STATE OF NEW MEXICO
WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF THE PETITION FOR PROPOSED AMENDMENTS TO 20.6.4.9 NMAC, DESIGNATION OF WATERS OF THE UPPER PECOS WATERSHED AS OUTSTANDING NATIONAL RESOURCE WATERS

No. WQCC 20-18 (R)

San Miguel County, the Village of Pecos, the New Mexico Acequia Association, Molino de la Isla Organics LLC, and the Upper Pecos Watershed Association,

Petitioners.

PETITIONERS' NOTICE OF INTENT TO SUBMIT REBUTTAL TESTIMONY

Petitioners San Miguel County, the Village of Pecos, the New Mexico Acequia Association, Molino de la Isla Organics LLC, and the Upper Pecos Watershed Association (collectively, "Petitioners") hereby file this Notice of Intent to Submit Rebuttal Testimony in this matter pursuant to 20.1.6 NMAC and the Procedural Order and Hearing Guidelines issued by the Hearing Officer. In accordance with the rules and order, Petitioners provide the following information:

1. Identify the person or entity for whom the witness(es) will testify:

The witness identified in this notice of intent appears on behalf of the Petitioners and their Petition to designate the waters of the Upper Pecos Watershed as Outstanding National Resource Waters.

2. Identify each technical witness the person or entity intends to present, and state the qualifications of that witness, including a description of their education and work background:

Petitioners identify the following technical witness:

MS. RACHEL CONN: Ms. Conn is Projects Director for Amigos Bravos. Ms. Conn's qualifications and resume describing her education and work background are attached in Petitioners' Exhibit 23. Ms. Conn's full written rebuttal testimony is attached in Petitioners' Exhibit 22.

3. Attach the full rebuttal testimony of each technical witness, which shall include an express basis for all expert opinion offered:

MS. RACHEL CONN: See attached Petitioners' Exhibit 22.

4. Include the text of any recommended modifications to the proposed regulatory change:

The text of recommended modifications to the proposed regulatory change is included as Petitioners' Amended Exhibit 1.

5. Identify and attach all rebuttal exhibits to be offered by the person(s) at the hearing:

Exhibit	Description
1 (as amended)	Proposed Amendments to 20.6.4.9 NMAC (amended)
6 (as amended)	Excel Chart Demonstrating Nominated Waters Meet ONRW Criteria (amended)
22	Technical Testimony of Rachel Conn
23	Resume of Rachel Conn
24	Map of Nominated Perennial, Ephemeral, and Intermittent Waters
25	Map of Nominated Wetlands
26	Excel Chart Documenting Geographic Details of Nominated Perennial, Ephemeral, and Intermittent Waters
27	Excel Chart Documenting Geographic Details of Nominated Wetlands
28	Valle Vidal ONRW Proceedings – Petition
29	Valle Vidal ONRW Proceedings – Transcript (12/13/2005)
30	Valle Vidal ONRW Proceedings – Transcript (12/14/2005)
31	Valle Vidal ONRW Proceedings – Deliberations (12/14/2005)
32	Valle Vidal ONRW Proceedings – WQCC Statement of Reasons
33	Testimony of Rebecca Roose, NMED Water Protection Division Director, to the United States Senate Committee on Environment and Public Works (Sept. 2020)
34	U.S. Environmental Protection Agency Report: *The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest* (Nov. 2008)

35	NMED, Surface Water Quality Bureau, Wetlands Program: *New Mexico Wetlands Technical Guide #1 – Wetland Functions* (Dec. 2012)

Respectfully submitted on this 24th day of March, 2021.

Kelly E. Nokes

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Attorneys for Petitioners

STATE OF NEW MEXICO
WATER QUALITY CONTROL COMMISSION

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No. WQCC 20-18 (R)

San Miguel County, the Village of Pecos, the New Mexico Acequia Association, Molino de la Isla Organics LLC, and the Upper Pecos Watershed Association,

Petitioners.

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing Notice of Intent to Submit Rebuttal Testimony, and accompanying Exhibits were served by email to all parties on March 24, 2021.

Respectfully Submitted,

Kelly E. Nokes

Kelly E. Nokes

PETITIONERS' EXHIBIT

1 (As Amended)

*Note Petitioners' proposed changes are in purple text, on top of NMED's proposed regulatory text, which is in red.

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 the guidelines for water quality control commission regulation hearings. 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 Pecos Headwaters basin:

(a) The Pecos river and all identified tributaries and wetlands from Dalton Canyon creek to the Pecos wilderness boundary;

(b) In the Dry Gulch-Pecos river subbasin, Dalton Canyon creek and all identified tributaries and wetlands from the Pecos river upstream to the headwaters, Wild Horse creek and all idenitifed tributaries from Dalton Canyon creek upstream to the headwaters, Macho Canyon creek and all identified tributaries from the Pecos river upstream to the headwaters and Sawyer creek and all identified tributaries from the Pecos river upstream to the headwaters;

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

(d) In the Rio Mora subbasin, Rio Mora and all identified tributaries from the Pecos river upstream to the Pecos wilderness boundary and Bear creek and all identified tributaries from the Rio Mora upstream to the Pecos wilderness boundary;

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

(f) In the Panchuela creek subbasin, Panchuela creek and all identified tributaries and wetlands from the Pecos river upstream to the Pecos wilderness boundary.

(g) The unnamed tributaries and wetlands designated are identified on the *Maps and List of Streams and Wetlands Within the Upper Pecos Watershed Designated as Outstanding National Resource Waters* published at the New Mexico state library and available on the department's website.

[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 XX/XX/XXXX]

PETITIONERS' EXHIBIT

6 (As Amended)

UPPER PECOS ONRW CRITERIA

*** Indicates Criteria Met (Note only NM Benefit plus one other column required)**

				Significant Attribute				
Waterbody/reach	**Stream miles and wetland acres (exhibit 26 and 27)**	**Description (Exhibit 26 and 27)**	**NM Benefit (p.11-17 of petition and Exhibits 3, 7, and 10)**	**State special trout water (p.29 of petition and exhibit 3)**	**Wild and Scenic River (p.27-28 and Exhibit 3)**	**Exceptional recreational significance (p.17-18, Appx.B and Exhibit 12)**	**Exceptional ecological significance (p. 19-26 , Appx.D of petition and Exhibits 3, 13, 22, 33, 34, and 35)**	**Water Quality equal to or better than numeric criteria (p.30-38 and Exhibit 3)**
Bear Creek and Bear Creek Trib-1	**2.41 stream miles**	From confluence with the Rio Mora to the Wilderness boundary, including identified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)	Upstream of State Special Trout Waters		Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 6 SERI 93 angler days (2000-1) Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits. 14 SGCN Peregrine Falcon - threatened (state)	NOT ASSESSED
Carpenter Creek	**0.32 stream miles**	From confluence with the Pecos River to the Wilderness boundary, including identified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)	Upstream of State Special Trout Waters		Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 7 SERI Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits. 16 SGCN Peregrine Falcon - threatened (state) Plants - 5 special status, 2 state endangered	NOT ASSESSED
Dalton Canyon Creek; Dalton Canyon Creek Trib- 1–11; Dalton Canyon Creek Freshwater Emergent Wetlands 2a, 2b, 2c; and Dalton Canyon Creek Freshwater Forested/Shrub Wetland 3	**23.71 stream miles; 21.57 wetland acres**	From confluence with the Pecos River to the headwaters, including identified tributaries and wetlands	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 5 SERI Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs, wetlands, and mainstem also detailed in Exhibits. Rio Grande Cutthroat Trout 20 SGCN Mexican Spotted Owl habitat - threatened (ESA)	MIXED YES - PC NO - HQColdWAL, specific conductance (2012)

UPPER PECOS ONRW CRITERIA

*** Indicates Criteria Met (Note only NM Benefit plus one other column required)**

				Significant Attribute				
Waterbody/reach	**Stream miles and wetland acres (exhibit 26 and 27)**	**Description (Exhibit 26 and 27)**	**NM Benefit (p.11-17 of petition and Exhibits 3, 7, and 10)**	**State special trout water (p.29 of petition and exhibit 3)**	**Wild and Scenic River (p.27-28 and Exhibit 3)**	**Exceptional recreational significance (p.17-18, Appx.B and Exhibit 12)**	**Exceptional ecological significance (p. 19-26 , Appx.D of petition and Exhibits 3, 13, 22, 33, 34, and 35)**	**Water Quality equal to or better than numeric criteria (p.30-38 and Exhibit 3)**
							Peregrine Falcon - threatened (state)	
Davis Creek and Davis Creek Trib-1	**3.33 stream miles**	From confluence with the Pecos River to the headwaters, including identified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits.	NOT ASSESSED
						4 SERI Trout water area (NMDGF)	21 SGCN Mexican Spotted Owl habitat - threatened (ESA) Peregrine Falcon - threatened (state) Plants - 1 special status, 1 state endangered	
Doctor Creek; Doctor Creek Trib-1–4; and Doctor Creek Freshwater Emergent Wetlands 4a, 4b,4c	**6.28 stream miles; 2.0 wetland acres**	From the confluence with Holy Ghost Creek to the headwaters, including identified tributaries and wetlands	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs, wetlands, and mainstem also detailed in Exhibits.	YES - HQColdWAL, PC
						4 SERI Trout water area (NMDGF)	Rio Grande Cutthroat Trout 22 SGCN Peregrine Falcon, Spotted Bat, Boreal Owl - threatened (state) Plants - 2 special status, 1 state endangered	

UPPER PECOS ONRW CRITERIA

*** Indicates Criteria Met (Note only NM Benefit plus one other column required)**

				Significant Attribute				
Waterbody/reach	**Stream miles and wetland acres (exhibit 26 and 27)**	**Description (Exhibit 26 and 27)**	**NM Benefit (p.11-17 of petition and Exhibits 3, 7, and 10)**	**State special trout water (p.29 of petition and exhibit 3)**	**Wild and Scenic River (p.27-28 and Exhibit 3)**	**Exceptional recreational significance (p.17-18, Appx.B and Exhibit 12)**	**Exceptional ecological significance (p. 19-26 , Appx.D of petition and Exhibits 3, 13, 22, 33, 34, and 35)**	**Water Quality equal to or better than numeric criteria (p.30-38 and Exhibit 3)**
Holy Ghost Creek; Holy Ghost Creek Trib-1–13; and Holy Ghost Creek Freshwater Pond 5	**10.18 stream miles; 0.20 wetland acres**	From the confluence with the Pecos River to the Wilderness boundary, including identified tributries and wetlands	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 4 SERI 2764 angler days (2003-04) Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs, wetlands, and mainstem also detailed in Exhibits. 21 SGCN Mexican Spotted Owl habitat - threatened (ESA) Peregrine Falcon - threatened (state) Plants - 1 ESA?, 2 special status, 2 state endangered	YES - HQColdWAL, PC
Indian Creek and Indian Creek Trib-1–7	**17.49 stream miles**	From the confluence with the Pecos River upstream to the headwaters, including identified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 4 SERI 47 angler days (2001-02) Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits. Rio Grande Cutthroat Trout 23 SGCN Mexican Spotted Owl habitat - threatened (ESA) Peregrine Falcon - threatened (state) Plants - 1 special status, 1 state endangered	YES - HQColdWAL, PC

UPPER PECOS ONRW CRITERIA

*** Indicates Criteria Met (Note only NM Benefit plus one other column required)**

				Significant Attribute				
Waterbody/reach	**Stream miles and wetland acres (exhibit 26 and 27)**	**Description (Exhibit 26 and 27)**	**NM Benefit (p.11-17 of petition and Exhibits 3, 7, and 10)**	**State special trout water (p.29 of petition and exhibit 3)**	**Wild and Scenic River (p.27-28 and Exhibit 3)**	**Exceptional recreational significance (p.17-18, Appx.B and Exhibit 12)**	**Exceptional ecological significance (p. 19-26 , Appx.D of petition and Exhibits 3, 13, 22, 33, 34, and 35)**	**Water Quality equal to or better than numeric criteria (p.30-38 and Exhibit 3)**
Jack's Creek	**1.36 stream miles**	From the confluence with the Pecos River to the Wilderness boundary, including wetlands, intermittent and ephemeral tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)	YES		Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 8 SERI 790 angler days (2007-08) Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits. Rio Grande Cutthroat Trout 15 SGCN Peregrine Falcon - threatened (state) Plants - 5 special status, 2 state endangered	YES - HQColdWAL, PC
Macho Canyon Creek and Macho Canyon Creek Trib-1–12	**29.32 stream miles**	From the confluence with the Pecos River to the headwaters, including identified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 5 SERI Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits. Rio Grande Cutthroat Trout 22 SGCN Mexican Spotted Owl habitat - threatened (ESA) Peregrine Falcon, Spotted Bat, Boreal Owl - threatened (state) Plants - 2 special status, 2 state endangered	MIXED YES - PC NO - HQColdWAL, specific conductance (2012)

UPPER PECOS ONRW CRITERIA

*** Indicates Criteria Met (Note only NM Benefit plus one other column required)**

				Significant Attribute				
Waterbody/reach	**Stream miles and wetland acres (exhibit 26 and 27)**	**Description (Exhibit 26 and 27)**	**NM Benefit (p.11-17 of petition and Exhibits 3, 7, and 10)**	**State special trout water (p.29 of petition and exhibit 3)**	**Wild and Scenic River (p.27-28 and Exhibit 3)**	**Exceptional recreational significance (p.17-18, Appx.B and Exhibit 12)**	**Exceptional ecological significance (p. 19-26 , Appx.D of petition and Exhibits 3, 13, 22, 33, 34, and 35)**	**Water Quality equal to or better than numeric criteria (p.30-38 and Exhibit 3)**
Panchuela Creek; Panchuela Creek Trib-1–2; and Panchuela Creek Freshwater Forested/Shrub Wetland 6	**1.89 stream miles; 0.64 wetland acres**	From the confluence with the Pecos River to the Wilderness boundary, including identified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs, wetlands, and mainstem also detailed in Exhibits.	YES - HQColdWAL, PC
						7 SERI 1410 angler days (2018-19) Trout water area (NMDGF)	16 SGCN Peregrine Falcon - threatened (state) Plants - 5 special status, 3 state endangered	
Pecos River; Pecos River Trib-1–28; Pecos River Freshwater Forested/Shrub Wetlands 8a, 8b, 8c, 8d, 8e, 8f, 8h; and Pecos River Freshwater Ponds 9a, 9b, 9c, 9d, 9e, 9f	**49.93 stream miles; 17.91 wetland acres**	From the Dalton site upstream to Wilderness boundary, including identified tributaries and wetlands	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)	YES, from Rio Mora upstream to Cowles	YES	Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs, wetlands, and mainstem also detailed in Exhibits.	YES - HQColdWAL, PC
						7 SERI 140,835 angler days (2018-19) Trout water area (NMDGF)	23 SGCN Mexican Spotted Owl habitat - threatened (ESA) Peregrine Falcon - threatened (state) Plants - 5 special status, 3 state endangered	Alamitos Canyon to Jack's Creek is listed for temperature in 2020, however only sampling was far downstream from nominated section

UPPER PECOS ONRW CRITERIA

*** Indicates Criteria Met (Note only NM Benefit plus one other column required)**

				Significant Attribute				
Waterbody/reach	**Stream miles and wetland acres (exhibit 26 and 27)**	**Description (Exhibit 26 and 27)**	**NM Benefit (p.11-17 of petition and Exhibits 3, 7, and 10)**	**State special trout water (p.29 of petition and exhibit 3)**	**Wild and Scenic River (p.27-28 and Exhibit 3)**	**Exceptional recreational significance (p.17-18, Appx.B and Exhibit 12)**	**Exceptional ecological significance (p. 19-26 , Appx.D of petition and Exhibits 3, 13, 22, 33, 34, and 35)**	**Water Quality equal to or better than numeric criteria (p.30-38 and Exhibit 3)**
Rio Mora and Rio Mora Trib-1–4	**6.19 stream miles**	From the confluence with the Pecos River to the Wilderness boundary, including identified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)	Upstream of State Special Trout Waters		Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 2732 angler days (2016-17) Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits. 16 SGCN Peregrine Falcon - threatened (state) Plants - 3 special status, 1 state endangered	YES - HQColdWAL, PC
Sawyer Creek and Sawyer Creek Trib-1	**3.48 stream miles**	From the confluence with the Pecos River to the headwaters, including identified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 4 SERI Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits. 18 SGCN Mexican Spotted Owl habitat - threatened (ESA) Peregrine Falcon - threatened (state)	NOT ASSESSED
Wild Horse Creek and Wild Horse Creek Trib-1–4	**7.04 stream miles**	From the confluence with Dalton Canyon Creek to the headwaters, includingidentified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout 4 SERI Trout water area (NMDGF)	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits. Rio Grande Cutthroat Trout 20 SGCN Mexican Spotted Owl habitat - threatened (ESA)	NOT ASSESSED

UPPER PECOS ONRW CRITERIA

*** Indicates Criteria Met (Note only NM Benefit plus one other column required)**

				Significant Attribute				
Waterbody/reach	**Stream miles and wetland acres (exhibit 26 and 27)**	**Description (Exhibit 26 and 27)**	**NM Benefit (p.11-17 of petition and Exhibits 3, 7, and 10)**	**State special trout water (p.29 of petition and exhibit 3)**	**Wild and Scenic River (p.27-28 and Exhibit 3)**	**Exceptional recreational significance (p.17-18, Appx.B and Exhibit 12)**	**Exceptional ecological significance (p. 19-26 , Appx.D of petition and Exhibits 3, 13, 22, 33, 34, and 35)**	**Water Quality equal to or better than numeric criteria (p.30-38 and Exhibit 3)**
							Peregrine Falcon, Spotted Bat, Boreal Owl - threatened (state)	
Willow Creek and Willow Creek Trib-1–4	**14.46 stream miles**	from the confluence with the Pecos River to the headwaters, including identified tributaries	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)			Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs and mainstem also detailed in Exhibits.	MIXED
						5 SERI	NMDGF plans to restore Rio Grande Cutthroat Trout	YES - PC
						1121 angler days (2003-04)	19 SGCN	NO - HQColdWAL, sediment and siltation, specific conductance (2004)
						Trout water area (NMDGF)	Mexican Spotted Owl habitat - threatened (ESA) Peregrine Falcon - threatened (state)	
							Plants - 1 special status, 1 state endangered	
Winsor Creek; Winsor Creek Trib-1–4; and Winsor Creek Freshwater Pond	**2.65 stream miles; 0.17 wetland acres**	From the confluence with the Pecos River to the Wilderness boundary, including identified tributaries and wetlands	Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)	Upstream of State Special Trout Waters		Camping, hiking, horsebackriding, hunting, fishing - trout, birdwatching, photography, backpacking, bike riding, rafting; trout	State and federal E&T status - petition pp. 19-26 lists and tables of wildlife, fish, and plants. Ecological significance of tribs, wetlands, and mainstem also detailed in Exhibits.	YES - HQColdWAL, PC
						7 SERI	15 SGCN	
						1449 (2007-08)	Peregrine Falcon - threatened (state)	
						Trout water area (NMDGF)	Plants - 6 special status, 3 state endangered	

