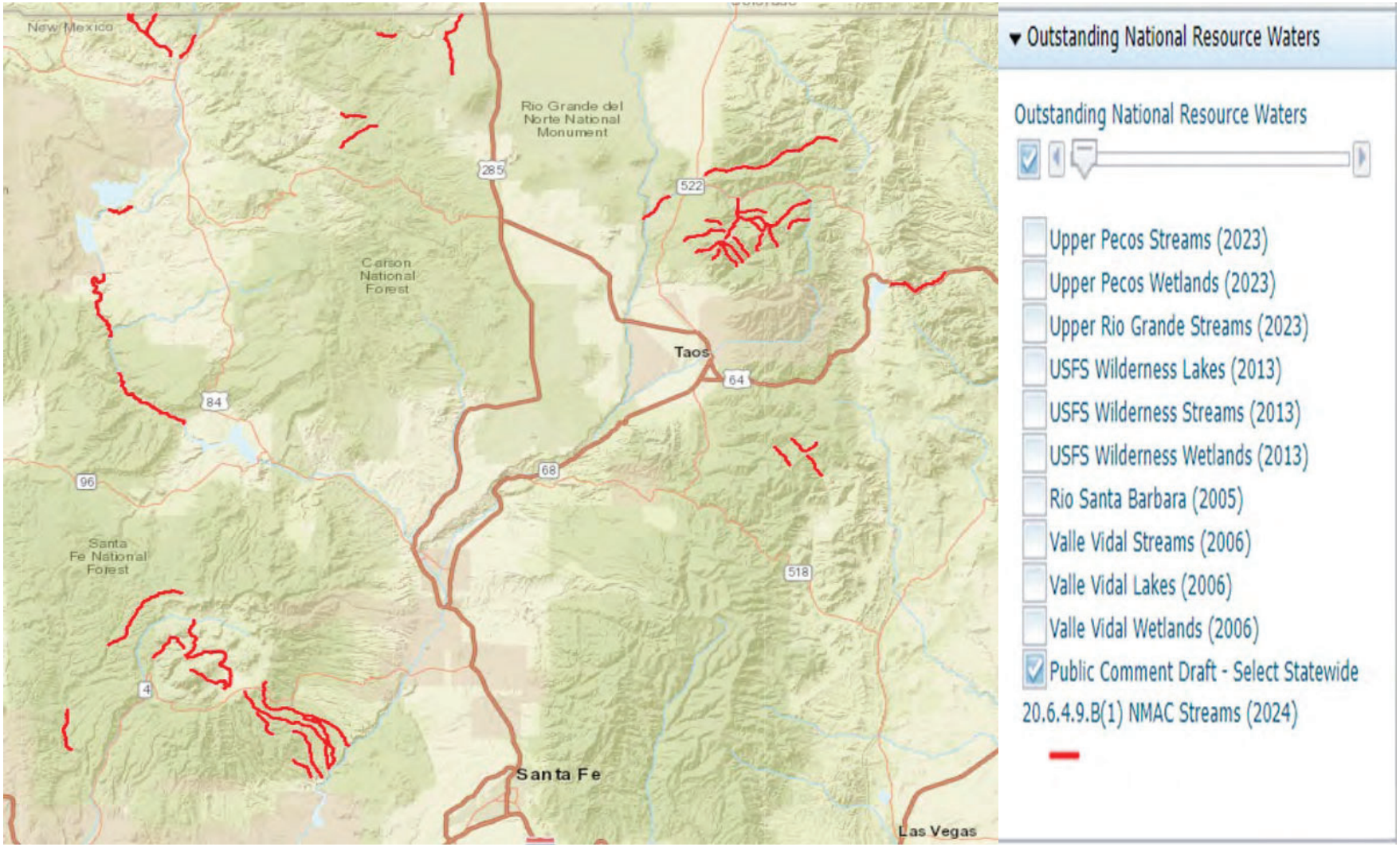
  And **One** of the Following

- **Special Designation – This Effort**
  - State Special Trout Water
  - National or State Park
  - National or State Monument
  - National or State Wildlife Refuge
  - Designated Wilderness Area
  - Designated Wild and Scenic River
- Exceptional Ecological or Recreational Significance
- Exceptional Water Quality
  - not modified by anthropogenic activities