UPPER PECOS ONRW CRITERIA

*** Indicates Criteria Met (Note only NM Benefit plus one other column required)**

				Significant Attribute				
Waterbody/reach	**Stream miles and wetland acres (exhibit 26 and 27)**	**Description (Exhibit 26 and 27)**	**NM Benefit (p.11-17 of petition and Exhibits 3, 7, and 10)**	**State special trout water (p.29 of petition and exhibit 3)**	**Wild and Scenic River (p.27-28 and Exhibit 3)**	**Exceptional recreational significance (p.17-18, Appx.B and Exhibit 12)**	**Exceptional ecological significance (p. 19-26 , Appx.D of petition and Exhibits 3, 13, 22, 33, 34, and 35)**	**Water Quality equal to or better than numeric criteria (p.30-38 and Exhibit 3)**
Dalton Canyon Creek Freshwater Emergent Wetlands 2a, 2b, and 2c	**20.91 wetland acres**		Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)				Flood control, wildilife habitat, water filtration, streamflow maintenance. Wetland Ecological significance detailed in Exhibit 13, 22, and 35	
Dalton Canyon Creek Freshwater Forested/Shrub Wetland 3	**0.66 wetland acres**		Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)				Flood control, wildilife habitat, water filtration, streamflow maintenance. Wetland Ecological significance detailed in Exhibit 13, 22, and 35	
Doctor Creek Freshwater Emergent Wetlands 4a, 4b, and 4c	**2.0 wetland acres**		Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)				Flood control, wildilife habitat, water filtration, streamflow maintenance. Wetland Ecological significance detailed in Exhibit 13, 22, and 35	
Holy Ghost Creek Freshwater Pond 5	**0.20 wetland acres**		Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)				Flood control, wildilife habitat, water filtration, streamflow maintenance. Wetland Ecological significance detailed in Exhibit 13, 22, and 35	
Panchuela Creek Freshwater Forested/Shrub Wetland 6	**0.64 wetland acres**		Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)				Flood control, wildilife habitat, water filtration, streamflow maintenance. Wetland Ecological significance detailed in Exhibit 13, 22, and 35	

UPPER PECOS ONRW CRITERIA

*** Indicates Criteria Met (Note only NM Benefit plus one other column required)**

				Significant Attribute				
Waterbody/reach	**Stream miles and wetland acres (exhibit 26 and 27)**	**Description (Exhibit 26 and 27)**	**NM Benefit (p.11-17 of petition and Exhibits 3, 7, and 10)**	**State special trout water (p.29 of petition and exhibit 3)**	**Wild and Scenic River (p.27-28 and Exhibit 3)**	**Exceptional recreational significance (p.17-18, Appx.B and Exhibit 12)**	**Exceptional ecological significance (p. 19-26 , Appx.D of petition and Exhibits 3, 13, 22, 33, 34, and 35)**	**Water Quality equal to or better than numeric criteria (p.30-38 and Exhibit 3)**
Pecos River Freshwater Emergent Wetland 7	**6.24 wetland acres**		Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)				Flood control, wildilife habitat, water filtration, streamflow maintenance. Wetland Ecological significance detailed in Exhibit 13, 22, and 35	
Pecos River Freshwater Forested/Shrub Wetlands 8a, 8b, 8c, 8d, 8e, 8f, and 8h	**12.51 wetland acres**		Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)				Flood control, wildilife habitat, water filtration, streamflow maintenance. Wetland Ecological significance detailed in Exhibit 13, 22, and 35	
Pecos River Freshwater Ponds 9a, 9b, 9c, 9d, 9e, and 9f	**5.40 wetland acres**		Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)				Flood control, wildilife habitat, water filtration, streamflow maintenance. Wetland Ecological significance detailed in Exhibit 13, 22, and 35	
Winsor Creek Freshwater Pond 10	**0.17 wetland acres**		Mitigate and adapt to climate change; historical and cultural significance; economic benefit (drinking water, outdoor recreation/tourism)				Flood control, wildilife habitat, water filtration, streamflow maintenance. Wetland Ecological significance detailed in Exhibit 13, 22, and 35	

PETITIONERS' EXHIBIT

22

STATE OF NEW MEXICO
WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF THE PETITION FOR PROPOSED AMENDMENTS TO 20.6.4.9 NMAC, DESIGNATION OF WATERS OF THE UPPER PECOS WATERSHED AS OUTSTANDING NATIONAL RESOURCE WATERS

No. WQCC 20-18 (R)

San Miguel County, the Village of Pecos, the New Mexico Acequia Association, Molino de la Isla Organics LLC, and the Upper Pecos Watershed Association,

Petitioners.

REBUTTAL TESTIMONY OF RACHEL CONN

I. SUMMARY AND QUALIFICATIONS

My name is Rachel Conn and I am the Projects Director for Amigos Bravos. Amigos Bravos is a non-profit water conservation organization dedicated to protecting and restoring the waters of New Mexico. Amigos Bravos has been working for 30 years to protect water quality in New Mexico.

I have worked for the past 23 years in the environmental field, with an intensive focus on water quality policy and protections. I began my professional career working for the Massachusetts Department of Environmental Protection as a consultant assessing the data management needs of the various bureaus in the department. I also worked for a non-profit in Colorado assessing and addressing water quality problems associated with gold mining. I have a B.A. in Environmental Biology from Colorado College.

For the past 21 years, I have worked for Amigos Bravos directly on New Mexico water quality policy and protection issues. As Projects Director for Amigos Bravos, I direct the

organization's projects in all three Amigos Bravos program areas. As part of this work I help New Mexico communities learn about and use the Clean Water Act ("CWA") to protect and clean up their rivers, streams, and other waters by giving trainings around the state on water quality standards, Total Maximum Daily Loads, National Pollutant Elimination System permits, Outstanding National Resource Waters ("ONRW" or "Outstanding Waters"), and other CWA topics. I have also served on the advisory board of the National Clean Water Network for 9 years, where I assist in guiding national CWA advocacy. I have provided technical testimony related to CWA requirements before the Water Quality Control Commission ("Commission") on many occasions, including during the last three Triennial reviews, as well as the rulemaking processes designating and promulgating rules governing Outstanding Waters. My complete resume is attached as Petitioners' Exhibit 23.

My testimony is offered in support of Petitioners and addresses sections 20.6.4.9.A and –B NMAC.

II. CLARIFICATION AND MODIFICATION OF PETITIONERS' NOMINATED WATERS

In their Notice of Intent to Present Technical Testimony, witnesses on behalf of the New Mexico Environment Department ("NMED" or "Department") expressed concern that the Petition did not provide an adequate map and sufficient evidentiary support that at least one of the eligibility criteria was met for all of the nominated waters in the Upper Pecos Watershed in accordance with the regulatory requirements of 20.6.4.9.A(1) and –B NMAC. NMED Exhibit 4 at pp. 7, 9, 11. To resolve these concerns, Petitioners first submit revised maps of the nominated perennial, intermittent, and ephemeral streams and nominated wetlands that identify each named stream by name and each unnamed stream and wetland by a number, along with charts of all

waters nominated identified by name or number and providing the number of miles for each stream, acreage for each wetland, and latitudinal and longitudinal coordinates for each water body. *See* Petitioners' Exhibits 24, 25, 26, and 27. Second, Petitioners further detail how each water body meets at least one of the eligibility criteria in 20.6.4.9.B NMAC. Third, Petitioners have revised the language in their proposed amendment to more specifically identify the waters nominated and to add filing maps of the nominated waters to provide even greater certainty as to the identification of the designated waters. *See* Petitioners' Amended Exhibit 1 (proposed regulatory language for 20.6.4.9.D(4) NMAC); *see also* 20.6.4.9.D(3)(h) NMAC (designated wetlands are shown on maps filed with New Mexico State Library and available on NMED website).

a. Nominated Waters Only Include Specifically Identified Named and Unnamed Waters

First, Petitioners modify their description of the nominated waters to clarify that, in addition to the 16 named waters in the Upper Pecos Watershed, the nomination for which NMED supports, NMED Exhibit 4 at pp. 11–12 and NMED Exhibit 15, only identified unnamed streams and wetlands are included in the nomination as Outstanding Waters. *See* Petitioners' Exhibit 24 (map of identified perennial, ephemeral, and intermittent waters) and Petitioners' Exhibit 25 (map of identified wetlands). Petitioners' Exhibit 24 is a revised map of the nominated perennial, intermittent, and ephemeral stream segments in the Upper Pecos Watershed, with each of the nominated unnamed ephemeral and intermittent stream segments identified by number. Petitioners' Exhibit 25 is a revised map of the nominated wetlands in the Upper Pecos Watershed, with each of the unnamed wetlands identified by number. Petitioners' Exhibit 26 is a chart that sets forth the mileage of each named and unnamed perennial, ephemeral, and

intermittent stream segment, the downstream and upstream boundaries of each stream segment, as well as the latitudinal and longitudinal coordinates of the mouth of each identified named and unnamed water included in the Upper Pecos Watershed nomination. Petitioners' Exhibit 27 is a chart that sets forth the acreage of each identified wetland, as well as the latitudinal and longitudinal coordinates of each identified wetland included in the Upper Pecos Watershed nomination.

Only the identified named and unnamed perennial, ephemeral, and intermittent waters and wetlands included in the revised maps (Petitioners' Exhibits 24 and 25) are nominated for designation as ONRWs in the Upper Pecos Watershed. We believe these maps, that have greater specificity, and charts (Petitioners' Exhibits 26 and 27) with additional identifying information fully address NMED's concern that the Petition did not meet the requirements of 20.6.4.9.A(1) NMAC (requiring "a map of the surface water of the state, including the location and proposed upstream and downstream boundaries"). NMED Exhibit 4 at p.13.

b. Identified Unnamed Waters Meet Criteria and Warrant Designation

Second, Petitioners provide additional evidentiary support, based on scientific principles, to demonstrate that each of the identified unnamed waters meets at least one of the eligibility criteria in 20.6.4.9.B NMAC. Amended Exhibit 6 is a revised chart, with reference to relevant scientific support in the Petition, demonstrating that each named and unnamed water meets at least one ONRW criterion. While some of these waters meets one or more criteria, there should be no doubt that each of the identified unnamed ephemeral and intermittent streams has exceptional ecological significance, and meets the requirements of 20.6.4.9.B(2) NMAC.

Ephemeral streams make up the vast majority of New Mexico waters — 89% — and deserve protections. As outlined in Petitioners' direct testimony, ephemeral waters are

ecologically significant and protecting them is essential to protecting downstream waters. *See* Petitioners' Exhibit 2 at p.11-12 and Exhibit 13 art p.8-9. NMED itself has made the case that ephemeral waters in New Mexico are ecologically significant. In testimony before the United States Senate Committee on Environment and Public Works Committee (Petitioners' Exhibit 33), Rebecca Roose, Director of NMED'S Water Protection Division, eloquently laid out the ecological importance of ephemeral waters:

> Science clearly demonstrates that ephemeral waters are ecologically and hydrologically significant in the arid southwestern United States. Ephemeral streams are the capillaries of watersheds, recharging aquifers and delivering water downstream for aquatic life, wildlife, and human use. Ephemeral streams may be the headwaters or major tributaries of perennial streams in New Mexico. Over time, pollutant discharges unregulated under CWA Section 402 and development activities unregulated under CWA Section 404 as a result of the [Navigable Waters Protection Rule ("NWPR")] will adversely impact downstream water quality in waters that are jurisdictional. For example, in New Mexico, ephemeral tributaries contribute up to 76% of the stormflow in the Rio Grande after a storm event. Where pollutants can be mobilized, ephemeral stormflows will deliver the pollutants to downstream waters, such as the Rio Grande. The cumulative impacts of these non-jurisdictional ephemeral stormflows will be detrimental to downstream water quality and threaten human health and the environment. This hydrologic and ecologic connection between ephemeral waters and downstream NWPR jurisdictional waters is well-established in EPA's own scientific record, which the Agencies flatly ignored in the final rule that excludes all ephemeral streams from the definition of WOTUS. Petitioners' Exhibit 33 at pg. 2.

Ms. Roose, in her testimony, outlines how important ephemeral drainages are to downstream waters and how they — especially in the arid southwest, such as New Mexico — can disproportionally impact these downstream waters. *Id.* at 2. She outlines how ephemeral waters provide habitat for wildlife and serve other critical functions such as transporting, storing, and depositing sediment and nutrients. *Id.* at 2-3. She testified

that "cumulative impacts of ephemeral streams throughout a watershed must be considered in order to protect and maintain water quality and watershed health." The U.S. Environmental Protection Agency has extensively set forth in numerous reports the critical ecological importance that ephemeral drainages play in overall watershed health.

> Ephemeral and intermittent streams provide the same ecological and hydrological functions as perennial streams by moving water, nutrients, and sediment throughout the watershed. When functioning properly, these streams provide landscape hydrologic connections; stream energy dissipation during high-water flows to reduce erosion and improve water quality; surface and subsurface water storage and exchange; ground-water recharge and discharge; sediment transport, storage, and deposition to aid in floodplain maintenance and development; nutrient storage and cycling; wildlife habitat and migration corridors; support for vegetation communities to help stabilize stream banks and provide wildlife services; and water supply and water-quality filtering. They provide a wide array of ecological functions including forage, cover, nesting, and movement corridors for wildlife. Petitioners' Exhibit 34 at pg. iii.

Additional information about the ecological importance of ephemeral drainages to the arid southwest is provided in Petitioners direct testimony from Gayle Killam (Petitioners' Exhibit 3 at pp. 11–12). The ecological importance of ephemeral streams in the nominated area is detailed in Petitioners' direct testimony from Bob Sivinski (Petitioners' Exhibit 13 at pp. 8–9).

Further, wetlands are rare and extremely important in New Mexico. *See* Petitioners' Exhibit 35. Wetlands currently make up only about 0.6% of land area in New Mexico, yet 85% of all of New Mexico's wildlife species depend upon these ecosystems for the essential habitat that they provide. *Id.* at pp. 24–33. It is important to note that headwater wetlands — such as those proposed for Outstanding Waters designation here — provide

a myriad of important ecological functions such as stream flow maintenance, flood control, aquatic habitat, wildlife habitat, nutrient cycling, and water filtration. *Id.*

We believe that these clarifications resolve NMED's concern that the Petition did not meet the eligibility criteria in 20.6.4.9.B NMAC. NMED Exhibit 4 at p. 9.

III. THERE IS PRECENDENT FOR A WATERSHED-SCALE ONRW DESIGNATION

Additionally, the Commission should note there is precedent for designating ONRWs at a landscape scale. In the 2005 designation of "the waters within the United States forest service Valle Vidal special management unit" as Outstanding Waters, the Commission protected from degradation all waters within a defined geographic boundary. A review of NMED's petition in that matter; technical testimony from NMED, the New Mexico Department of Game and Fish ("NMDGF"), and other parties; the Commission's deliberations; and the Commission's Statement of Reasons makes it abundantly clear that the Commission's ONRW designation in that matter did not only include the named waters in 20.6.4.9.D(2) NMAC.[1]

In 2005, Amigos Bravos was a party in the Valle Vidal ONRW petition and I worked closely with NMED and NMDGF on their petition and the nomination. At the hearing, Amigos Bravos presented a number of witnesses, including former wetland scientist and restoration expert Bill Zeedyk who provided extensive technical testimony on the importance of the nominated Valle Vidal wetlands. For the Commission's reference, we have provided a copy of

[1] In its notice of intent, NMED puts forth an incorrect interpretation of the Valle Vidal designation. *See* NMED Exhibit 2 at pp. 6–7 and NMED Exhibit 4 at p. 13. We are providing NMED with additional information on the Valle Vidal nomination and designation with a request that NMED reconsider its interpretation.

the petition from that proceeding (Petitioners' Exhibit 28); the transcripts of proceedings, volumes 1 and 2 (Petitioners' Exhibits 29 and 30 respectively); the transcript of the Commission's deliberations (Petitioners' Exhibit 31); and the Commission's Statement of Reasons (Petitioners' Exhibit 32). A fair reading of the materials that form the basis the designation – and my own personal and distinct recollection -- demonstrate that the nomination and designation intended to encompass "all waters" of the Valle Vidal Special Management Unit, as stated multiple times in the state agencies' petition, and not just the named perennial waters in the nomination. At the very outset, the petition (Petitioners' Exhibit 28 at p. 2), states: "The partners propose to nominate **all waters** of the Valle Vidal" as ONRWs (emphasis added). The intent to nominate "all waters" is repeated in the map section (Petitioners' Exhibit 28 at p. 4): "**All the waters** encompassed in the 100,000 acre Valle Vidal Wildlife Management Unit . . . are proposed for designation as Outstanding National Resource Waters (ONRW)" (emphasis added).

Throughout, the petition refers to the "waters of the Valle Vidal" as the nominated waters (not just the named perennial streams). *See, e.g.,* (Petitioners' Exhibit 28 at cover page and pp. 2, 3, 4, 8, 16, 19, 33). The petition refers multiple times to the "drainages" in the Valle Vidal when referring to the nominated waters, indicating a comprehensive nomination. *See, e.g., id.* at pp. 2, 4, 6, 9, 24, 27. And the petition refers multiple times to "Comanche Creek and its many tributaries" as nominated waters, not just Comanche Creek. *See id.* at pp. 2, 6, 14, 24. Looking at the map of the nominated waters, which appears on page 5 of the petition, a number of unnamed tributaries to Comanche Creek are mapped, and include both perennial and other streams. Appendix I of the petition sets forth the "Stream Descriptions" of the nominated waters. The discussion on the Comanche Creek nomination, p. 24, states: "Comanche Creek and **all of**

its tributaries are contained within the boundaries of the Valle Vidal. In total, the Comanche Creek drainage contains nearly 60 miles of stream." (Emphasis added). There can be no doubt that all tributaries to Comanche Creek (which itself is much less than 60 miles) were part of the nomination, not just Comanche Creek, as NMED argues in its notice of intent. *See* NMED Exhibit 2 at pp. 6–7 and NMED Exhibit 4 at p. 13.

Appendix I (Petitioners' Exhibit 28 at p. 29), also has a section entitled "Other Waters" that provides: "There are several waters on the Valle Vidal, including Bonita, Abreu, and Lookout canyons that have not been recently surveyed for fish. It is likely these waters are ephemeral and contain no fish; however, they may contain important habitat for aquatic invertebrates." It is crystal clear that these waters — which are likely ephemeral and which are not part of the named waters in the nomination — were waters nominated in the Valle Vidal petition.

In the map section of the Valle Vidal petition (Petitioners' Exhibit 28 at p. 4), the petitioners state that "All the waters" in the Valle Vidal are proposed for designation and then include a map that depicts both named and unnamed waters. While the map would be clearer if it had a legend, the intent was to nominate all waters depicted. Otherwise, those waters would not have been depicted on the map of the nominated waters. This interpretation is consistent with my clear understanding of the nomination at the time of those proceedings.

And, while the Valle Vidal petition identifies named perennial waters that were nominated, the petition never once states that the nomination is limited to the named perennial waters only.

Similarly, a review of the transcript of proceedings shows that the petitioners never limited their designation to the named waters. Instead, NMED's principal witness, Marcy

Leavitt, Chief of the NMED Surface Water Quality Bureau, began her testimony, as the petition began, stating that: "The purpose of today's hearing is to propose amendments to Subsection D of 20.6.4.9 NMAC that would designate **all of the surface waters of the United States Forest Service Valle Vidal Management Unit as Outstanding National Resource Waters**." Petitioners' Exhibit 29 at p. 34 (emphasis added). To put this statement in context it is helpful to look at New Mexico's definition of "surface waters" which provides:

> Surface water(s) of the state means all surface water 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 originaly created in 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. 20.6.4.7.S(5) NMAC.

This definition is intentionally very broad and expressly includes many more water bodies than just perennial streams. In addition, the Commission's water quality standards themselves lay out the standards that apply to these "surface waters of the state," including specific protections for intermittent and ephemeral waters. *See* 20.6.4.97 and 20.6.4.98 NMAC.