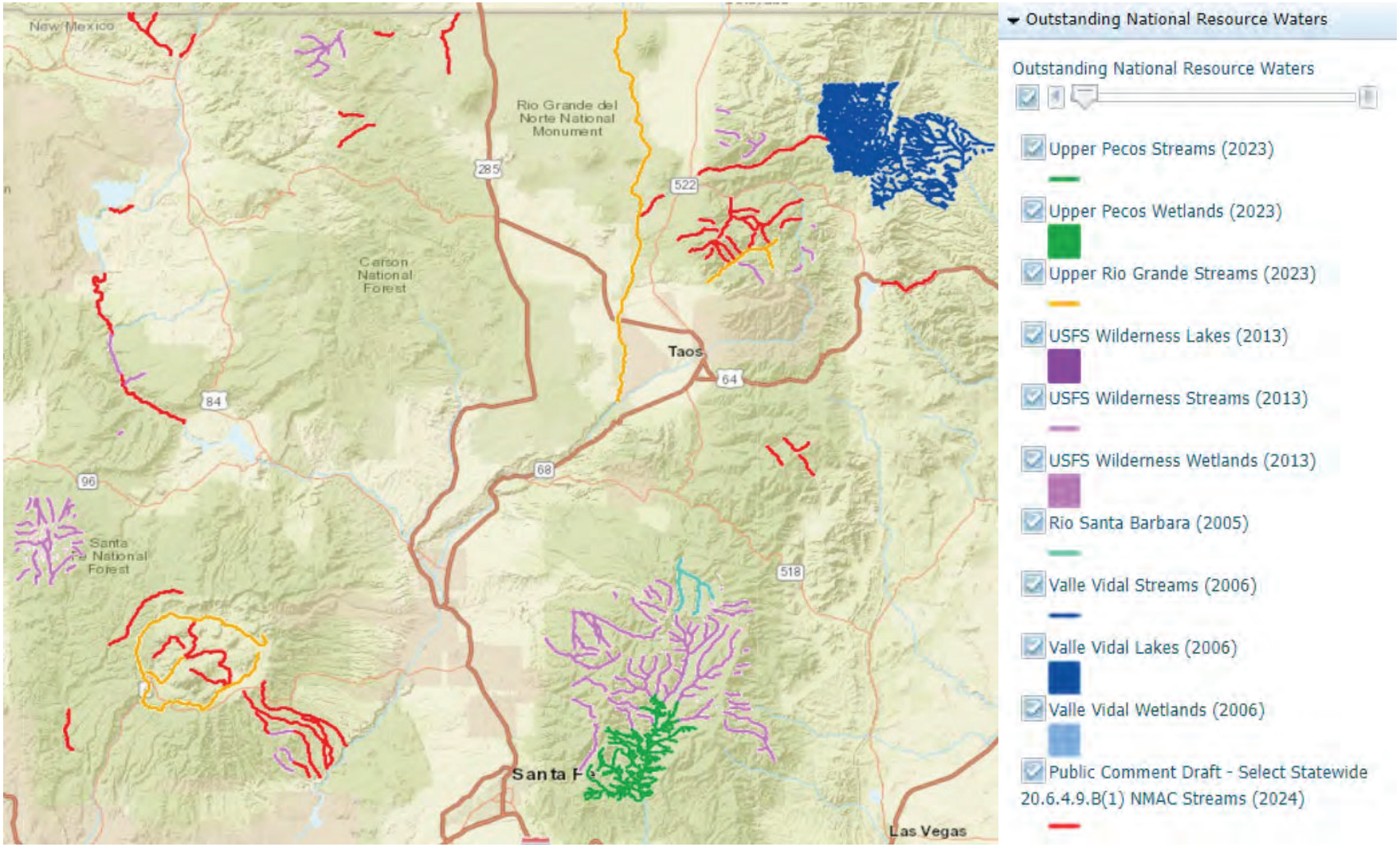
Nomination (20.6.4.9(A) NMAC):

- Map(s) (Appendix A)
- Criteria Demonstrated through Evidence Based on Scientific Principles (Nomination)
- Activities that Might Reduce Water Quality (Nomination)
- Additional Evidence to Substantiate the Designation (Nomination)
- Water Quality Data to Establish Baseline (Appendix B)
- Affidavit of Public Notice of the Petition (Appendix D)

2024 ONRW Designation Nomination



2024 ONRW Designation Nominations



NMED Exhibit 17

How You Can Participate

Ask questions, or provide input and feedback:

- Do you support or oppose the nominated waters for ONRW designation?
- Provide anecdotal or scientific water quality information
- Are you familiar with or visited the nominated waters in the past?
- Do they hold special significance for you or your family?
- Anything else you think should be considered?

- Provide Public Comment to WQCC
  - Public Comment Portal
    - Deadline = December 9
- Attend WQCC Hearing
  - Provide oral or written comment
    - Deadline = Through the end of the hearing
    - December 9 – Dedicated Public Comment
- Provide Technical Testimony
  - Scientific, Engineering, Economic, or other specialized topics.
    - Does not include legal arguments, general comments, or statements of policy or position
  - Instructions provided in the public notice
  - Deadline for Notice of Intent = November 20

Where Can I Find Information?

SWQB Webpages:

https://www.env.nm.gov/surface-water-quality/wqs/

https://www.env.nm.gov/surface-water-quality/2024onrw/

https://www.env.nm.gov/surface-water-quality/onrws/

https://gis.web.env.nm.gov/oem/?map=swqb

NMED Webpages:

https://www.env.nm.gov/events-calendar/

https://nmed.commentinput.com/comment/search

WQCC Webpages:

https://www.env.nm.gov/opf/water-quality-control-commission/

https://www.env.nm.gov/opf/docketed-matters/

12

Smart Comment Demonstration

https://nmed.commentinput.com/comment/search

13

SWQB OpenEnviroMap Demo

https://gis.web.env.nm.gov/oem/?map=swqb

Questions?
For Additional Information Contact

Standards, Planning & Reporting Team

Surface Water Quality Bureau

New Mexico Environment Department

michael.baca1@env.nm.gov or 505.470.1652

https://www.env.nm.gov/surface-water-quality/2024onrw

LYNETTE STEVENS GUEVARA

Summary of Qualifications:
Thirty+ years of experience in natural resources protection and management with emphasis on water quality monitoring, assessment, and restoration. Major strengths include project management and collaboration, data management and interpretation, technical report preparation and editing, and developing tools and techniques to increase efficiency.

Professional Experience:

11/22 – present New Mexico Environment Dept. Surface Water Quality Bureau, Santa Fe, NM

Monitoring, Assessment, and Standards Section Program Manager

- Managed a group of fourteen technical staff including supervising three team leaders to:
    - Monitor, assess, and report on surface water quality conditions around New Mexico
    - Develop, revise, and maintain New Mexico's related surface water quality standards
    - Develop total maximum daily load (TMDL) planning documents to address impairments
    - Provide related assistance and support to other Bureau sections and stakeholders as needed
- Complete program management activities including grant writing, funding allocations, hiring, and performance reviews
- Prepare and implement EPA grants applications and revisions, associated workplans, and budgets designed to achieve Department and Bureau goals
- Actively participate on various EPA and state counterpart workgroups regarding water quality policy, implementation, guidance, and strategies to achieve Clean Water Act goals and deliverables
- Actively collaborate with other NMED Water Protection Division bureau management and staff on collaborative projects and initiatives to move the Department forward

11/20- 10/22 New Mexico Environment Dept. Ground Water Quality Bureau, Santa Fe, NM

Pollution Prevention Section Reuse Team Leader

- Serve as in-house expert for above-ground use of reclaimed domestic wastewater and aquifer recovery and storage permits to encourage successful implementation of water reuse projects
- Maintain individual groundwater discharge permit case load, provide review and comment on all permits with reuse components, and contribute to the oversight of all discharge permits managed by the Section
- Research and propose IT modernization tools to provide e-Permitting and e-Reporting tools to increase efficiency, compliance, and transparency
- Manage CWA 319 grant including workplans, budgeting, and reporting
- Hire and supervise and manage a team of three technical staff

08/01 – 11/20 New Mexico Environment Dept. Surface Water Quality Bureau, Santa Fe, NM

State on New Mexico Clean Water Act §303(d)/ §305(b) Assessment Coordinator (2001-2020)
Project management duties performed to develop and maintain the biennial Clean Water Act §303(d)/ §305(b) Integrated Report and List to Congress:

- Collated and assessed chemical, physical, and biological data to determine surface water quality impairments based on current water quality standards in 20.6.4 NMAC
- Developed and applied assessment protocols used to determine water quality attainment
- Developed automated assessment procedures in R statistical programming language
- Collaborated with NMED IT and USEPA Office of Water to merge and improve NMED inhouse and

national water quality monitoring and assessment databases
- Presented to the NM Water Quality Control Commission (WQCC) and EPA Region 6 for approval
- Prepared and presented testimony to the NM WQCC regarding Outstanding National Resource Waters (ONRW) nominations in the Valle Vidal and to defend impairment determinations
- Participated in various EPA and state counterpart workgroups and national conferences regarding Clean Water Act policy, procedures, and deliverables
- Collaborated with the USDA National Sedimentation Lab to develop sedimentation assessment protocols for the San Juan River basin
- Collaborated with the EPA Office of Research and Development and EPA Region 6 to develop sedimentation and nutrient assessment protocols and monitoring techniques

Monitoring and Assessment Section Program Manager (2004-2006)
- Managed a group of twelve technical staff including supervising three team leaders in order to monitor, assess, and report on surface water quality conditions around New Mexico
- Participated in grant writing, funding allocations, hiring, and performance reviews
- Developed Requests for Proposals and participated in selection of funding recipients
- Prepared and implemented strategic plans, associated workplans, and budgets designed to achieve Department and Bureau goals through implementation of several EPA grants
- Developed and presented budget requests for NMED and EPA to meet program goals

Monitoring and Assessment Section TMDL, GIS and Database Team Leader (2001-2003)
- Supervised and managed three technical staff to develop total maximum daily load (TMDL) water quality planning documents, GIS tools, and water quality databases for the Section
- Participated in hiring, performance reviews, and completing team goals to support the Bureau.
- Developed team timelines and specific TMDL, GIS, and database tasks and products needed to accomplish goals, and participated in the evolution of the Monitoring and Assessment Section
- Developed, public noticed, and presented TMDL water quality planning documents to stakeholders and the NM WQCC to address identified water quality impairments

05/97 – 08/01 Navajo Nation, Window Rock, AZ

Hydrologist II, Navajo Nation EPA Water Quality Program (02/99 -08/01)
- Project management, including the proposal and implementation of watershed restoration projects; designing monitoring networks; preparing outreach materials, presentations, and technical reports; and coordinating activities with federal tribal and federal land management partners
- Developed bioassessment monitoring program, associated quality assurance project plans, and provided training to staff and students
- Coordinated surface water quality sampling, interpreted data, and prepared summary reports

Hydrologist II/Supervisor, Navajo Nation Water Management Branch (05/97 -02/99)
- Supervised and managed stream gage and watershed restoration staff, including hiring, training, evaluations, budgeting, and ensuring deliverables were met
- Project management of watershed restoration projects with tribal and federal land management partners, including the development of RFPs, contracts, workplans, work schedules, permits, project budgets, and monitoring networks
- Maintained nine active continuous stream gages - coordinated with USGS, ordered needed equipment, surveyed benchmarks, measured stream flow, developed rating curves, and assisted with water monitoring design of irrigation canals

Education:

Bachelor of Business Administration (Marketing), Gonzaga University, Spokane, WA

Post-baccalaureate coursework at University of Washington and Shoreline CC, Seattle, WA
Master of Science (Watershed Science), Colorado State University, Fort Collins, CO

Computer Skills:

MS Office, Oracle database design team, SSTEMP modeling, RStudio programming, ArcGIS, website maintenance

Interests / Hobbies:

Founding treasurer of Wild Sage Co-op (now La Montanita) Gallup branch, past Parent-Teacher-Kid Association board member, bike-to-school and community trails advocate, mountain biking, skiing, hiking

Publications and Presentations:

Guevara, L. 2003. The challenges and opportunities of implementing TMDLs in states with no instream flow program. In proceedings of *ASAE Conference on Emerging TMDL Issues*. Albuquerque, NM.

Guevara, L. 2012. Determining sediment impairment in New Mexico using biologic and geomorphic sediment thresholds. In proceedings of *National Water Quality Monitoring Conference*. Portland, OR. Available at: http://acwi.gov/monitoring/conference/2012/.