In the Valle Vidal ONRW proceedings, there was abundant testimony at the hearing on the nomination of wetlands and the importance of protecting wetlands to protect the whole of the ecosystem. David Propst, Ph.D., NMDGF's principal witness, discussed the importance of wetlands, Petitioners' Exhibit 31 at pp. 49–50, and Mr. Zeedyk provided extensive, and compelling, testimony on the critical functions wetlands serve and why they deserve protection. Petitioners' Exhibit 30, pp. 354-368. During their deliberations, the Commissioners cited frequently and approvingly to Mr. Zeedyk's testimony. Petitioners' Exhibit 31 at pp. 6-7,

12, 17, 23, 26-27. And, in its Statement of Reasons, the Commission specifically referred to wetlands, in paragraphs 11 and 12. Petitioners' Exhibit 32. Based on all of this, it is clear that wetlands are included in the Valle Vidal designation.

Throughout the Commission's deliberations, there was no discussion that the nomination – which expressly included "all waters" of the Valle Vidal, tributaries of Comanche Creek, and "other waters" — including the likely ephemeral waters of Bonita, Abreu, and Lookout canyons — should be restricted to the named perennial waters. And, as stated, there was ample discussion from the Commission about the importance of protecting wetlands, which were then included in the Commission's statement of reasons, as was reference to the "drainages" in the Valle Vidal in paragraphs 13 and 14, indicating a comprehensive designation. *See id.*

Finally, all of the surface waters in the Valle Vidal are currently managed by the U.S. Forest Service as ONRWs as indicated in its 2019 Assessment, where it lists the ONRWs designated in the Carson National Forest as including: "the west, middle and east forks of the Rio Santa Barbara on the Camino Real [Ranger District ("RD")] (designated in 2005); all surface waters within the Valle Vidal on the Questa RD (designated in 2006); and all perennial streams, lakes, and wetlands within the Carson's NF's wilderness areas (designated in 2010)." Carson National Forest Draft Land Management Plan, July 2019[2].

The recitation above is not intended to be exhaustive, but I believe demonstrates that, consistent with my recollection, the Valle Vidal nomination was not limited to the named perennial waters only. Instead, the Valle Vidal designation created clear precedent for nominating "all waters" of a defined geographic area, which is very similar to Petitioners'

[2] https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd631756.pdf

approach here, in which the Petitioners nominate "all waters" of the Upper Pecos Watershed for ONRW designation, with the caveat that Petitioners' are now identifying all waters nominated, in an abundance of caution and to be responsive to NMED's concerns.

IV. THE REGULATIONS AUTHORIZE A WATERSHED-SCALE DESIGNATION AS LONG AS THE REGULATORY REQUIREMENTS ARE MET AND A WATERSHED-SCALE DESIGNATION IS GOOD POLICY IN NEW MEXICO

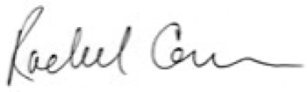
Regardless of the precedent set by the Valle Vidal designation — which supports the designation of "all waters" within a geographic area — the regulations support the designation of all waters within a defined region, such as the nomination of the identified waters in the Upper Pecos Watershed nominated here. The characteristics of each specific nominated water do not exist in a vacuum, isolated from each other, but rather are contingent on each other and the synergistic impact they have on each other and the whole of the watershed — a watershed that provides valuable ecological functions, high quality habitat to species, and significant recreational and economic resources not only to the local communities within the watershed, but to the State of New Mexico as a whole. In short, the whole of the Upper Pecos Watershed is greater than the sum of its individual surface water segments. The Commission can, and should, designate all identified waters within this geographic area, just as they did in the case of the Valle Vidal.

In this case, given Petitioners desire to present to the Commission a nomination that is closely aligned to what the Department has indicated it will support, Petitioners have modified their proposal to include both a map with each waterbody labeled, as well as comprehensive lists with upstream and downstream boundaries of all nominated waters identified. *See* Petitioners' Exhibits 24, 25, 26, and 27.

V. PETITIONERS' SUBMITTED WATER QUALITY DATA (APPENDIX C) PROVIDE AN ADEQUATE BASELINE WHERE AVAILABLE

Section 20.6.4.9.A(3) NMAC requires an ONRW petition to provide water quality data, if available, in order to establish baseline conditions. Petitioners submitted all available water quality data in Appendix C of the Petition. The water quality data that was submitted in Appendix C was obtained from and provided by the Department. The Department expresses concern that the data is unorganized and confusing, NMED Exhibit 4 at p. 10, however, and as admitted by the Department, *see id.*, the Petitioners submitted the data as it was provided by the Department and in full accordance with the requirements of 20.6.4.9.A(3) NMAC. For nominated waters with no correlating water quality data as submitted in Appendix C, Petitioners are not aware that any data exists. As such, Petitioners have met the requirements of 20.6.4.9.A(3) NMAC.

Respectfully submitted on this 24th day of March, 2021.



RACHEL CONN, Projects Director
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PETITIONERS' EXHIBIT

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RACHEL L. CONN
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Taos, NM 87571
Email: rconn@amigosbravos.org

Experience – Water Quality and Environmental Policy

Projects Director, Amigos Bravos, Taos, NM 2010-present
Oversees projects in all three of Amigos Bravos' program areas – Holding Polluters Accountable, Restoring Watershed Health, and Building a Water Protection Movement for the Future. Provides technical oversight and leadership to various projects such as addressing stormwater contamination at Los Alamos National Laboratory; monitoring and advocating for solutions to water discharges at Chevron/Molycorp Mine; monitoring water quality in four streams in Taos County; overseeing wetland and riparian restoration projects. Monitors and participates in state and federal regulatory processes such as the New Mexico copper rulemaking process, New Mexico dairy rulemaking process, triennial review of New Mexico water quality standards; antidegradation policy decisions; and EPA rulemaking related to water quality.

Clean Water Circuit Rider, Amigos Bravos, Taos, NM, 2002-2010
Provided training on the Clean Water Act including topics such as water quality standards, total maximum daily loads (TMDLs), nation pollutant discharge elimination system (NPDES), and antidegradation including Outstanding National Resource Waters. Provided capacity building support to individuals and communities wanting to protect rivers. Helped coordinate legal and technical resources for watershed and community groups. Tracked and commented on state and national water regulations and policies. Organized and facilitated multiple community coalitions, including coordinating and facilitating meetings, tracking budget items, communicating with the media and assisting with strategic planning.

Project Associate, Amigos Bravos, Taos, NM 2001-2002
Coordinated a project that examined the economic benefits of mine reclamation. Assisted with an investigation into the potential health impacts of mining practices in a community impacted by molybdenum mining. Assisted with writing press releases, coordinating meetings and representing Amigos Bravos at community events. Organized annual art auction that grossed over $15,000.

Co-Chair, New Mexico Mining Act Network 2013-present
Leads program to implement and strengthen the mine permitting and reclamation requirements of the New Mexico Mining Act.

Vice Chair, Clean Water Network, 2010-2013
Helped oversee financial, organizational and programmatic aspects of the Clean Water Network, a national coalition of conservation organizations devoted to protecting clean water. Chaired the Water Quality Standards Workgroup of the Network, which analyzed and participated in rulemaking procedures that impacted water quality.

Board of Directors, Red River Restoration Group, 2003-2012
Led the formation of the Red River Restoration Group (formally Rio Colorado Reclamation Committee) and participated in overseeing the financial, organizational and programmatic direction of the group. Reviewed technical documents, hired and oversaw technical experts, organized public meetings, and tracked regulatory requirements and compliance related to the Chevron/Molycorp mine in Questa, NM

Project Director, Costilla County Committee for Environmental Soundness, San Luis, CO, 1999-2000
Directed year-long project related to water contamination from a gold mine, funded through an environmental justice grant from the Environmental Protection Agency (EPA). Analyzed water quality data, coordinated experts and drafted a plan outlining options to the town in the event of contamination of their drinking water. Edited and wrote articles for the group's monthly newsletter. Performed accounting and grant reporting tasks. Served as an interface between the state and federal government to ensure that community needs and concerns were addressed.

Environmental Analyst, Massachusetts Department of Environmental Protection, Boston, 1998-1999

Worked on information management practices in the four different bureaus within the Department. Conducted interviews and facilitated meetings to determine what information was necessary for the many different programs including the toxic use reduction program, the air quality programs, and the solid waste program.

Field Researcher, Sevielleta National Wildlife Refuge, 1997
Worked and lived on the refuge at the University of New Mexico's field station. Measured percent cover, and identified flora as part of the plant research crew. Learned to identify by sight over a hundred different species of southwest plants.

Education

Colorado College, Colorado Springs, CO May 1997
Bachelor of Arts in Environmental Biology

Technical Testimony Experience

Triennial Review of Water Quality Standards, New Mexico Water Quality Control Commission, 2013, 2009 2003 – Presented technical testimony on Clean Water Act requirements, public participation components, antidegradation including Outstanding National Resource Waters, and applicability of water segment specific uses and criteria.

Dairy Rulemaking, New Mexico Water Quality Control Commission, 2010 – Presented technical testimony on public notice requirements.

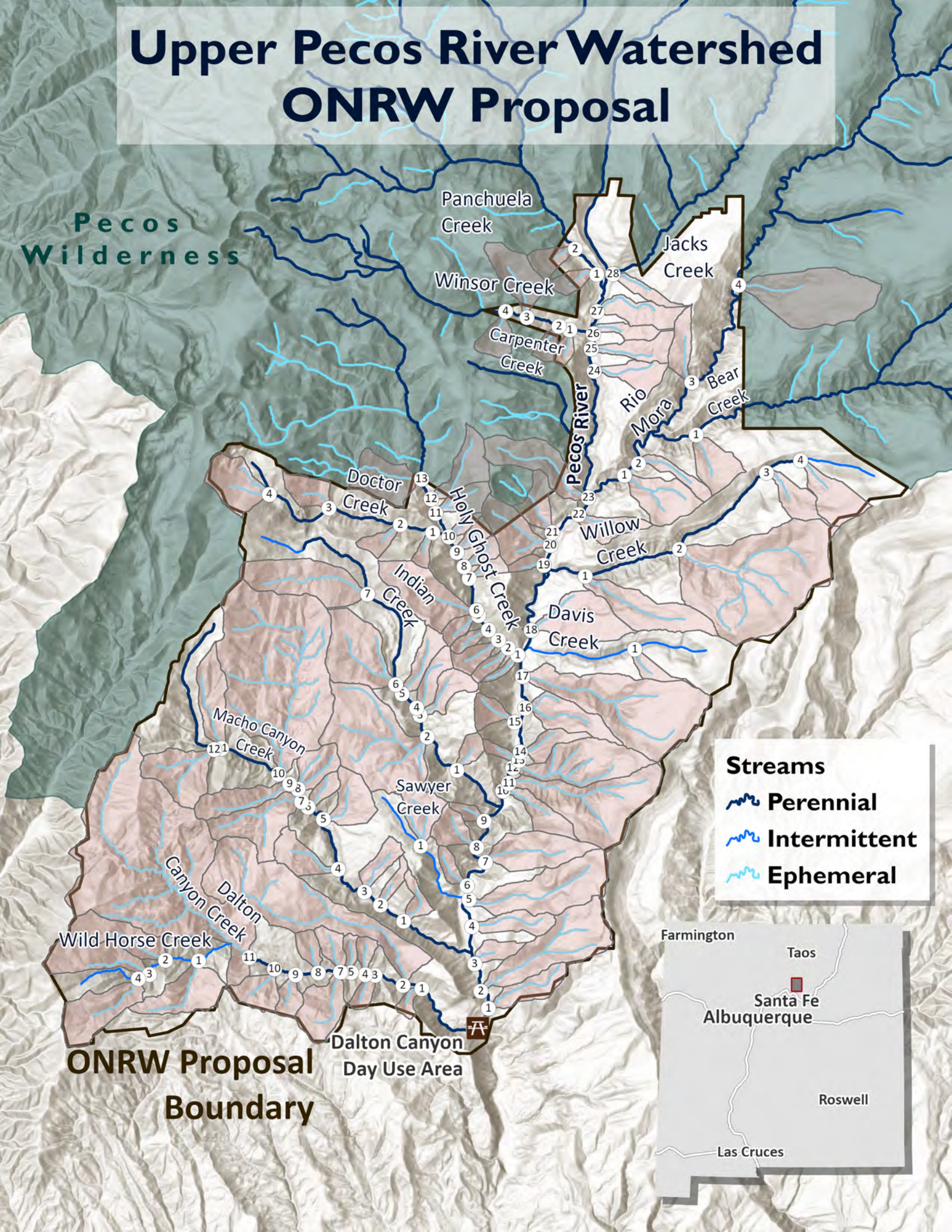
Outstanding National Resource Water Hearing, New Mexico Water Quality Control Commission, 2010 – Presented technical testimony on New Mexico's antidegradation policy and Clean Water Act requirements.

Antidegradation Hearing, New Mexico Water Quality Control Commission, 2007 – Presented technical testimony on New Mexico's antidegradation policy and proposed to changes to the policy.

Minimal Impact Mining Hearing, New Mexico Mining Commission, 2013 – Presented technical testimony on the impacts to communities from extractive industries and the need for public processes such as conducting environmental analysis before initiating large scale mining.

PETITIONERS' EXHIBIT 24

Upper Pecos River Watershed ONRW Proposal



PETITIONERS' EXHIBIT

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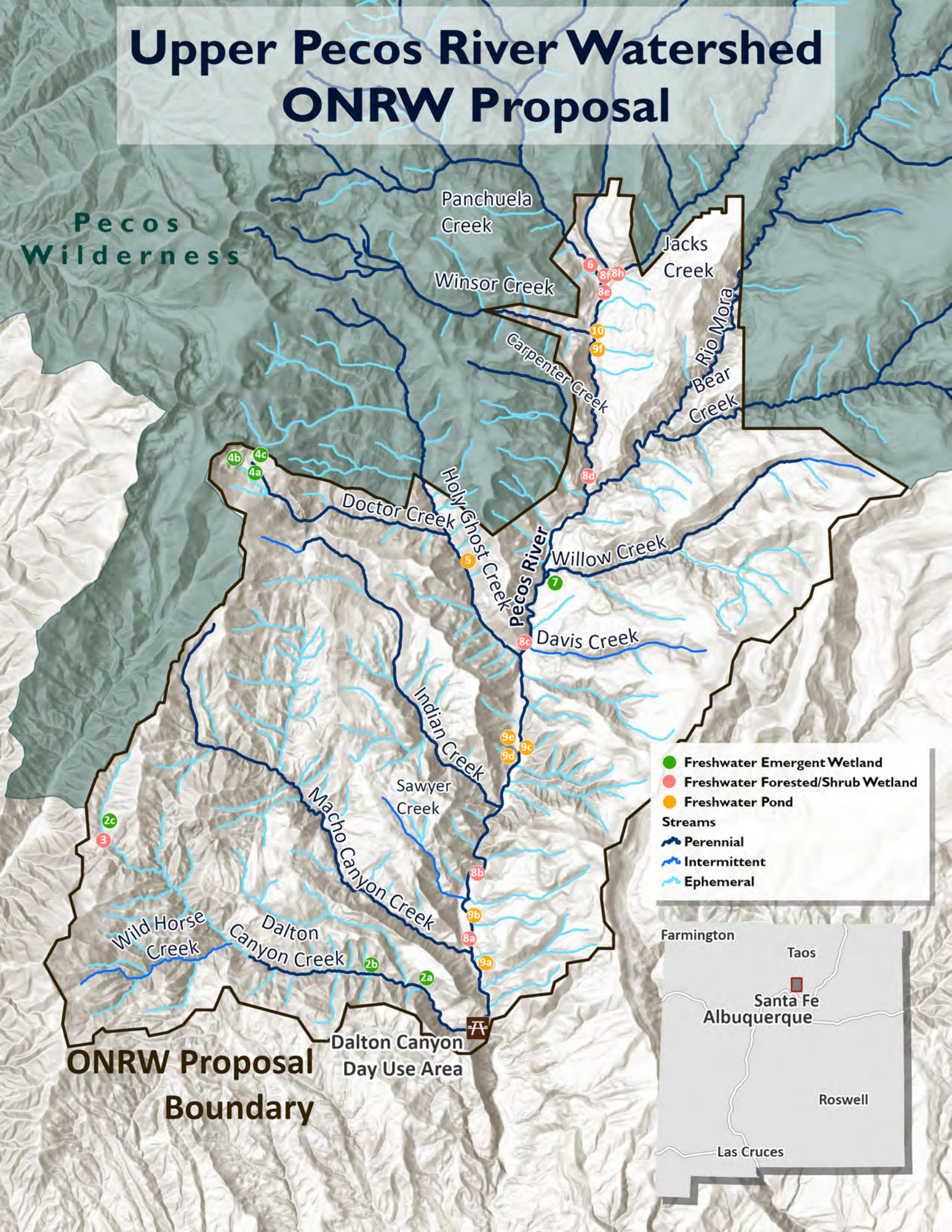
Upper Pecos River Watershed
ONRW Proposal
Pecos Wilderness
Panchuela Creek
Winsor Creek
Jacks Creek
Rio Mora
Carpenter Creek
Bear Creek
Holy Ghost Creek
Doctor Creek
Pecos River
Willow Creek
Davis Creek
Indian Creek
Sawyer Creek
Macho Canyon Creek
Wild Horse Creek
Dalton Canyon Creek
Dalton Canyon Day Use Area
ONRW Proposal Boundary
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Streams
Perennial
Intermittent
Ephemeral
Farmington
Taos
Santa Fe
Albuquerque
Roswell
Las Cruces