Hughes, R., *et. al*. 2022. Biological assessment of western USA sand-bed rivers based on modeling historical and current fish and macroinvertebrate data. River Research and Applications 38: Issue 4, 639-656. Available at: https://onlinelibrary.wiley.com/doi/10.1002/rra.3929.

Irwin, R. and L. Stevens. 1996. Psuedoreplication issues versus hypothesis testing and field study designs: Alternative study designs and statistical analyses help prevent data misinterpretation. Park Science. Spring 1996. National Park Service, Denver, CO.

Irwin, R.; Stevens, L.; and M. Van Mouwerik, M. 1998. Environmental Contaminants Encyclopedia: Integrated Resource Management Application. National Park Service, Ft. Collins, CO. Available at: Environmental Contaminants Encyclopedia. Available at: https://irma.nps.gov/DataStore/Reference/Profile/2257033.

Jessup, B.K., D. Eib, L. Guevara, J. Hogan, F. John, S. Joseph, P. Kaufmann, and A. Kosfiszer. 2010. Sediment in New Mexico Streams: Existing conditions and potential benchmarks. Prepared for the EPA Region 6, Dallas, TX and the New Mexico Environment Department, Santa Fe, NM. Available at: http://www.nmenv.state.nm.us/swqb/Sedimentation/.

Jessup, B.K., P. Kaufmann, F. John, L. Guevara, and S. Joseph. 2014. Bedded Sediment Conditions and Macroinvertebrate Responses in New Mexico Streams: A First Step in Establishing Sediment Criteria. Journal of American Water Resources Association. July. Volume 50, Issue 6.

Stevens, L.I. 1996. Benthic macroinvertebrates as indicators of water quality. Master's thesis. Department of Earth Resources, Colorado State University, Ft. Collins, CO.

Viera, N., W. Clements, L. Guevara, and B. Jacobs. 2004. Resistance and resilience of stream insect communities to repeated hydrologic disturbances after a wildfire. Freshwater Biology 49: 1243-1259.

Shelly Lemon

4710 Viento Del Norte
Santa Fe, NM
87507
505-363-2659
shellylemon@hotmail.com

EDUCATION

M.S. Hydrology
University of Arizona – Tucson, AZ

B.S. Biology
Minor in Chemistry/Math
University of Arizona – Tucson, AZ

PROFESSIONAL EXPERIENCE

Bureau Chief – Surface Water Quality Bureau, NM Environment Department

August 2016 – Present NMED – Surface Water Quality Bureau, Santa Fe, NM

- Manage the Surface Water Quality Bureau of the New Mexico Environment Department by planning, setting, and achieving goals set forth in the Department's Strategic Plan, EPA approved work plans, and program planning documents.
- Contribute to and implement Department strategic goals, objectives, and actions.
- Collaborate with the public, stakeholders, and decision makers (legislators, Governor's Office, etc.) to ensure that the goals of the Department are achieved.
- Oversee an operating budget of approximately $11 million dollars that requires administration of general funds, special revenue funds, interagency transfers, and federal grants, including oversight of the Bureau's grants and contracts management.
- Develop, tailor, and implement administrative, programmatic, and financial operation procedures to ensure accountability and facilitate successful completion of projects.
- Directly or indirectly supervise 42 technical and administrative staff including hiring, work performance evaluations, and discipline, if needed. Ensure performance goals are met and activities are conducted in accordance with applicable statutes, policies, rules, permits, orders, and grant commitments.
- Develop and respond to legislative proposals and develop regulatory initiatives to promote and enhance surface water quality protections in New Mexico.
- Provide leadership and substantive expertise on technical and policy working groups, particularly in support of Department priority initiatives.
- Periodically meet with managers and staff to evaluate program effectiveness, identify strengths, weaknesses, and opportunities, and develop strategies to improve Bureau programmatic operating functions.
- Facilitate coordination between EPA, and other public and private entities involved in surface water quality protection, management, and regulation.
- Ensure that information requests are responded to in a timely and professional manner.
- Oversee short-term investigations in response to citizen complaints, accidental spills, and other emergencies.
- Work with the Bureau's webmaster to create, update, and maintain webpages, resources, and links associated with activities of the Bureau.

Program Manager for Monitoring, Assessment and Standards

June 2015 – October 2016 NMED – Surface Water Quality Bureau, Santa Fe, NM

- Managed the Surface Water Quality Bureau's monitoring, assessment, and standards programs including writing, submitting, and managing the Clean Water Act Section 106 grants on an annual basis with semi-annual updates.
- Oversaw and evaluated the performance of 15 staff.
- Participated in the development and revision of state surface water quality standards and regulations including the 2013 Triennial Review presented during the Water Quality Control Commission's October 2015 hearing and subsequent deliberations.

- Planned water quality surveys throughout New Mexico that met budgetary constraints and data quality objectives.
- Reviewed, integrated, and assessed data for use in Clean Water Act required activities.
- Prepared water quality reports (e.g. watershed survey summaries, use attainability analyses, TMDLs, etc.) for the public and as a deliverable to EPA.
- Reviewed, updated, and developed protocols to standardize tasks including sample collection, data assessment, and report writing.
- Represented the Bureau at meetings, professional conferences, workshops, and Water Quality Control Commission meetings.
- Conducted short-term investigations in response to citizen complaints, accidental spills, and other emergencies.
- Maintained analytical results in the Bureau's water quality database, prepared retrievals of stored data, and scheduled uploads of data to EPA's national database.
- Worked with the Bureau's webmaster to create, update, and maintain webpages, resources, and links associated with activities of the Section and Bureau.

Municipal Team Leader – Point Source Regulation Section

March 2014 – May 2015 NMED – Surface Water Quality Bureau, Santa Fe, NM

- Reviewed and evaluated the performance of the Municipal Team by providing meaningful, frequent, and ongoing input on work performance and prioritization of workloads.
- Cooperated with and supported the efforts of other Bureau sections. Facilitated positive working relationships with other state and federal agencies, stakeholders, and cooperators involved in National Pollutant Discharge Elimination System (NPDES) permitting activities.
- Reviewed, analyzed data, and prepared comments on NPDES permits submitted to the Bureau for certification under Section 401 of the Federal Clean Water Act. Ensured consistency in NPDES permit certifications.
- Investigated regulated facilities for compliance/non-compliance with applicable state and federal surface water quality laws, standards, and regulations, and prepared and submitted comprehensive inspection reports that documented the status of the facilities regarding the federal NPDES permit program and regulations.
- Collected accurate and detailed information and useable evidence during site investigations to supplement information contained in NPDES permits, to evaluate violations of state surface water quality standards and regulations, and to assist EPA with enforcement.
- Reviewed, analyzed, and prepared well-written, clear, concise, and factual comments on proposed or new amended federal and state agency policies and procedures, regulations, and technical recommendations.
- Developed standard operating procedures for wastewater sampling and compliance sampling. Evaluated and acquired sampling equipment necessary for monitoring NPDES permitted facilities.

Reviewed, analyzed data, and prepared comments relevant to regulatory requirements and surface water quality studies and findings on Environmental Assessments (EA) and Environmental Impact Statements (EIS) submitted to SWQB for review.

Acting Program Manager for Monitoring, Assessment and Standards

July 2012 – July 2013 NMED – Surface Water Quality Bureau, Santa Fe, NM

- Managed the Surface Water Quality Bureau's monitoring, assessment, and standards programs including writing, submitting, and managing the Clean Water Act Section 106 Monitoring Initiative grant on an annual basis with semi-annual updates.
- Oversaw and evaluated the performance of 15 staff.
- Participated in the development and revision of state surface water quality standards and regulations.

- Planned water quality surveys throughout New Mexico that met budgetary constraints and data quality objectives.
- Reviewed, integrated, and assessed data for use in Clean Water Act required activities.
- Prepared water quality reports (e.g. watershed survey summaries, use attainability analyses, TMDLs, etc.) for the public and as a deliverable to EPA.
- Developed protocols to standardize tasks including sample collection, data assessment, and report writing.
- Represented the Bureau at meetings, professional conferences, workshops, and Water Quality Control Commission meetings.
- Conducted short-term investigations in response to citizen complaints, accidental spills, and other emergencies.
- Maintained analytical results in the Bureau's water quality database, prepared retrievals of stored data, and scheduled uploads of data to the EPA's national database.
- Worked with the Bureau's webmaster to create, update, and maintain webpages, resources, and links associated with activities of the Section and Bureau.