PETITIONERS' EXHIBIT

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Stream	Miles	Downstream boundary	Upstream Boundary	Lat/Long at mouth of stream	
				Latitude	Longitude
Bear Creek	1.70	Confluence with the Rio Mora	Wilderness Boundary	35.79033	-105.6431
Bear Trib - 1	0.71	Confluence with Bear Creek	Headwaters	35.790	-105.631
Carpenter Creek	0.32	Confluence with the Pecos River	Wilderness Boundary	35.78719	-105.6607
Dalton Canyon Creek	9.09	Confluence with the Pecos River	Headwaters	35.65884	-105.6887
Dalton Trib - 1	0.37	Confluence with Dalton Canyon Creek	Headwaters	35.668	-105.704
Dalton Trib - 2	5.24	Confluence with Dalton Canyon Creek	Headwaters	35.668	-105.709
Dalton Trib - 3	0.49	Confluence with Dalton Canyon Creek	Headwaters	35.671	-105.717
Dalton Trib - 4	0.47	Confluence with Dalton Canyon Creek	Headwaters	35.671	-105.719
Dalton Trib - 5	0.48	Confluence with Dalton Canyon Creek	Headwaters	35.671	-105.723
Dalton Trib - 6	0.60	Confluence with Dalton Canyon Creek	Headwaters	35.671	-105.726
Dalton Trib - 7	1.04	Confluence with Dalton Canyon Creek	Headwaters	35.671	-105.726
Dalton Trib - 8	0.41	Confluence with Dalton Canyon Creek	Headwaters	35.671	-105.732
Dalton Trib - 9	0.50	Confluence with Dalton Canyon Creek	Headwaters	35.671	-105.738
Dalton Trib - 10	0.58	Confluence with Dalton Canyon Creek	Headwaters	35.672	-105.744
Dalton Trib - 11	4.43	Confluence with Dalton Canyon Creek	Headwaters	35.674	-105.751
Davis Creek	2.86	Confluence with the Pecos River	Headwaters	35.74247	-105.6767
Davis Trib - 1	0.47	Confluence with Davis Creek	Headwaters	35.743	-105.647
Doctor Creek	3.67	Confluence with Holy Ghost Creek	Headwaters	35.76749	-105.6979
Doctor Trib - 1	0.36	Confluence with Doctor Creek	Headwaters	35.768	-105.702
Doctor Trib - 2	0.40	Confluence with Doctor Creek	Headwaters	35.770	-105.711
Doctor Trib - 3	0.51	Confluence with Doctor Creek	Headwaters	35.773	-105.730
Doctor Trib - 4	1.24	Confluence with Doctor Creek	Headwaters	35.776	-105.746
Holy Ghost Creek	3.30	Confluence with Pecos River	Wilderness Boundary	35.7408	-105.6782
Holy Ghost Trib - 1	0.61	Confluence with Holy Ghost Creek	Headwaters	35.741	-105.679
Holy Ghost Trib - 2	0.51	Confluence with Holy Ghost Creek	Headwaters	35.743	-105.682
Holy Ghost Trib - 3	0.61	Confluence with Holy Ghost Creek	Headwaters	35.744	-105.684
Holy Ghost Trib - 4	0.49	Confluence with Holy Ghost Creek	Headwaters	35.747	-105.687
Holy Ghost Trib - 5	0.49	Confluence with Holy Ghost Creek	Headwaters	35.750	-105.690
Holy Ghost Trib - 6	1.53	Confluence with Holy Ghost Creek	Headwaters	35.751	-105.690
Holy Ghost Trib - 7	0.38	Confluence with Holy Ghost Creek	Headwaters	35.758	-105.692
Holy Ghost Trib - 8	0.49	Confluence with Holy Ghost Creek	Headwaters	35.761	-105.694
Holy Ghost Trib - 9	0.47	Confluence with Holy Ghost Creek	Headwaters	35.764	-105.695
Holy Ghost Trib - 10	0.40	Confluence with Holy Ghost Creek	Headwaters	35.767	-105.698
Holy Ghost Trib - 11	0.58	Confluence with Holy Ghost Creek	Wilderness Boundary	35.772	-105.701
Holy Ghost Trib - 12	0.21	Confluence with Holy Ghost Creek	Wilderness Boundary	35.775	-105.703
Holy Ghost Trib - 13	0.12	Confluence with Holy Ghost Creek	Wilderness Boundary	35.780	-105.705
Indian Creek	6.62	Confluecence with Pecos River	Headwaters	35.70763	-105.6831
Indian Trib - 1	0.41	Confluence with Indian Creek	Headwaters	35.716	-105.695
Indian Trib - 2	4.45	Confluence with Indian Creek	Headwaters	35.723	-105.703
Indian Trib - 3	0.72	Confluence with Indian Creek	Headwaters	35.728	-105.705
Indian Trib - 4	0.83	Confluence with Indian Creek	Headwaters	35.729	-105.706
Indian Trib - 5	0.93	Confluence with Indian Creek	Headwaters	35.732	-105.710
Indian Trib - 6	1.78	Confluence with Indian Creek	Headwaters	35.735	-105.712
Indian Trib - 7	1.73	Confluence with Indian Creek	Headwaters	35.754	-105.720
Jack's Creek	1.36	Confluence with the Pecos River	Wilderness Boundary	35.82486	-105.6548
Macho Canyon Creek	8.11	Confluence with the Pecos River	Headwaters	35.6754	-105.6907
Macho Trib - 1	0.62	Confluence with Macho Canyon Creek	Headwaters	35.683	-105.709
Macho Trib - 2	0.38	Confluence with Macho Canyon Creek	Headwaters	35.686	-105.715
Macho Trib - 3	0.72	Confluence with Macho Canyon Creek	Headwaters	35.689	-105.720

Stream	Miles	Downstream boundary	Upstream Boundary	Lat/Long at mouth of stream	
				Latitude	Longitude
Macho Trib - 4	0.82	Confluence with Macho Canyon Creek	Headwaters	35.694	-105.727
Macho Trib - 5	0.74	Confluence with Macho Canyon Creek	Headwaters	35.705	-105.731
Macho Trib - 6	0.60	Confluence with Macho Canyon Creek	Headwaters	35.707	-105.735
Macho Trib - 7	1.94	Confluence with Macho Canyon Creek	Headwaters	35.709	-105.737
Macho Trib - 8	1.31	Confluence with Macho Canyon Creek	Headwaters	35.711	-105.738
Macho Trib - 9	1.23	Confluence with Macho Canyon Creek	Headwaters	35.712	-105.740
Macho Trib - 10	10.07	Confluence with Macho Canyon Creek	Headwaters	35.715	-105.743
Macho Trib - 11	1.18	Confluence with Macho Canyon Creek	Headwaters	35.720	-105.759
Macho Trib - 12	1.59	Confluence with Macho Canyon Creek	Headwaters	35.720	-105.761
Rio Mora	5.41	Confluence with the Pecos River	Wilderness Boundary	35.77625	-105.6599
Mora Trib - 1	1.46	Confluence with the Rio Mora	Headwaters	35.781	-105.650
Mora Trib - 2	0.93	Confluence with the Rio Mora	Headwaters	35.783	-105.647
Mora Trib - 3	0.74	Confluence with the Rio Mora	Headwaters	35.801	-105.632
Mora Trib - 4	0.04	Confluence with the Rio Mora	Wilderness Boundary	35.823	-105.620
Panchuela Creek	1.07	Confluence with the Pecos River	Wilderness Boundary	35.82156	-105.6562
Panchuela Trib -1	0.43	Confluence with Panchuela Creek	Wilderness Boundary	35.825	-105.658
Panchuela Trib -2	0.39	Confluence with Panchuela Creek	Wilderness Boundary	35.831	-105.664
Pecos River	14.11	Dalton Canyon Confluence	Wilderness Boundary	35.65884	-105.6887
Pecos Trib - 1	1.37	Confluence with the Pecos River	Headwaters	35.663	-105.686
Pecos Trib - 2	3.19	Confluence with the Pecos River	Headwaters	35.667	-105.688
Pecos Trib - 3	0.40	Confluence with the Pecos River	Headwaters	35.673	-105.690
Pecos Trib - 4	1.16	Confluence with the Pecos River	Headwaters	35.681	-105.691
Pecos Trib - 5	2.08	Confluence with the Pecos River	Headwaters	35.687	-105.692
Pecos Trib - 6	0.62	Confluence with the Pecos River	Headwaters	35.690	-105.692
Pecos Trib - 7	1.28	Confluence with the Pecos River	Headwaters	35.696	-105.687
Pecos Trib - 8	0.62	Confluence with the Pecos River	Headwaters	35.699	-105.690
Pecos Trib - 9	0.37	Confluence with the Pecos River	Headwaters	35.705	-105.688
Pecos Trib - 10	0.84	Confluence with the Pecos River	Headwaters	35.711	-105.683
Pecos Trib - 11	3.33	Confluence with the Pecos River	Headwaters	35.713	-105.681
Pecos Trib - 12	3.24	Confluence with the Pecos River	Headwaters	35.716	-105.680
Pecos Trib - 13	0.38	Confluence with the Pecos River	Headwaters	35.718	-105.678
Pecos Trib - 14	0.61	Confluence with the Pecos River	Headwaters	35.720	-105.678
Pecos Trib - 15	0.62	Confluence with the Pecos River	Headwaters	35.726	-105.680
Pecos Trib - 16	1.56	Confluence with the Pecos River	Headwaters	35.730	-105.677
Pecos Trib - 17	3.46	Confluence with the Pecos River	Headwaters	35.737	-105.678
Pecos Trib - 18	0.84	Confluence with the Pecos River	Headwaters	35.747	-105.675
Pecos Trib - 19	0.40	Confluence with Pecos River	Headwaters	35.761	-105.672
Pecos Trib - 20	1.09	Confluence with Pecos River	Wilderness Boundary	35.765	-105.670
Pecos Trib - 21	0.51	Confluence with the Pecos River	Wilderness Boundary	35.768	-105.670
Pecos Trib - 22	0.73	Confluence with the Rio Mora	Headwaters	35.772	-105.663
Pecos Trib - 23	0.59	Confluence with the Pecos River	Wilderness Boundary	35.776	-105.660
Pecos Trib - 24	0.95	Confluence with the Pecos River	Headwaters	35.804	-105.659
Pecos Trib - 25	0.96	Confluence with the Pecos River	Headwaters	35.809	-105.660
Pecos Trib - 26	0.50	Confluence with the Pecos River	Headwaters	35.812	-105.659
Pecos Trib - 27	1.06	Confluence with the Pecos River	Headwaters	35.817	-105.658
Pecos Trib - 28	0.64	Confluence with the Pecos River	Headwaters	35.825	-105.654
Sawyer Creek	2.21	Confluence with the Pecos River	Headwaters	35.6871	-105.6922
Sawyer Trib - 1	1.28	Confluence with Sawyer Creek	Headwaters	35.699	-105.705
Wild Horse Creek	2.69	Confluence with Dalton Canyon Creek	Headwaters	35.67709	-105.7556

Stream	Miles	Downstream boundary	Upstream Boundary	Lat/Long at mouth of stream	
				Latitude	Longitude
Wild Horse Trib - 1	1.33	Confluence with Wild Horse Creek	Headwaters	35.673	-105.764
Wild Horse Trib - 2	1.03	Confluence with Wild Horse Creek	Headwaters	35.674	-105.773
Wild Horse Trib - 3	1.02	Confluence with Wild Horse Creek	Headwaters	35.670	-105.778
Wild Horse Trib - 4	0.98	Confluence with Wild Horse Creek	Headwaters	35.669	-105.781
Willow Creek	5.92	Confluence with the Pecos River	Headwaters	35.75803	-105.6718
Willow Trib - 1	1.75	Confluence with Willow Creek	Headwaters	35.759	-105.661
Willow Trib - 2	5.60	Confluence with Willow Creek	Headwaters	35.765	-105.635
Willow Trib - 3	0.59	Confluence with Willow Creek	Headwaters	35.782	-105.612
Willow Trib - 4	0.60	Confluence with Willow Creek	Headwaters	35.784	-105.603
Winsor Creek	1.77	Confluence with the Pecos River	Wilderness Boundary	35.81165	-105.659
Winsor Trib - 1	0.41	Confluence with Winsor Creek	Headwaters	35.813	-105.665
Winsor Trib - 2	0.17	Confluence with Winsor Creek	Wilderness Boundary	35.814	-105.668
Winsor Trib - 3	0.19	Confluence with Winsor Creek	Wilderness Boundary	35.815	-105.677
Winsor Trib - 4	0.11	Confluence with Winsor Creek	Wilderness Boundary	35.817	-105.683
Total	*179.93*				

PETITIONERS' EXHIBIT

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Stream	label	type	Acres	Latitude	Longitude
Dalton Canyon Creek	2a	Freshwater Emergent Wetland		35.668	-105.705
Dalton Canyon Creek	2b	Freshwater Emergent Wetland		35.671	-105.720
Dalton Canyon Creek	2c	Freshwater Emergent Wetland	20.91	35.702	-105.791
Dalton Canyon Creek	3	Freshwater Forested/Shrub Wetland	0.66	35.701	-105.790
Doctor Creek	4a	Freshwater Emergent Wetland		35.781	-105.752
Doctor Creek	4b	Freshwater Emergent Wetland		35.782	-105.754
Doctor Creek	4c	Freshwater Emergent Wetland	2.00	35.783	-105.751
Holy Ghost Creek	5	Freshwater Pond	0.20	35.761	-105.693
Panchuela Creek	6	Freshwater Forested/Shrub Wetland	0.64	35.827	-105.660
Pecos River	7	Freshwater Emergent Wetland	6.24	35.759	-105.671
Pecos River	8a	Freshwater Forested/Shrub Wetland		35.679	-105.692
Pecos River	8b	Freshwater Forested/Shrub Wetland		35.693	-105.689
Pecos River	8c	Freshwater Forested/Shrub Wetland		35.743	-105.676
Pecos River	8d	Freshwater Forested/Shrub Wetland		35.781	-105.660
Pecos River	8e	Freshwater Forested/Shrub Wetland		35.822	-105.656
Pecos River	8f	Freshwater Forested/Shrub Wetland		35.824	-105.655
Pecos River	8h	Freshwater Forested/Shrub Wetland	12.51	35.825	-105.653
Pecos River	9a	Freshwater Pond		35.672	-105.689
Pecos River	9b	Freshwater Pond		35.683	-105.692
Pecos River	9c	Freshwater Pond		35.720	-105.678
Pecos River	9d	Freshwater Pond		35.720	-105.679
Pecos River	9e	Freshwater Pond		35.722	-105.679
Pecos River	9f	Freshwater Pond	5.40	35.810	-105.659
Winsor Creek	10	Freshwater Pond	0.17	35.811	-105.660
		Total	***48.74***		

Wetland type	*Total acres by wetland type*
Freshwater Emergent Wetland	*29.15*
Freshwater Forested/Shrub Wetland	*13.81*
Freshwater Pond	*5.77*
Total	***48.74***

PETITIONERS' EXHIBIT

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PUBLIC DISCUSSION DRAFT

NOMINATION OF

THE WATERS OF THE VALLE VIDAL

AS

OUTSTANDING NATIONAL RESOURCE WATER

New Mexico Department of Game and Fish,
New Mexico Environment Department - Surface Water Quality Bureau,
and
New Mexico Energy Minerals and Natural Resources Department - State Forestry

JULY 2005

Executive Summary

The Valle Vidal is one of New Mexico's most prized areas for those individuals that appreciate the splendor of the outdoors. Donated to the people of the United States by the Pennzoil Corporation in 1982, the area is now managed by the U.S.D.A. Forest Service. Trophy elk hunting, fly fishing, horseback riding, hiking, bird watching, and cross country skiing are among the activities for which the Valle Vidal is famous.

Water is the lifeblood of the area's wildlife populations, terrestrial and aquatic. The headwater streams of the Valle Vidal flow into two major drainages, the Rio Grande and South Canadian. New Mexico's state fish, the Rio Grande cutthroat trout, occupies waters on both slopes of the Valle Vidal. Other native and introduced fish species also call the waters of the Valle Vidal home, attracting anglers from around the country. The woodlands support herds of elk and deer as well as a diversity of bird life.

The large meadows of the western portions of Valle Vidal contain the meandering Comanche Creek and its many tributaries, eventually flowing into the Rio Costilla, which flows through the west side of the Valle Vidal into the Rio Grande. The east side of the Valle Vidal contains streams that flow into the South Canadian and eventually the Arkansas River. The headwaters of Middle Ponil, McCrystal, North Ponil, Leandro, and Seally Canyon creeks are all contained within the boundaries of the Valle Vidal. Shuree Lakes discharge into Middle Ponil Creek and are a popular destination for many visitors to the Valle Vidal.

The partners propose to nominate all waters of the Valle Vidal under authority of the New Mexico Water Quality Act and New Mexico Administrative Code (20.6.4.9 NMAC) as Outstanding National Resource Water (ONRW). ONRWs are waters that possess outstanding ecological or recreational values. This designation would provide further incentive to maintain the quality of these waters into the future for the benefit of both humans and wildlife. Designation as an ONRW helps ensure that water quality is maintained or improved from the point in time of designation to protect water quality for existing uses. ONRW designation would not limit existing uses as long as these uses do not degrade water quality from the levels at the time of designation.

Protection of ONRWs is recognized under New Mexico water quality standards - antidegradation policy (Paragraph 3, Subsection A of 20.6.4.8 NMAC [New Mexico Administrative Code]), that states no degradation shall be allowed in high quality waters designated by the commission as ONRWs. This policy is supported by the

implementation plan (20.6.4.8.B NMAC), which encourages best management practices within watersheds to reduce or abate sources of water pollutants.

Many waters of the Valle Vidal are eligible for protection as Wild and Scenic under the federal Wild and Scenic Rivers Act. They directly support an outstanding trout fishery that is visited by over 5,000 anglers annually. New Mexico's largest elk herd roams the watersheds drained by the streams of the Valle Vidal. Numerous hunters, scouts, campers, and others who benefit from the pristine qualities of these streams and lakes also utilize these areas.

High water quality adds to the large variety of wildlife and plants, including several sensitive and unique species that inhabit the Valle Vidal. Though some stream segments on the Valle Vidal do not currently meet the requirements for their designated use as "cold water fishery," many groups and individuals have been working proactively to improve the condition of these waters for recreation and wildlife.

There are several ongoing and potential activities that might contribute to a reduction of water quality in the future. Ongoing activities include livestock grazing, recreation, roads, invasive plants and their control, fisheries management, and fire. Current activities are carefully monitored through cooperation of the U.S. Forest Service, New Mexico State Forestry, and New Mexico Department of Game and Fish. Proactive and well-planned management is not expected to create permanent reductions in water quality.

Nomination of the waters of the Valle Vidal as ONRW may help guide the approval process for future activities that would affect water quality. Potential activities that could impact water quality in the future include the possibility that the area may be developed for logging or oil and gas. These activities have the potential to decrease water quality through sedimentation from road building and high use of forest roads by maintenance trucks, depletion of groundwater levels, and discharge of water and extraction-derived pollutants produced in oil or gas pumping. Though this development may provide short-term economic gains, it is likely that many of the existing local industries would be negatively and permanently affected by this development. Existing industries are based around providing services for individuals wishing to recreate on the Valle Vidal including hunters, anglers, wildlife watchers, and others just wishing to experience the grandeur of the area.

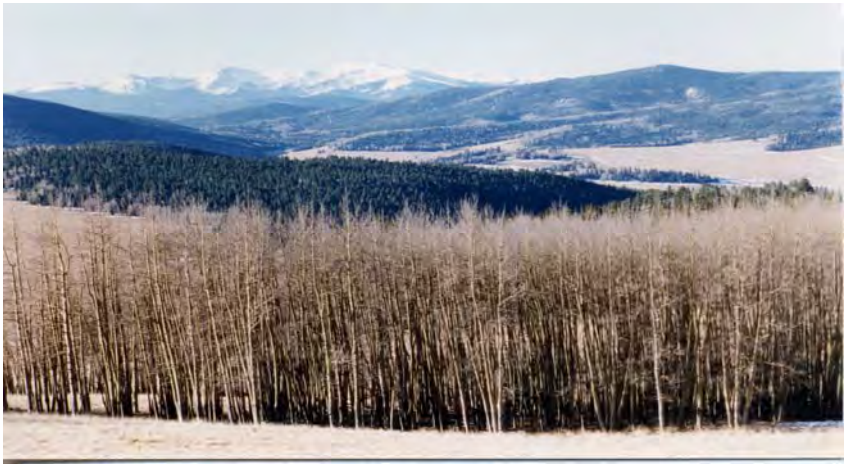
The New Mexico Department of Game and Fish, New Mexico Environment Department – Surface Water Quality Bureau, and New Mexico State Forestry believe that designation of the waters of the Valle Vidal as ONRWs will help conserve the existing conditions and the special qualities of the Valle Vidal into the future. With appropriate management this area can continue to be a gem within New Mexico's borders, providing the opportunity for many to visit and enjoy the recreational opportunities that exist there as well as providing habitat for large numbers of wildlife species including New Mexico's state fish, the Rio Grande cutthroat trout.

Petition for the waters of the Valle Vidal as an ONRW

20.6.4.9 NMAC (State of New Mexico Standards for Interstate and Intrastate Surface Waters)

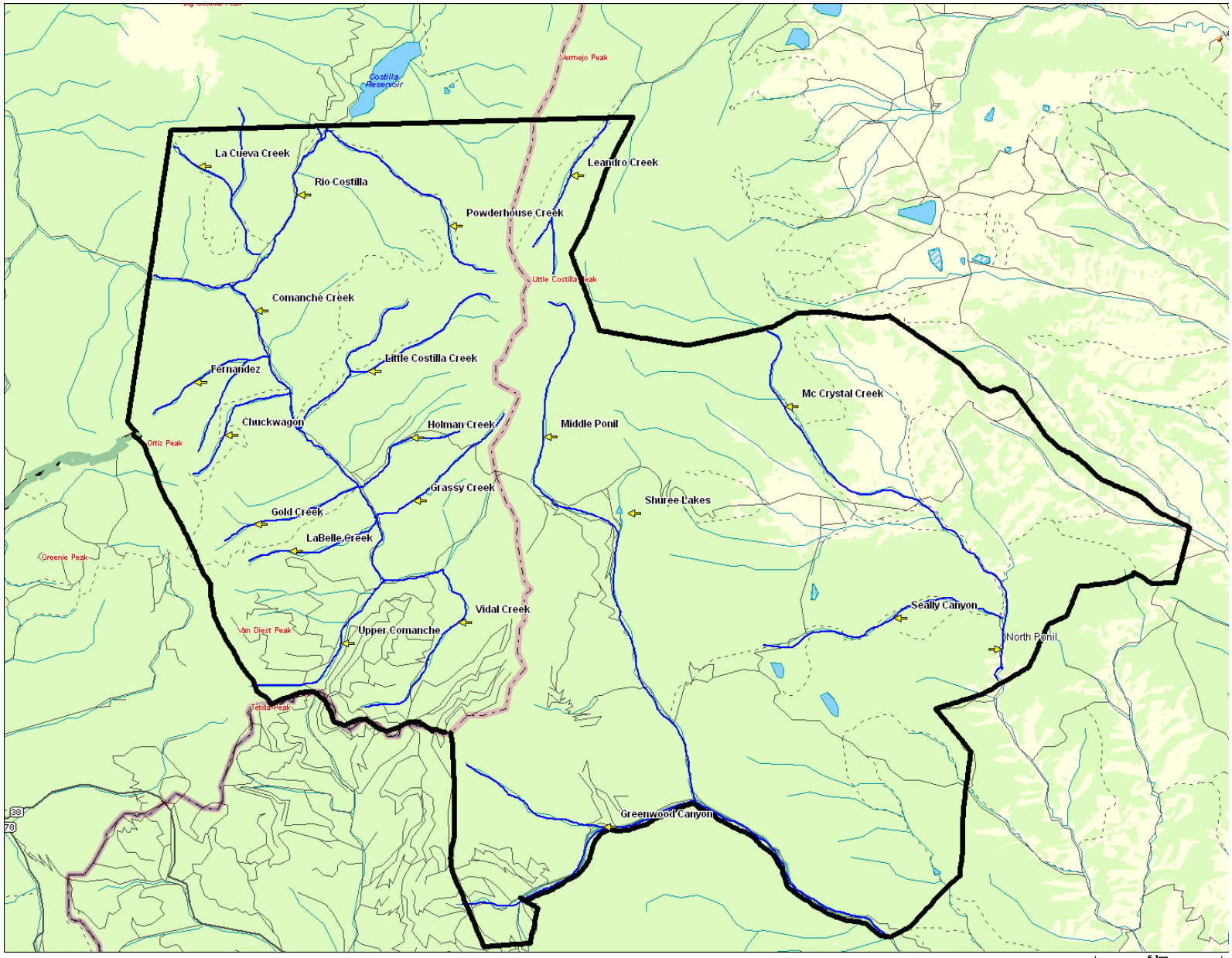
A. Procedures for nominating an ONRW
   1. Map
   2. Written statement based on scientific principles ONRW criteria listed in Subsection B
   3. Water quality data for baseline
   4. Discussion of activities that might contribute to reduction of water quality in the proposed ONRW
   5. Any additional evidence to substantiate designation, including an analysis of the economic impact of the designation on the local and regional economy within the state of NM.
   6. Affidavit of publication of notice

B. Criteria for ONRWs
   1. The water is a significant attribute of a state gold medal trout fishery, roadless area, 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 uses, recreational uses, and human health uses, and the water has not been significantly modified by human activities in a manner that substantially detracts from its value as a natural resource.



Section 1. Map of Valle Vidal.

All the waters encompassed in the 100,000-acre Valle Vidal Wildlife Management Unit of the Carson National Forest (Valle Vidal) are proposed for designation as Outstanding National Resource Waters (ONRW). The Valle Vidal (located in Colfax and Taos counties of northeastern New Mexico) has three main drainages: Rio Costilla, Middle Ponil, and North Ponil creeks. Additionally, the Valle Vidal contains the headwaters of Leandro Creek, which flows to the Vermejo River. Permanently watered streams (high-lightened in blue on following map) are more common in western than eastern portions of Valle Vidal. The Pennzoil Company donated the Valle Vidal to the American people in 1982. It is now administered as a special unit by the Questa District of Carson National Forest.


Costilla Reservoir
Vermejo Peak
La Cueva Creek
Rio Costilla
Leandro Creek
Powderhouse Creek
Little Costilla Peak
Comanche Creek
Little Costilla Creek
Fernandez
Mc Crystal Creek
Chuckwagon
Holman Creek
Middle Ponil
Ortiz Peak
Grassy Creek
Shuree Lakes
Gold Creek
LaBelle Creek
Greenie Peak
Vidal Creek
Seally Canyon
Van Diest Peak
Upper Comanche
North Ponil
Tetilla Peak
Greenwood Canyon
38
78
© 2001 DeLorme. Topo USA® 3.0
Scale: 1 : 125,000 Zoom Level: 10-6 Datum: NAD27 Map Rotation: 0° Magnetic Declination: 10.0°E
5 km

Section 2. Support for designation of Valle Vidal as ONRW.

1. Significant attributes of water

The Valle Vidal is one of New Mexico's most scenic landscapes. The lush valleys of the Valle Vidal were formed by the collapse of an ancient volcanic crater. New Mexico Magazine touts the Valle Vidal as one of the highlight areas for outdoor recreation in New Mexico, Great Outdoor Recreation Pages (GORP) list the Valle Vidal as one of the ten best camping areas in the country, stating that it "is a special treasure to those who want to experience the west as it once was." During summer months, the Valle Vidal is popular among anglers, wildlife watchers, hikers, and others wishing to take in its splendor. Winter months provide opportunities for snowmobiling, snowshoeing, and cross-country skiing.

The Valle Vidal is part of the Carson National Forest, and is managed as a special wildlife area, containing many large roadless areas. The Valle Vidal boasts some of northern New Mexico's best aquatic resources. The Valle Vidal includes several waters, which have sufficient values to classify them under the federal government's Wild and Scenic Rivers program (Table 1). McCrystal Creek has been determined to be eligible based on its remarkable fish (Rio Grande cutthroat trout), wildlife, scenery, as well as recreational and ecological values. The entire drainage, including the North Ponil is determined to have remarkable historic value. Middle Ponil Creek is outstanding for its wildlife, historic, and recreational values. Additionally, the entire Rio Costilla drainage, including Powderhouse, La Cueva Creek, as well as Comanche Creek and its tributaries, are eligible to be classified as "wild, scenic or recreational" under the Wild and Scenic Rivers Act.

These rivers receive protection as if they were designated Wild and Scenic. Therefore, they must be managed to maintain and, to the extent possible, enhance their outstanding values. Management and development of the rivers cannot be modified to the degree that eligibility or classification would be affected.[1]

[1] Carson Forest Plan Amendment 12, Protection of Eligible Wild, Scenic, or Recreational River Areas, Carson National Forest, Taos County, NM.

Table 1. Eligibility of Valle Vidal waters under the federal Wild and Scenic Rivers Act.

Drainage	Water Name	Wild and Scenic Classification
Middle Ponil	Middle Ponil	Recreation
North Ponil	McCrystal	Recreation
North Ponil	North Ponil	Wild
Rio Costilla	Rio Costilla	Recreation
Rio Costilla	La Cueva	Scenic
Rio Costilla	Powderhouse	Wild
Rio Costilla (Comanche)	Chuckwagon	Wild
Rio Costilla (Comanche)	Comanche Creek	Recreation
Rio Costilla (Comanche)	Foreman	Wild
Rio Costilla (Comanche)	Gold	Wild
Rio Costilla (Comanche)	Grassy	Scenic
Rio Costilla (Comanche)	Holman	Recreation
Rio Costilla (Comanche)	La Belle	Recreation
Rio Costilla (Comanche)	Little Costilla	Wild
Rio Costilla (Comanche)	Vidal	Wild

2. Recreational or ecological significance:

2.1 Recreational significance

Whether one comes to the Valle Vidal Unit of the Carson National Forest to hunt, fish, or hike, this is one of the great recreational experiences available in New Mexico, if not the nation. The Valle Vidal was one of the first national forest units in the state where resource managers agreed to maintain quality elk herds as well as a quality hunting experience. License numbers were kept intentionally low to provide the public the opportunity to locate trophy-sized bulls typically not found on more intensively hunted public lands.

From the start, it also was managed as a once-in-a-lifetime hunting opportunity, an effort to provide more hunters the opportunity to experience this beautiful mountainous area. In addition, closures occur on portions of the Valle Vidal during winter (January 1 to March 31) and spring calving (May 1 to June 30) to protect the elk. Legally licensed elk hunters

may also hunt for bear during their seasons and there are also twenty permits available to hunt wild turkey.

For anglers, the waters of the Valle Vidal offer the chance to catch the Rio Grande cutthroat trout *(Oncorhynchus clarki virginalis)*, as well as brown trout (*Salmo trutta)*, rainbow trout (*O. mykiss)* and brook trout (*Salvelinus fontinalis)*. Since 1997, an average of 5,000 anglers have visited the Valle Vidal, fishing 15,000 days each year. Rio Costilla (Costilla Creek) and Shuree Lakes are the most visited destinations. In keeping with the spirit of maintaining a quality angling experience, fishing is not allowed on the Valle Vidal until July 1.

Rainbow trout are stocked in the ponds of Shuree Lakes, which have a bag limit of two fish 15 inches or larger. One of the ponds is designated as a "kids pond" for anglers under 12 years of age. All stream fishing is catch-and-release. By providing both opportunities for keeping large stocked trout and catch-and-release fishing for wild fish in streams, the Valle Vidal attracts a diverse group of anglers. Characteristics of individual streams included in this nomination are presented in Appendix 1.

"The Valle Vidal is still one of the few easy access public fisheries that's good enough to guide on," writes author and fishing guide Taylor Streit. "It's every man's stream, not just because there are lots of fish, but the gentle nature of the meadows make it perfect for both young and old. I've even had handicapped people catch fish there."

Camping is a popular activity in the Valle Vidal. To help protect the Valle Vidal from impacts of camping, it is restricted to campground areas or away from roads for those choosing to pack into the backcountry. Great Outdoor Recreation Pages voted two campgrounds, Cimarron and McCrystal, among the top ten best U.S. Campgrounds.

Scouts from around the nation and several foreign countries visiting the Philmont Scout Ranch have been using the Valle Vidal to teach Leave No Trace skills. Since 1998, more than 23,000 participants have had a portion of their trek on the Valle Vidal. As well, several camps are used to teach young people a variety of interesting skills from astronomy to the rich history of the Valle Vidal area. A letter from Philmont Scout Ranch is appended, describing their use and value of the wilderness experience for their scouts on the Valle Vidal (Appendix 4).

Separate cross-country skiing/snowshoeing and snowmobiling areas are designated on the west side of the Valle Vidal. Opening of winter recreational areas usually coincides with the migration of the elk herd to the east side. In summer, the wide-open valleys of the Valle Vidal provide great places for hiking and horseback riding for all skill levels.

The streams, lakes, meadows, woodlands, and forests of the Valle Vidal also provide excellent bird watching opportunities, and the area is an important destination for both resident and out-of-state birders. The value of the Valle Vidal to nesting, migrating and wintering birds, as well as the area's attractiveness for bird watching is enhanced by the pristine nature of the surroundings. Within the Valle Vidal, birders can expect to find species typical of the Southern Rocky Mountains, including Bald Eagle (*Haliaeetus leucocephalus)*, Peregrine Falcon (*Falco peregrinus anatum)*, Northern Goshawk (*Accipiter gentiles)*, Three-toed Woodpecker (*Picoides tridactylus dorsalis*), American Dipper (*Cinclus mexicanus unicolor*), Grace's Warbler (*Dendroica graciae graciae*), Western Tanager (*Piranga ludoviciana*), Green-tailed Towhee (*Pipilo chlorurus*), and Red Crossbill (*Loxia curvirostra*).

2.2 Ecological significance

The Valle Vidal supports a large variety of wildlife species (Appendix 2, tables 2-1 and 2-2). There are several threatened or sensitive species that are found on the Valle Vidal as well as the largest elk herd in the state. Although the area is not classified as a wilderness area, there are a limited number of open roads and many of these have seasonal closures, affording wildlife a great deal of protection from human traffic.

All of the main drainages contain populations of Rio Grande cutthroat trout, the state fish of New Mexico. The Rio Grande cutthroat trout is currently found in less than 10 percent of its native range in the watersheds of New Mexico and Colorado. Rio Grande cutthroat trout is listed as a species of concern by the U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish, and Region 3 of the U.S. Forest Service. The Rio Grande cutthroat trout is currently under litigation to be considered a "candidate" species for federal listing under the Endangered Species Act. All of the waters contained on the Valle Vidal are suitable and historical, Rio Grande cutthroat trout habitat. Comanche, Leandro, McCrystal, and Powderhouse creeks all contain Rio Grande cutthroat trout populations that have high levels of genetic purity (NMDGF 2002). The entire Rio Costilla drainage is proposed for restoration for Rio Grande cutthroat trout. Other native fishes that currently occur in the waters of the Valle Vidal include creek chub (*Semotilus atromaculatus*) and longnose dace (*Rhinichthys cataractae*).

There are several amphibians, mammals, and birds, listed as sensitive or threatened species that are found on the Valle Vidal (Appendix 2). Northern leopard frogs (*Rana pipiens)* are listed as a Region 3 U. S. Forest Service sensitive species and also have been documented in the Valle Vidal. Mammals that are dependent on maintenance of streams with high water quality include the little brown myotis bat (*Myotis lucifugus)*, long-eared myotis bat (*Myotis evotis)*, fringed myotis bat (*Myotis thysanodes)*, long-legged myotis bat (*Myotis volans)*, Western small-footed myotis bat (*Myotis ciliolabrum)*, and heather vole (*Phenacomys intermedius)*. Bald eagles (*Haliaeetus leucocephalus)* are also known to utilize the waters of the Valle Vidal.

Additionally, rare aquatic invertebrates, such as Knobbedlip fairy shrimp (*Eubranchipus bundyi*) and Packard's fairy shrimp (*Branchinecta packardi)*, have been found in several ephemeral waters on the Valle Vidal. The Packard's fairy shrimp is known from only two other sites in New Mexico; El Malpais and Mount Taylor.

Plant communities on Valle Vidal are a diverse assemblage of forest, mountain meadow, wetland, and alpine tundra vegetation typical of the southern Rocky Mountain floristic region. Lower elevation forests are dominated by ponderosa pine (*Pinus ponderosa*) while mid-elevations have mixed conifer forests of ponderosa pine, limber pine (*Pinus flexilis*), Douglas fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), blue spruce (*Picea pungens*), and large glades of aspen (*Populus tremuloides*). The highest forested elevations are covered with subalpine forests of corkbark fir (*Abies arizonica*), Engelmann spruce (*Picea engelmannii*), and bristlecone pine (*Pinus aristata*).

Several stands of bristlecone pine on Valle Vidal are considered old-growth for that species. In fact, a bristlecone pine tree on the south flank of Little Costilla Peak is one of the largest known trees of this species in the world. There are two co-champion bristlecone pines on the Big Tree Register – one on Valle Vidal and another of similar size in adjacent Colfax County.

Alpine tundra and mountain meadow plant communities are relatively rare in the mountains of northern New Mexico. Tundra vegetation on Valle Vidal is confined to a small area at the highest elevations of Little Costilla Peak. However, the mountain meadows of Valle Vidal range from small forest openings to extensive fescue grasslands that contribute significantly to scenic views and the wildlife species that depend on these open habitats.

Riparian woodlands and wet meadows are also rare in New Mexico. These are especially diverse plant communities that provide clean water by slowing and filtering runoff. Woody vegetation along Valle Vidal streams range from narrowleaf cottonwood (*Populus angustifolia*) and willows (*Salix* sp.) to mountain alder (*Alnus incana*) and red-osier dogwood (*Cornus sericea*) at higher elevations. Numerous springs and seeps produce wet meadow cienegas and bogs dominated by various native sedges (*Carex* sp.), grasses, and a diverse array of other herbaceous plants that create unique and productive wildlife habitats.

3. Existing Water Quality.

The Surface Water Quality Bureau (SWQB) of the New Mexico Environment Department has monitored and assessed the streams on the Valle Vidal over the last 16 years. These data are summarized in Appendix 3. A large majority of these assessments indicate the waters are at or above the applicable standards, i.e. are meeting their designated uses. However, some of the streams do not currently meet their designated uses (Table 2). Appendix 3, Table 3-2 lists the exceedence ratios, the number of times a parameter exceeded the standard over the total number of times that parameter was measured. For most parameters the exceedence ratio must be 0.15 for the segment to be listed as not supporting the designated use.

Several pro-active projects, by several organizations, to improve these streams and riparian habitats have been undertaken. Currently the Comanche Creek working group includes individuals from the Quivira Coalition, New Mexico Department of Game and Fish, Carson National Forest, and New Mexico Environment Department as well as the current grazing permittee for the Valle Vidal. A Watershed Implementation Plan for the Comanche Creek Watershed, funded by a 319 grant from the EPA, provides the outline of projects to improve water quality in Comanche Creek.

Section 3: Baseline Water Quality Data.

The New Mexico Environment Department (NMED) has monitored water quality at 7 sites within the boundaries of the Valle Vidal, as well as several sites at downstream locations (Appendix 3, Table 3-1). Sites in the Ponil Watershed were monitored 7 times in 1989 and again in 1998 (Appendix 3, Table 3-4). The Costilla Watershed was surveyed 2 to 4 times a year between 1986 and 1995 and 8 times in 2000 (Appendix 3, Table 3-3 and Figures 3-1 and 3-2). Thermographs were also deployed in Comanche Creek in 2002 and 2003 to record diurnal and seasonal variations in temperature. Thermographs were placed at Comanche Creek below the elk exclosure between May 18 and October 23 of 2002 and at Comanche Creek above the confluence with Rio Costilla between July 2 and September 4 of 2003 (Appendix 3, Figure 3-3).

Water quality monitoring included measurement of a number of chemical and physical parameters including: dissolved oxygen (DO), temperature, pH, turbidity, total nitrogen (TN), total phosphorus (TP), and dissolved metals such as aluminum, zinc and lead. These parameters are then compared to applicable standards to determine if the waters are meeting their designated uses. Stream bottom deposits are assessed to determine the percent of fine substrate (sand and fiber) from a geomorphic survey, benthic macroinvertebrate surveys, and comparing these variables to those from a reference site. The reference should be minimally disturbed and have characteristics such as elevation, geology, hydrology, hydraulics, watershed size, in-stream habitat (pools, substrate, etc), and riparian vegetation similar with the study site.