Monitoring Team Leader – Monitoring, Assessment and Standards

April 2011 – July 2013 NMED – Surface Water Quality Bureau, Santa Fe, NM

- Managed the statewide ambient monitoring program for the Bureau. The Monitoring Team is responsible for collecting water quality data and associated flow measurements in surface waters of the state. Data collected by the Monitoring Team is used to determine if the water body meets water quality standards and ensure designated uses are supported.
- Oversaw and evaluated the performance of 5 staff.
- Planned water quality surveys throughout New Mexico that met budgetary constraints and data quality objectives.
- Ensured adequate and appropriate data were collected to support a variety of Clean Water Act required activities (e.g., water quality standards amendments, TMDL development, NPDES permits, nonpoint source monitoring effectiveness, etc.).
- Prepared watershed survey summaries for the public and as a deliverable to EPA.
- Developed protocols to standardize tasks including sample collection, data assessment, and report writing. Specifically, responsible for developing, updating, and revising the *Field Sampling Plan* and *Physical Habitat* standard operating procedures.
- Maintained analytical results in the Bureau's water quality database, prepared retrievals of stored data, and scheduled uploads of data to EPA's national database.
- Conducted short-term investigations in response to citizen complaints, accidental spills, and other emergencies.
- Worked with the Bureau's webmaster to create, update, and maintain monitoring webpages, resources, and links.
- Represented the Bureau at meetings, professional conferences, and workshops.

Nutrients and Lakes Team Leader & TMDL Writer – Monitoring and Assessment

August 2004 – April 2011 NMED – Surface Water Quality Bureau, Santa Fe, NM

- Prepared watershed planning documents (i.e., TMDLs) to improve water quality and conducted public meetings to address stakeholder comments and concerns.
- Presented the final draft documents to the NM Water Quality Control Commission for inclusion and adoption into the State's Water Quality Management Plan.
- Oversaw the nutrient criteria development program for streams, rivers, and lakes.
- Headed efforts in hydrology and monitoring design to develop a *Hydrology Protocol* that distinguishes between ephemeral, intermittent, and perennial waters in New Mexico and to create a practical yet thorough 10-year monitoring and assessment strategy for the Bureau.
- Managed and evaluated the performance of 3 technical staff.

Graduate Research Assistant – Sustainability of semi-Arid Hydrology and Riparian Areas

January 2002 – January 2004 SAHRA – University of Arizona, Tucson, AZ

- Designed, coordinated, and implemented a hydrologic research project to determine the influence of land use and regional hydrology on surface water quality in a semi-arid stream.
- Organized and prepared an objective, scientifically sound thesis describing the methods, results, conclusions, and management implications of this research.
- Co-authored the journal article, "Spatial variability in dissolved organic matter and inorganic nitrogen concentrations in a semiarid stream, San Pedro River, Arizona" for the *Journal of Geophysical Research* Volume: 112, Issue: G3.

Graduate Teaching Assistant

January 2002 – December 2003 University of Arizona, Tucson, AZ

- Assisted in the instruction of an "Introduction to Global Change" class for undergraduates and a "Fundamentals of Water Quality" class for graduates.
- Developed hands-on activities to enhance global awareness and environmental stewardship.
- Designed and facilitated a final project to encourage critical analysis and informed decision-making.

OTHER EXPERIENCE

Middle School Science Teacher | Academy of Technology and the Classics, Santa Fe, NM
August 2013 – March 2014

High School Science Teacher | Chino Valley High School, Chino Valley, AZ
August 1998 – June 2001

Teacher Fellow | Earth Watch Institute - Bellavista Preserve, Ecuador
Summer 1999 (2 weeks)

Science Instructor | Nizhoni - Upward Bound Summer Academy, Flagstaff, AZ
Summer 1997, 1998 (6 weeks/Summer)

Naturalist | San Joaquin Outdoor Education, La Honda, CA
February 1995 – June 1995, August 1995 – June 1996

Science Instructor & Dive Master | Catalina Island Marine Institute, Avalon, CA
June 1993 – January 1995; Summer 1994, 1995, 1996 (10 week/Summer)