As Comanche Creek is one of the waters of the Valle Vidal not currently meeting designated uses (Table 2), there are projects underway to improve its condition. A Watershed Implementation Plan for the Comanche Creek Watershed, funded by a 319 grant from the EPA, provides the outline of projects designed to improve water quality in Comanche Creek.

The following is a brief overview of recent results of water quality surveys on the streams of the Valle Vidal.

Rio Costilla Basin**:**
From May through October 2002 Comanche Creek thermograph recorded temperatures higher than 23˚C, which are in excess of those required to support the designated use of the high quality cold water fisheries. Geomorphic and benthic macroinvertebrate data, however, indicated full support for the designated use.

Eight water quality samples collected from Costilla Creek below the reservoir from May through October 2000 indicated that a small proportion of the samples had exceedences for aluminum, lead, nickel, and zinc. None, however, was persistent enough to result in an assessment of nonsupport of the designated use. Below the Valle Vidal boundary, the turbidity requirement was exceeded for the spring samples.

Middle Ponil:
From May 1998 through March 1999, Middle Ponil Creek had exceedences for turbidity indicating a slight impairment to the high quality cold-water fishery designated use. In the summer of 2002, a nearly 100,000-acre fire burned through much of the Middle Ponil drainage below Greenwood Canyon. It is likely that ash flows from this event caused dramatic changes to water quality in the lower portions of Middle Ponil Creek.

North Ponil:
From May 1998 through March 1999, North Ponil Creek had exceedences for turbidity and phosphorus, indicating a slight impairment to the high quality cold-water fishery designated use. McCrystal Creek, a tributary to North Ponil Creek, assessed in 1999, had temperatures in excess of the requirements for the high quality cold-water fishery designated use.

Other Valle Vidal Waters:
Leandro Creek and Seally Canyon were assessed in 1998 and met all designated use requirements.

Table 2: Current classification of Valle Vidal waters for their designated use categories as identified by NMED.

		Designated Uses										
Drainage	**Water Name**	**Domestic Water Supply**	**Fish Culture**	**High Quality Cold Water Fishery**	**Industrial Water Supply**	**Irrigation**	**Livestock Watering**	**Municipal Water Supply**	**Secondary Contact**	**Wildlife Habitat**	**Probable Source of Impairment**	**Specific Impairments**
Vermejo	**Leandro Creek**	Fully Supporting		Fully Supporting	Fully Supporting	Fully Supporting	Not Assessed	Fully Supporting	Not Assessed	Fully Supporting		
Ponil	**McCrystal Creek**	Fully Supporting		Not Supporting	Fully Supporting	Fully Supporting	Not Assessed	Fully Supporting	Not Assessed	Fully Supporting	Loss of Riparian Habitat	Temperature
Ponil	**Middle Ponil Creek**	Fully Supporting		Not Supporting	Fully Supporting	Fully Supporting	Not Assessed	Fully Supporting	Not Assessed	Fully Supporting	Forest Roads, Loss of Riparian Habitat, Rangeland Grazing, Streambank Modifications/destabilization	Sedimentation/ siltation, Temperature, Turbidity
Ponil	**North Ponil Creek**	Fully Supporting		Not Supporting	Fully Supporting	Fully Supporting	Not Assessed	Fully Supporting	Fully Supporting	Fully Supporting	Habitat modification, Loss of Riparian Habitat, Rangeland Grazing, Silviculture Harvesting	Sedimentation/ siltation, Temperature, Turbidity
Ponil	**Seally Canyon**	Fully Supporting		Fully Supporting	Fully Supporting	Fully Supporting	Not Assessed	Fully Supporting	Not Assessed	Fully Supporting		
Ponil	**Shuree Pond (North)**	Not Assessed		Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed		
Ponil	**Shuree Pond (South)**	Not Assessed		Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed		
Costilla	**Comanche Creek (Costilla - Little Costilla)**	Fully Supporting	Fully Supporting	Not Supporting		Fully Supporting	Fully Supporting		Not Assessed	Fully Supporting	Rangeland Grazing	Temperature
Costilla	**Costilla Creek (Comanche to Costilla Dam)**	Fully Supporting	Fully Supporting	Fully Supporting		Fully Supporting	Fully Supporting		Not Assessed	Fully Supporting		
Costilla	**Comanche Creek Tributaries**	Not Assessed		Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed		

Section 4. Activities that might contribute to the reduction of water quality on the Valle Vidal.

Current Activities:

Protecting the watershed and improving water quality were recognized as challenges for resource management agencies as early as 1983 when the U.S. Forest Service, Vermejo Park Ranch, and the New Mexico Game Commission signed a management directive for Valle Vidal. At that time, riparian habitat was considered "poor." Lack of streambank vegetation contributes to increased sediment loads as well as increased water temperatures.

Grazing

There have been many improvements in grazing management and on-the-ground restoration efforts by several groups to foster recovery of riparian zones.

Currently, range riders discourage cattle from lingering in riparian zones. In addition, grazing exclosures have been placed in many areas to encourage reestablishment of woody riparian vegetation from natural regrowth or plantings have been made by volunteer organizations. Changes in these proactive management practices might have negative effects on water quality and watershed health. Managers will continue to work with permittees to enhance improving trends in water quality of Valle Vidal streams.

Roads and OHV Use

Since 1982, approximately 300 miles of roads have been closed or rerouted to limit their impacts to aquatic systems in the Valle Vidal.[2] Roads and trails are often the main contributor of fine sediments to mountain streams. Additionally, recreation has impacts on riparian vegetation due to trampling by campers and hikers. Currently, regulations on the Valle Vidal prohibit use of vehicles off of established roads and camping is confined to designated-use areas or backcountry camping, at least ½ mile from open roads, 100 yards from natural waters, and 300 yards from artificial impoundments.

Off highway vehicle (OHV) users are one of many groups that appreciate the Valle Vidal for its recreational values. Unfortunately, OHV use, especially illegal and irresponsible use, is an activity that has the potential to contribute to reduction of water quality in the Valle Vidal. Irresponsible motorized use on public lands causes degradation of plant and wildlife habitat; erosion of soils, reduction of plant populations and plant diversity; water and air pollution; damage to cultural resources; and interference with other forms of

[2] Comanche Creek Watershed Implementation Plan – Bionomics Southwest 2003.

recreation.[3] Specifically, OHV use can cause erosion and contribute to increases in conductivity, sediment deposition, and turbidity in water systems. This is especially a risk when OHV users drive in, or up and down the banks of the water body.

OHV use is popular on all open Forest Service roads in the Valle Vidal including the main road through the Valle Vidal (F.R. 1950) and the jeep loop (F.R. 1950, F.R. 1913 and F.R. 1914). Unfortunately, some users choose to stray from these legally designated routes to travel overland and on closed roads and two-track routes. Some stray from designated routes while others gain access from areas outside Valle Vidal. Two examples of illegal access from other Forest Service units include the closed forest service road near Midnight Meadows in the upper Bitter Creek drainage in the Upper Red River area and overland travel from the Anchor mine site, also in the Upper Red River drainage. The Carson National Forest currently has only one OHV enforcement officer for the entire Forest. The large patrol area, as well as extent of OHV abuse Forest wide, makes it difficult for the Forest Service to control problems related to OHV abuse. Fortunately, programs such as the state administered 319 program provide opportunities to help diminish impacts of OHV use. Currently Amigos Bravos, in cooperation with the Forest Service is implementing a 319 project to patrol, control, and mitigate OHV use in the Upper Red River Watershed. Under this project the two problem areas mentioned above are targeted for more effective closure actions and reclamation. To avoid degradation of waters in the Valle Vidal, other projects of this nature could be implemented on Valle Vidal and adjacent Forest Service areas to control potential problems. The Carson National Forest has recognized the problem of irresponsible OHV in the Forest and has recently dedicated substantial resources towards mapping the problem, hosting public meetings, signage and fencing, and working with the public on issues of enforcement.

Best Management Practices (Invasive Plants, Fishery Management, Fire Management)

There are several ongoing and proposed management activities that may cause short-term impacts to water quality, but would have an overall positive effect on health of the watershed and wildlife habitats. The short-term reductions in water quality caused by these management activities should be considered in context of the long- term benefits gained from improved watershed health. Included in these activities are control of invasive species (plant and animal), fisheries management, and fire management.

Controlling invasive and nonnative noxious weeds is a key piece of the Forest Service natural resource agenda for sustaining forests and watershed health. Nationally, invasive species infest 4,600 acres of new land daily[4]. These plant invasions may lower water tables, prevent recovery of disturbed riparian habitat, decrease food available to wildlife and affect food webs[5], alter important ecological processes and resources[6], and lead to

[3] The Wilderness Society, "A Citizen's Guide to Off-Road Vehicle Management and Your Bureau of Land Management Public Lands, April 2002.
[4] Westbrooks, Randy G. Invasive plants: changing the landscape of America: fact book/.-- Washington, D.C.: Federal Interagency Committee for the Management of Noxious and Exotic Weeds, 1998.
[5] Harty, Francis M. 1986. Exotics and their ecological ramifications. Nat. Areas J. 6:20-26.
[6] Melgoza, Graciela, R. S. Nowak and R. J. Tausch. 1990. Soil water exploitation after fire: competition between Bromus tectorum (cheatgrass) and two native species. Oecologia 83:7-13.

endangerment of native species[7,8]. Noxious weeds can disrupt grazing patterns, increase the intensity and frequency of natural fires, lower water tables, and increase soil erosion rates.[9] Noxious weeds are a potential problem to water quality, fisheries, and watershed health, and decrease ecosystem health along rivers and streams. These aggressive alien plants can colonize disturbed areas and prevent succession of native plants, ultimately resulting in slower recovery of disturbed habitat and increased sediment run-off. Riparian shade may also be reduced when native riparian species are replaced with invasive nonnative species.

Proposed activities for invasive plants on Southwestern Region Forests include eradication or control of weeds that pose a threat along riparian areas, roads, trails, recreation sites, administrative sites, gas/oil pads (and pipelines), and range improvements. Areas of recent natural disturbance, such as the Ponil Fire complex and other burned areas will also receive attention. Proposed activities include:

- Hand pulling, grubbing with hand tools or hand-operated power tools, mowing and disking, or plowing with tractor-mounted implements;
- biological control using insects or plant pathogens introduced into the weed habitat;
- controlled grazing using goats and sheep to intensively and repeatedly graze weeds;
- herbicide application to weed populations using hand or vehicle-mounted sprayer applications;
- prescribed burning using limited pile or broadcast burning to eliminate seed heads and resident populations of weeds.

Following invasive plant control elimination efforts, appropriate native species will be restored.[10]

Currently, restoration of Rio Grande cutthroat trout and other native fishes is a high priority for Carson National Forest and New Mexico Department of Game and Fish. Nonnative fish species compete with native species. In addition, several nonnative trout species hybridize with native trout, thereby eliminating the native species. The entire Rio Costilla Drainage, including Comanche Creek, is proposed for restoration of the native fish community. Activities within this project would potentially involve removal of nonnative trout and white sucker by mechanical removal and application of a piscicide to the water. Application of a piscicide would have to be approved by the New Mexico

[7] Parenti, Robert L. and E. O. Guerrant, Jr. 1991. Down but not out: reintroduction of the extirpated Malheur wirelettuce, Stephanomeria malheurensis. Endangered Species Update 8:62-63

[8] Flather, Curtis H.; Linda A. Joyce and Carol A. Bloomgarden. 1994. Species Endangerment Patterns in the United States. USDA Forest Service Rocky Mountain Forest and Range Experiment Station General Technical Report RM-241, Fort Collins, Colorado.

[9] Greater Yellowstone Coalition, Threats to Wildlife, Exotic Plants

[10] Summary of the Draft Environmental Impact Statement for the Environmental Impact Statement for the Invasive Plant Control Project Carson and Santa Fe National Forests in Colfax, Los Alamos, Mora, Rio Arriba, San Miguel, Santa Fe, Sandoval and Taos Counties in New Mexico. USDA Forest Service, Southwestern Region.

Water Quality Control Commission. The Rio Grande cutthroat trout populations in Powderhouse and Leandro Creeks were restored to Rio Grande cutthroat trout with the use of piscicide and mechanical removals.

Wildfire management activities, such as thinning and prescribed burning, increase diversity within the forest and reduce the likelihood of large scale, catastrophic wildfire that could cause long- term degradation in water quality as a result of topsoil loss. Following the Ponil Complex Fire of 2002, the Middle Ponil Drainage experienced large scale flooding and erosion, which eliminated most of the aquatic life in the lower drainage.

Potential Activities:

Oil and Gas Development

The El Paso Corporation has requested authorization from US Forest Service to explore for and develop natural gas resources in the Valle Vidal. At this time, the Carson National Forest is attempting to amend the forest plan to include the Valle Vidal[11]. It is anticipated that after this amendment is completed, an official analysis will be conducted to determine the impacts of oil and gas development, specifically coal bed methane, on the Valle Vidal.

There are several impacts of oil and gas development that can be anticipated to affect water quality and the natural landscape. Their severity depends upon level of development. Currently it is estimated that between 190 and 500 wells will be installed[12]. One of the obvious necessities for installation and maintenance of wells would be construction of additional roads to access them. These roads would likely increase sedimentation in streams. Heavy traffic on these roads will likely cause elevated levels of dust and potential air pollution issues

Well pad site on neighboring Vermejo Park Ranch.

During the oil/gas extraction process, water is pumped from aquifers associated with coal beds. The aquifer must be pumped out ("produced") to cause coal beds to release methane gas. How "produced" water is disposed of as well as its removal will affect how severe impacts may be on water quality and quantity. Water quantity might be diminished in those streams and pond systems that depend on natural springs. There are

[11] Federal Register: 70 FR 34441, June 14, 2005

[12] Power, T. M. 2005, The local economic impacts of natural gas development in Valle Vidal, New Mexico. A report prepared as comment to the Carson National Forest.

several options for "disposal" of water produced during the extraction process. Water can be reinjected into the aquifer, released into natural stream systems, or held in ponds. Often, water associated with this pumping is brackish, high in suspended solids and potentially contains other contaminants.

Coal bed methane extraction is underway in nearby areas. "In Colorado, development of coal bed methane has been underway the longest in La Plata County, including Durango. While the geology there is different than in the Raton Basin, the experiences of La Plata County citizens are instructive regarding the types of environmental impacts that coal bed methane can bring. Along the Fruitland Coal Outcrop, early methane production led to "uncontrolled seeps of flammable and toxic gases, underground coal fires, large-scale vegetation die-off and contamination of groundwater, domestic wells, and homes." [13]

Timber Harvest and Forest Management

Some Valle Vidal forests are suitably mature and accessible for timber harvest. There are, however, no large mills within an economical haul distance to support an extensive cut of this resource. A few small, local mills might be established in the future to harvest small timber leases if this activity is prescribed in the forthcoming Carson National Forest Management Plan. This forest management plan may also prescribe some forest thinning activities to maintain or improve forest health. These activities would create temporary roads and soil disturbance that could increase sediment delivery to streams for a year or two until vegetation is reestablished. Best management practices for erosion control and sediment retention would be applied to these disturbances.

Section 5. Other information regarding ONWR designation for waters of Valle Vidal

Many of the land-based economies of northern New Mexico are based on production of animals: bison, beef cattle, and sheep. Since the 1970s, however, there has been steady growth in the state's land and water based recreation businesses. Those enterprises are often more dependent upon production of fish and wildlife than the traditional products of the livestock industry. The success of this relatively new industry, the fish and wildlife industry, is dependent upon the State of New Mexico maintaining a reputation for unspoiled vistas and abundant wild animals and fish. That budding industry definitely would benefit from designating waters of the Valle Vidal as Outstanding National Resource Waters. The designation would make the area even more marketable than it is.

Clearly, much of the Valle Vidal's appeal comes from the generally undisturbed state of the land and streams in the area. If there were impacts to the scenic and recreational experiences because of degradation of water quality, local businesses that cater to visitors of the Valle Vidal might experience large economic declines. Degradation of water

[13] Draper, Electa. "More wells urged despite woes," The Denver Post, 6/7/00.

quality could impact the quantity and types of wildlife that currently use the area, have negative impacts on angling, as well as impact the scenic quality of streams and lakes on the Valle Vidal.

The U.S. Fish and Wildlife Service estimates that in 2001, over 670,00 individuals participated in wildlife watching activities in New Mexico. Of those, nearly 400,000 were nonresidents who came here to see elk, bears, eagles, turkeys and more than 500 other species of birds that frequent the state[14]. Wildlife watching expenditures statewide were estimated to be $558 million. Fishing had an estimated statewide expenditure of $176 million and hunting contributed another $153 million. The expenditures total roughly a billion dollars annually pumped into the state's economy by people who hunt, fish or watch wildlife. The total impact to the state's economies is a bit less than $2.5 billion.

As one of New Mexico's prime public viewing, fishing, and hunting areas, the Valle Vidal accounts for a substantial portion of this economic activity. The people of New Mexico and the nation who hunt and fish especially value it. They recognize it for the rare opportunity it is, a once-in-a-lifetime chance to pursue one of North America's greatest big game species, the elk, in one of New Mexico's most wonderful locations.

Elk hunting on the Valle Vidal is viewed as exclusive, hunters being limited to one bull and one cow hunt in their lifetime. In the case of archery and muzzleloader hunts, which have an either-sex bag limit, those hunters only get one opportunity to hunt the Valle Vidal. For the 2005 season, 270 permits for a five-day hunt are available (188 NM residents and 82 non-residents).

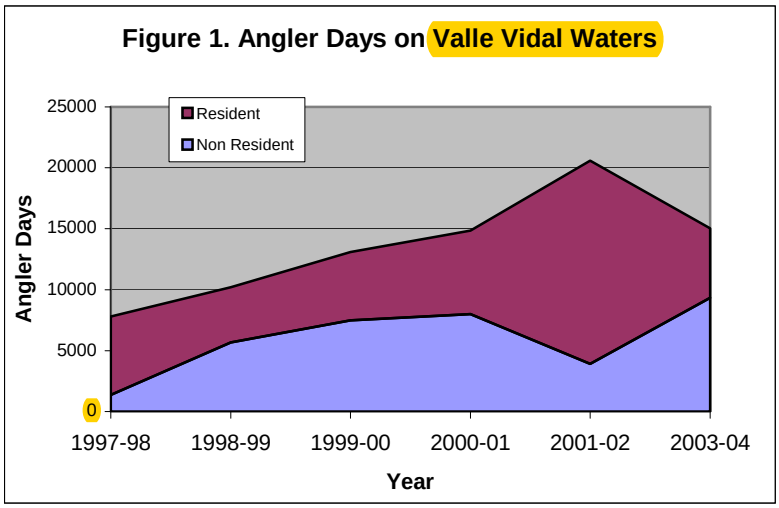
Many residents and nonresidents who initially think they are capable of hunting an area like the Valle Vidal rethink that idea once they see the expanse of this remarkable terrain. A single meadow that can take more than an hour to hike across is not the kind of place where one wants to pack out on ones own back something as large as an 800-pound bull elk. Several commercial outfitting operations exist now on the Valle Vidal. The Carson National Forest reports there are three elk-hunting operators and eight fishing-trip outfitters currently registered to use the property for at least a portion of their business. The New Mexico Council of Guides and Outfitters estimates these 11 businesses alone provide roughly $500,000 to the economic well-being of northern New Mexico.

"We estimate we provide services to roughly 15 percent of all those who draw licenses for the Valle Vidal," said John Boretsky, executive director for the Council. Each hunter using an outfitter pays an average of $4,500 to the outfitter. Boretsky estimates the money paid to elk-hunting outfitters therefore is $206,250.00. As these dollars cycle through the economies of the communities — for wages, groceries, fuel — their impact grows. The Council reports the "multiplier" for outfitted big game hunting is 1.749, meaning the outfitter income has an ultimate impact of $360,731.25[15].

[14] U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau. 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.
[15] Economic Contribution of Outdoor Recreation Industry in New Mexico – Professional Hunting Contribution, 2003

The guided hunting trips, however, only represent a portion of the recreational activity on the Valle Vidal. For example, if guided hunters take 15 percent of the 270 permits issued for the area each year, then do-it-yourself residents and nonresidents account for 233 of those licenses. In its 2001 National Survey of Fishing, Hunting and Wildlife-Associated Recreation, the U.S. Fish and Wildlife Service estimated each resident elk hunter spends $108 a day. The average nonresident hunter spends $92 each day.

Assuming that unguided resident hunters account for 215 elk licenses each season, and assuming they hunt four days, the dollars generated by them would be $92,880. The remaining 18 nonresident hunters would contribute $6,624. The multiplier for travel and tourism is typically between 1.5 and 2.5, meaning the true impact of those dollars is somewhere between $149,256 and $248,760[16]. Elk hunting on the Valle Vidal contributes more than a half million dollars to the economies of the communities and individuals surrounding the area.



Much the same can be said for fishing. From 1997-2003, an annual average of 5,000 individuals came to the Valle Vidal and fished 15,000 days. Statewide, NM resident anglers spent $82 each day of fishing and non-resident anglers spent $71, which represents over $1 million spent by anglers fishing on the Valle Vidal.

Business of several local fishing guides are based on fishing Valle Vidal streams. With an average cost of $350.00 a day for a guided fishing trip, Boretsky estimates the immediate dollars contributed by fishing on the Valle Vidal at $87,500. "The multiplier for fishing is 1.54, meaning that industry locally is worth about $134,750" [17] each year.

If development, such as coal bed methane drilling, were allowed on the Valle Vidal, the local community may see short-term gains in economic development. However, many of the jobs require skilled workers that are often filled by gas field workers from other areas[18]. Coal bed methane development can be relatively short-term in duration and often does not provide for long term support of local economic growth, leading to a boom and bust economy for the local community.

[16] Avitourism in Texas, 1999.
[17] Economic Survey for Guided Fishing Along the San Juan River, 2004.
[18] The Local Economic Impacts of Natural Gas Development in Valle Vidal, New Mexico. A report prepared as comments to the Carson National Forest. Thomas Michael Power, Chair – Economics Department, University of Montana. January 2005.

Undoubtedly, the attractiveness of the Valle Vidal for angling, hunting, and other outdoor recreation would be decreased with oil and gas development. It is difficult to project the long-term economic impacts to the local community if income from recreational activities were to decline, but it is not unreasonable to assume they would be substantial and negative.

Section 6. Affidavit of Publication of Notice of the Petition

Appendix 1: Stream Descriptions

Rio Costilla Watershed

Rio Costilla

There are two main sections of the Rio Costilla within the boundaries of Valle Vidal. The main stem of Rio Costilla flows through Costilla Reservoir, which is fully contained within Vermejo Park Ranch, approximately 6 miles through the Valle Vidal, and finally onto Rio Costilla Cooperative Livestock Association (RCCLA) property. Traditionally, water is not released from the reservoir between October and May. During the irrigation season (generally, May-September), flows in the Rio Costilla are highest during the week, when fields are being irrigated.

The Rio Costilla is the most visited water on the Valle Vidal, with an average of 7,700 angler days. Cutthroat trout, rainbow trout, and occasionally brown trout and brook trout can be caught in the Rio Costilla on the Valle Vidal. All fishing is catch and release with artificial flies and lures.

Other fish species that occupy the Rio Costilla include nonnative white sucker and native longnose dace. The mainstem of the Rio Costilla has been proposed for renovation as part of an effort to establish a "metapopulation" of Rio Grande cutthroat trout. This project would include the Rio Costilla and all of its tributaries from headwaters on

Vermejo Park Ranch to Latir Creek on RCCLA, encompassing nearly 200 miles of habitat. The completion of this project would help secure Rio Grande cutthroat trout into the future.

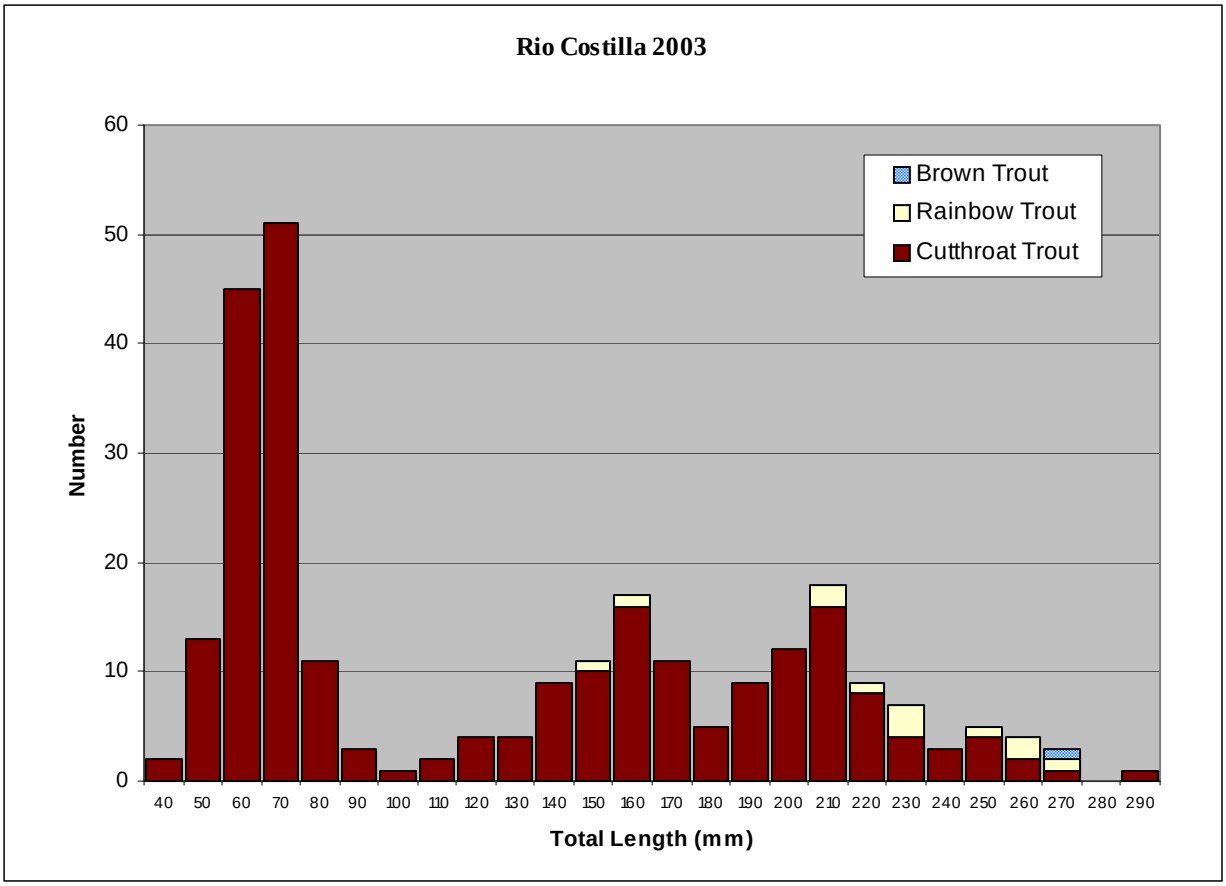


Figure 1-1. Size-structure of trout populations in Rio Costilla on the Valle Vidal, September 2003.

Comanche Creek

Comanche Creek and all of its tributaries are contained within the boundaries of the Valle Vidal. In total, the Comanche Creek drainage contains nearly 60 miles of stream. The upper portions, including Vidal Creek, contain pure Rio Grande cutthroat trout. White sucker and longnose dace are also found in the Comanche Creek drainage.

Since 1998, groups such as New Mexico Trout, Trout Unlimited, and the Quivira Coalition have been

working with Carson National Forest (and their permittees), New Mexico Department of Game and Fish, and the New Mexico Environment Department to improve fish habitats and water quality in Comanche Creek. Volunteer groups have assisted in the construction of several grazing exclosures and plantings to help establish woody vegetation along the creek. Additionally with help from an an EPA 303d grant and a Watershed Implementation Plan, other projects have been completed to help decrease sedimentation from roads and headcuts in the drainage.

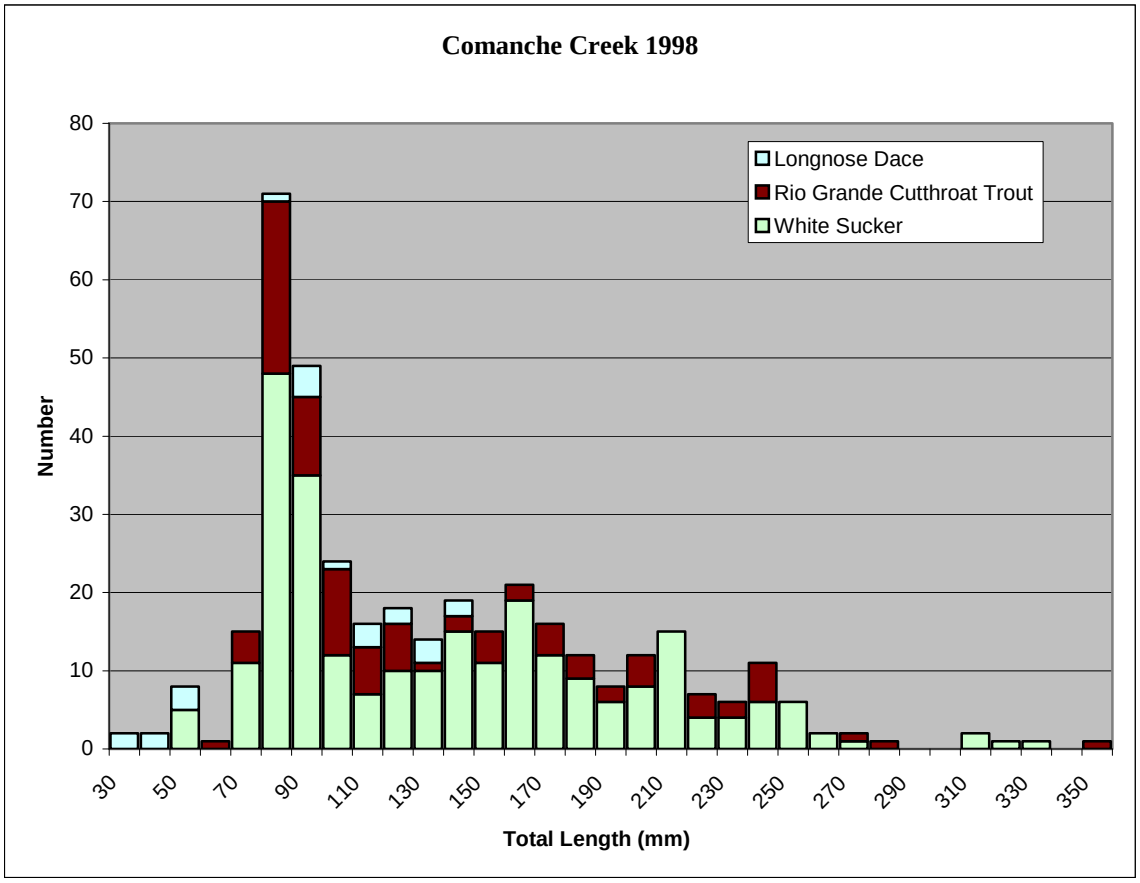


Figure 1-2. Size-structure of fish populations in Comanche Creek, summer 1998.

Powderhouse Creek

Powderhouse Creek is a small tributary to the Rio Costilla that flows in just below Costilla reservoir. Renovation of Powderhouse Creek for Rio Grande cutthroat trout was completed in 1997. Fintrol® (antimycin-A) was applied to the stream above a waterfall barrier to remove nonnative brook trout that were displacing pure native Rio Grande cutthroat. Following treatment, Rio Grande cutthroat trout were returned to the stream. The stream now supports about 2000 Rio Grande cutthroat trout per surface hectare. Angler use on this stream is about 100-angler days/year. Below the barrier brook trout as well as Rio Grande cutthroat trout are available to the angler. In total, Powderhouse creek has four miles of fish habitat, 3 of which are above the fish barrier.

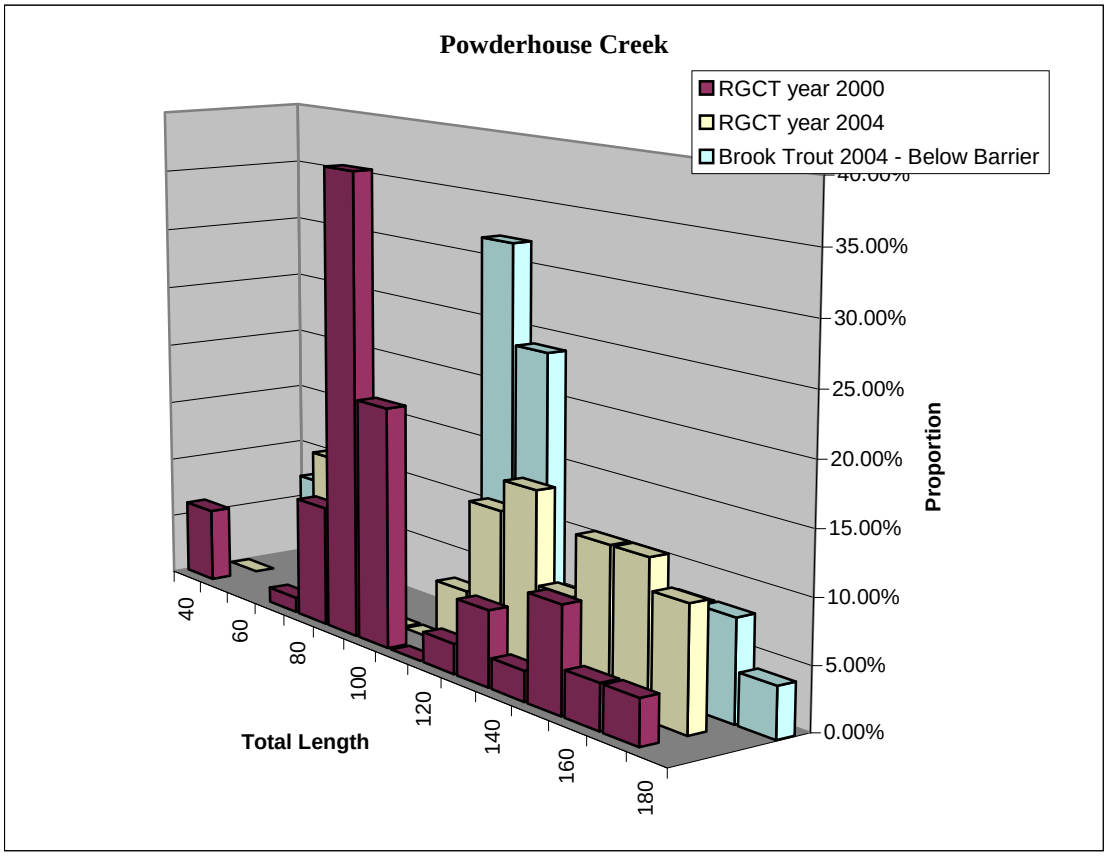


Figure 1-3. Size-structure of trout populations in captured in Powderhouse Creek, 2000 and 2004.

La Cueva Creek

La Cueva Creek is also a small tributary of the Rio Costilla, joining it about one mile upstream of the Comanche Creek confluence. This system also has Rio Grande cutthroat trout. La Cueva Creek has a very small width to depth ratio, with deep pools, which provide habitat for Rio Grande cutthroat trout. Few anglers venture up into this small canyon stream. On average 200 angler days are reported for La Cueva creek each year.

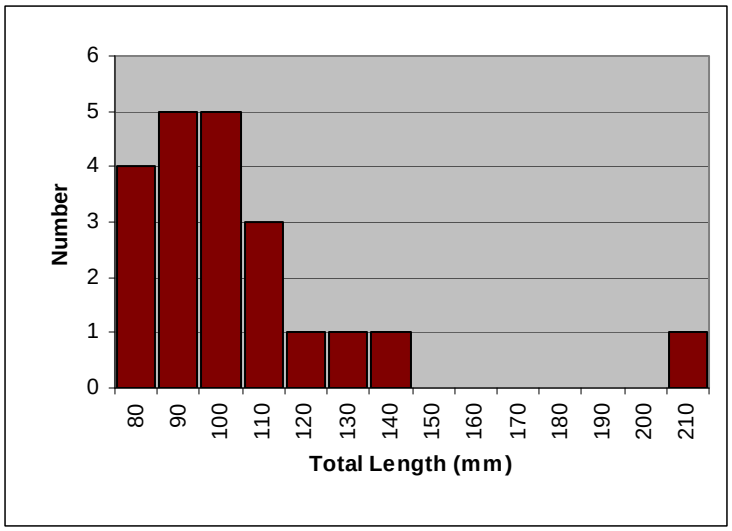


Figure 1-4. Size-structure of Rio Grande cutthroat trout population in La Cueva creek, July 2004.

North Ponil Drainage

The main headwater of North Ponil Creek is McCrystal Creek, which flows off Vermejo Park Ranch onto the Valle Vidal. The upper portions of McCrystal Creek contain a population of Rio Grande cutthroat trout. A popular campground near the creek provides access for hikers and anglers. On average, 150 angler days are spent fishing for the cutthroat trout in McCrystal Creek.

Lower in the drainage, North Ponil Creek contains populations of creek chub, longnose dace, and nonnative white sucker. Seally Canyon also contains creek chub. There are several ephemeral lakes associated with the North Ponil drainages. Packard's fairy shrimp, a rare species in New Mexico, occupy these lakes.

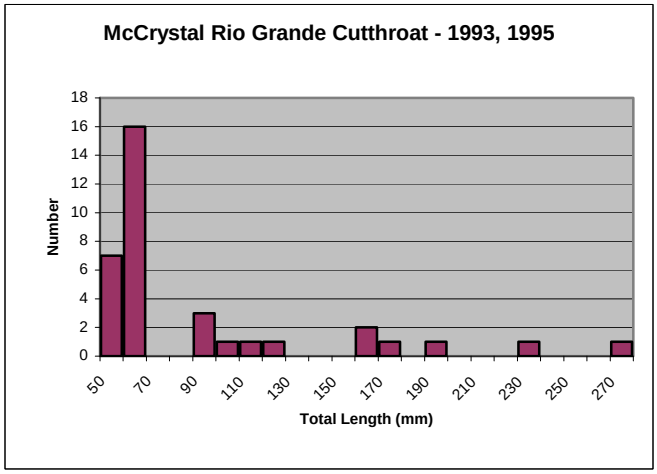


Figure1-5. Size-structure of Rio Grande cutthroat trout population in McCrystal Creek , 1993 and 1995.

Middle Ponil Drainage

Upper portions of Middle Ponil Creek, above Shuree Lakes, flow though a meadow off the east slope of Little Costilla Peak. This area contains a population of cutthroat x rainbow trout hybrids. Approximately 300 angler days are reported for this area.

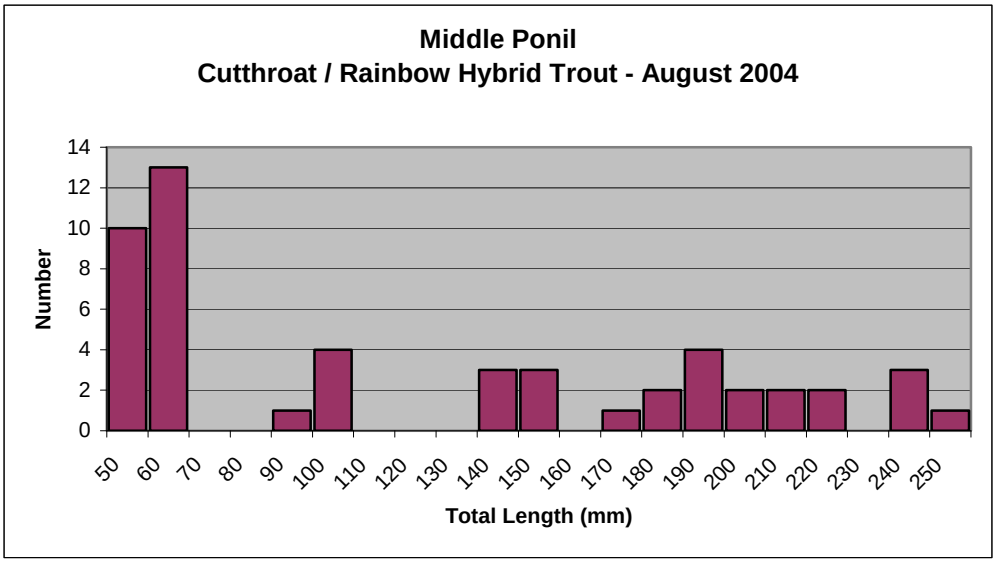


Figure 1-6.Size-structure of cutthroat x rainbow trout population in Middle Ponil Creek, August 2004.

Shuree Lakes are the second-most visited location for angling on the Valle Vidal. On average, 4,500 angler days are reported each year for those looking to catch stocked rainbow trout. This is the only water on the Valle Vidal where fish can be kept, the bag limit is two trout over 15". Shuree Lakes include three ponds ranging in size from 1 to 7 acres. All three ponds are stocked annually with trophy sized trout. One of the ponds is designated as a "kids pond" for anglers under 12 years of age.

Below Shuree Lakes, mainly cutthroat x rainbow trout are found. In the summer of 2002, the nearly 100,000 acre Ponil Complex Fire burned through the area. It is believed that all the fish below Greenwood canyon were killed by ash flows (J. Martinez, Carson N.F. pers. Com.).

Below the Valle Vidal boundary, Middle Ponil Creek flows onto Elliott Barker State Wildlife Area and Philmont Scout Ranch.

Other Waters

There are several waters on the Valle Vidal, including Bonita, Abreu, and Lookout canyons that have not been recently surveyed for fish. It is likely these waters are ephemeral and contain no fish; however, they may contain important habitat for aquatic invertebrates.

Leandro Creek

Valle Vidal contains the headwaters of Leandro Creek. Approximately three miles of stream are within Valle Vidal. After leaving Valle Vidal, the stream flows through Vermejo Park Ranch to its confluence with Vermejo River. In 1998, the portions of Leandro Creek on the Valle Vidal were renovated for Rio Grande cutthroat trout. Brook trout were removed using Fintrol® (antimycin-A) and Rio Grande cutthroat trout from Ricardo Creek (a nearby tributary to the Vermejo River) were released into the renovated stream. A constructed waterfall barrier, just upstream of Vermejo Park Ranch, prevents movement of nonnative brook trout back into Rio Grande cutthroat trout habitat.

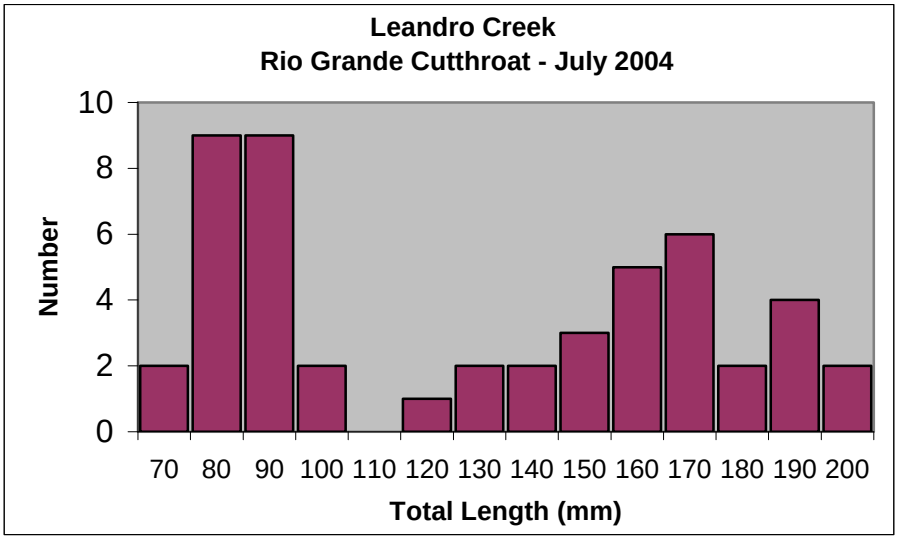


Figure 1-7. Size-structure of Rio Grande cutthroat trout population in Leandro Creek, July 2004.

Appendix 2. Lists of Wildlife Species.

Table 2-1. List of native vertebrate wildlife species found on the Valle Vidal.
** Species likely to be impacted by reduction in water quality/quantity, and associated impacts on mesic and riparian habitats.
*Species that could potentially be impacted by reduction in water quality/quantity, and associated impacts on mesic and riparian habitats.

Common Name	Species	Status
Fish		
**Rio Grande cutthroat trout	*Oncorhynchus clarki virginalis*	Sensitive/Species of Concern
**Creek chub	*Semotilus atromaculatus*	
**Longnose dace	*Rhinichthys cataractae*	
Amphibians		
**Tiger salamander	*Ambystoma tigrinum*	
**Chorus frog	*Pseudacris triseriata*	
**Northern leopard frog	*Rana pipiens*	Sensitive
Reptiles		
Mountain short-horned lizard	*Phrynosoma hernandesi*	
Fence lizard	*Sceloporus undulatus*	
Plateau striped whiptail	*Cnemidophorus velox*	
Many-lined skink	*Eumeces multivirgatus*	
Racer	*Coluber constrictor*	
Ringneck snake	*Diadophis punctatus*	
Hognose snake	*Heterodon nasicus*	
Smooth green snake	*Liochlorophis vernalis*	
Bullsnake	*Pituophis catenifer*	
**Blackneck garter snake	*Thamnophis cyrtopsis*	
**Wandering garter snake	*Thamnophis elegans*	
**Plains garter snake	*Thamnophis radix*	
Prairie rattlesnake	*Crotalus viridis*	
Birds		
**Bald Eagle	*Haliaeetus leucocephalus*	Federally Threatened
*Peregrine Falcon	*Falco peregrinus anatum*	State Threatened
Boreal Owl	*Aegolius funereus*	State Threatened
*Northern Goshawk	*Accipiter gentilis*	Sensitive/Species of Concern
Mexican Spotted Owl	*Strix occidentalis lucida*	Federally Threatened
Mammals		
*Masked Shrew	*Sorex cinereus*	
*Montane Shrew	*Sorex monticolus*	
Merriam's Shrew	*Sorex merriami*	
**Water Shrew	*Sorex palustris*	
*Little Brown Myotis Bat	*Myotis lucifugus*	Sensitive
*Long-eared Myotis	*Myotis evotis*	Sensitive
*Fringed Myotis	*Myotis thysanodes*	Sensitive
*Long-legged Myotis	*Myotis volans*	Sensitive
*Western Small-footed Myotis	*Myotis ciliolabrum*	Sensitive
*Silver-haired Bat	*Lasionycteris noctivagans*	

Table 2-1. Continued – list of native vertebrate wildlife species of the Valle Vidal.

Common Name	Species	Status
*Big Brown Bat	*Eptesicus fuscus*	
*Hoary Bat	*Lasiurus cinereus*	
*Townsend's Big-eared Bat	*Corynorhinus townsendi*	
Pika	*Ochotona princeps*	
Mountain Cottontail	*Sylvilagus nuttalli*	
Snowshoe Hare	*Lepus americana*	
Least Chipmunk	*Neotamias minimus*	
Colorado Chipmunk	*Neotamias quadrivittatus*	
Yellow-bellied Marmot	*Marmota flaviventris*	Sensitive
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	
Spotted Ground Squirrel	*Spermophilus spilosoma*	
Rock Squirrel	*Spermophilus variegatus*	
Golden-mantled Ground Squirrel	*Spermophilus lateralis*	
Gunnison's Prairie Dog	*Cynomys gunnisoni*	Sensitive
Abert's Squirrel	*Sciurus aberti*	
Red Squirrel	*Tamiasciurus hudsonicus*	
Botta's Pocket Gopher	*Thomomys bottae*	
Northern Pocket Gopher	*Thomomys talpoides*	Sensitive
**Beaver	*Castor canadensis*	
Deer Mouse	*Peromyscus maniculatus*	
Brush Mouse	*Peromyscus boylii*	
Rock Mouse	*Peromyscus difficilis*	
Mexican Woodrat	*Neotoma mexicana*	
Bushy-tailed Woodrat	*Neotoma cinerea*	
*Gapper's Red-backed Vole	*Clethrionomys gapperi*	
*Heather Vole	*Phenacomys intermedius*	Sensitive
*Meadow Vole	*Microtus pennsylvanicus*	
*Long-tailed Vole	*Microtus longicaudus*	
**Muskrat	*Ondatra zibethicus*	
**Western Jumping Mouse	*Zapus princeps*	
Porcupine	*Erethizon dorsatum*	
Coyote	*Canis latrans*	
Gray Fox	*Urocyon cinereoargenteus*	
Black Bear	*Ursus americanus*	
*Raccoon	*Procyon lotor*	
American Marten	*Martes americana*	State Threatened
Ermine	*Mustela erminea*	
Long-tailed Weasel	*Mustela frenata*	
**Mink	*Mustela vison*	
Badger	*Taxidea taxus*	
Striped Skunk	*Mephitis mephitis*	
Mountain Lion	*Felis concolor*	
Bobcat	*Felis rufus*	
*Elk	*Cervus elaphus*	
*Mule Deer	*Odocoileus hemionus*	

Table 2-2. Aquatic invertebrates known to exist in the waters of the Valle Vidal.

Order	Family	Taxa	Costilla	Middle Ponil	North Ponil
AMPHIPODA	Hyalellidae	*Hyalella azteca*	x		
AMPHIPODA	Hyalellidae			x	
ANNELIDA		*Lumbricus aquaticus*	x		
ANNELIDA	Hirudinea		x		
ANNELIDA	Nematoda		x		
ANNELIDA	Oligocheaeta		x		
ANNELIDA	Tubificidae		x		x
ARACHNIDA	Trombidiformes		x		
BASOMMATOPHORA	Planorbidae	*Gyraulus sp.*		x	
BASOMMATOPHORA	Lymnaeidae	*Lymnaea* sp.	x		
BASOMMATOPHORA	Physidae	*Physella*		x	
BASOMMATOPHORA	Lymnaeidae			x	
BRACHIOPODA		*Branchinecta packardi*		x	x
BRACHIOPODA		*Eubranchipus bundyi*	x		
COLEOPTERA	Dytiscidae	*Agabus sp.*	x		
COLEOPTERA	Elmidae	*Cleptelmis sp.*	x		
COLEOPTERA	Haliplidae	*Haliplus sp.*		x	
COLEOPTERA	Dryopidae	*Helichus sp.*	x		x
COLEOPTERA	Elmidae	*Heterlimnius sp.*	x	x	
COLEOPTERA	Hydraenidae	*Hydraena sp.*	x		
COLEOPTERA	Elmidae	*Narpus sp.*	x		
COLEOPTERA	Elmidae	*Optioservus sp.*	x	x	x
COLEOPTERA	Elmidae	*Zaitzevia parvula*	x		
COLEOPTERA	Elmidae	*Zaitzevia sp.*		x	
COLEOPTERA	Curculionidae		x		
COLEOPTERA	Dryopidae			x	
COLEOPTERA	Elmidae			x	
COLEOPTERA	Hydrophilidae		x		
COLEOPTERA				x	
COLLEMBOLA			x		
DIPTERA	Ceratopogonidae	*Probezzia sp*		x	
DIPTERA	Bephariceridae	*Agathon sp.*	x		
DIPTERA	Tipulidae	*Antocha*		x	
DIPTERA	Tipulidae	*Antocha monticola*	x		
DIPTERA	Athericidae	*Atherix sp.*	x		
DIPTERA	Ceratopogonidae	*Atrichopogon sp.*	x		
DIPTERA	Ceratopogonidae	*Bezzia sp.*	x	x	x
DIPTERA	Empididae	*Chelifera*		x	
DIPTERA	Empididae	*Chelifera sp.*	x		

Table 2-2 cont. Aquatic invertebrates known to exist in the waters of the Valle Vidal.

Order	Family	Taxa	Costilla	Middle Ponil	North Ponil
DIPTERA	Chironomidae	*Chironominae sp.*	x	x	
DIPTERA	Tabanidae	*Chrysops*		x	
DIPTERA		*Culicoides sp.*	x		
DIPTERA		*Dicanota sp.*	x		x
DIPTERA	Tipulidae	*Dicranota sp.*	x	x	
DIPTERA		*Eukiefferiella sp.*			x
DIPTERA	Tipulidae	*Hexatoma sp.*	x	x	
DIPTERA	Tipulidae	*Holorusia grandis*	x		
DIPTERA	Muscidae	*Limnophora sp.*	x		
DIPTERA	Tipulidae	*Limonia sp.*		x	
DIPTERA	Empididae	*Oreogeton sp.*	x		
DIPTERA	Tipulidae	*Ormosia*		x	
DIPTERA	Chironomidae	*Orthocladius sp.*	x	x	x
DIPTERA	Psychodidae	*Pericoma sp.*	x	x	
DIPTERA	Ceratopogonidae	*Probezzia sp.*	x		
DIPTERA	Simuliidae	*Prosimulinum sp.*	x		
DIPTERA	Simuliidae	*Simuliidae sp.*	x		
DIPTERA	Simuliidae	*Simulinum sp.*	x	x	
DIPTERA	Simuliidae	*Simulium vittatum*	x		
DIPTERA	Tabanidae	*Tabanus sp.*		x	
DIPTERA	Chironomidae	*Tanypodinae sp.*	x	x	
DIPTERA	Tipulidae	*Tipula sp.*	x		
DIPTERA	Empididae	*Trichoclinocera sp.*	x		
DIPTERA		*Tvetenia sp.*			x
DIPTERA	Chironomidae			x	
DIPTERA	Dixidae		x		
DIPTERA	Simuliidae			x	
DIPTERA	Stratiomyidae		x		
EPHEMEROPTERA	Baetidae	*Acentrella insignificans*			x
EPHEMEROPTERA	Baetidae	*Acentrella sp.*	x		
EPHEMEROPTERA	Ameletidae	*Ameletus sp.*	x	x	
EPHEMEROPTERA	Ephemerellidae	*Attenella margarita*	x		
EPHEMEROPTERA	Baetidae	*Baetis sp.*	x	x	
EPHEMEROPTERA	Baetidae	*Baetis tricaudatus*			x
EPHEMEROPTERA	Heptageniidae	*Cinygmula sp.*	x	x	
EPHEMEROPTERA	Ephemerellidae	*Drunella coloradensis*	x		
EPHEMEROPTERA	Ephemerellidae	*Drunella doddsi*	x		
EPHEMEROPTERA	Ephemerellidae	*Drunella doddsi*		x	
EPHEMEROPTERA	Ephemerellidae	*Drunella grandis*	x		
EPHEMEROPTERA	Ephemerellidae	*Drunella sp.*		x	x

Table 2-2 cont. Aquatic invertebrates known to exist in the waters of the Valle Vidal.

Order	Family	Taxa	Costilla	Middle Ponil	North Ponil
EPHEMEROPTERA	Heptageniidae	*Epeorus sp.*	x		
EPHEMEROPTERA	Ephemerellidae	*Ephemerella inermis*	x		x
EPHEMEROPTERA	Ephemerellidae	*Ephemerella infrequens*	x		
EPHEMEROPTERA	Ephemerellidae	*Ephemerella sp.*		x	
EPHEMEROPTERA	Heptageniidae	*Leucrocuta sp.*	x		
EPHEMEROPTERA		*Nixe sp.*			x
EPHEMEROPTERA	Leptophlebiidae	*Paralptophlebia sp.*	x		
EPHEMEROPTERA	Heptageniidae	*Rhithrogena sp.*		x	
EPHEMEROPTERA	Heptageniidae	*Rithrogena hageni*	x		
EPHEMEROPTERA		*Ticorythodes sp.*			x
EPHEMEROPTERA	Ephemerellidae	*Timpanoga hecuba*	x		
EPHEMEROPTERA	Ephemerellidae			x	
EPHEMEROPTERA	Heptageniidae			x	
EPHEMEROPTERA	Leptophlebiidae		x		
HAPLOTAXIDA	Tubificidae			x	
HEMIPTERA	Gerridae		x		
HETEROPTERA	Corixidae			x	
LEPIDOPTERA			x		
LUMBRICULIDA	Lumbriculidae			x	
ODANATA	Gomphidae	*Ophiogomphus sp.*	x	x	x
PLECOPTERA	Perlodidae	*Alloperla severa*			x
PLECOPTERA	Nemouridae	*Amphinemura banksi*			x
PLECOPTERA	Nemouridae	*Amphinemura sp.*	x		
PLECOPTERA		*Classinia sabulosa*	x		
PLECOPTERA	Perlodidae	*Cultus sp.*	x		
PLECOPTERA	Perlidae	*Hesperoperla pacifica*	x	x	x
PLECOPTERA	Perlodidae	*Isoperla sp.*	x		x
PLECOPTERA	Nemouridae	*Malenka*		x	
PLECOPTERA	Perlodidae	*Megarcys signata*	x		
PLECOPTERA		*Paraleuctra sp.*	x		
PLECOPTERA	Pteronarcyidae	*Pteronarcella badia*	x		x
PLECOPTERA	Pteronarcyidae	*Pteronarcella sp.*		x	
PLECOPTERA	Pteronarcyidae	*Pteronarcys sp.*	x		
PLECOPTERA	Perlodidae	*Skwala paralella*	x		
PLECOPTERA	Chloroperlidae	*Suwallia*	x		
PLECOPTERA	Chloroperlidae	*Sweltsa* sp.	x	x	
PLECOPTERA	Chloroperlidae	*Triznaka sp.*	x		
PLECOPTERA	Nemouridae	*Zapada sp.*	x	x	
PLECOPTERA	Capniidae		x		

Table 2-2 cont. Aquatic invertebrates known to exist in the waters of the Valle Vidal.

Order	Family	Taxa	Costilla	Middle Ponil	North Ponil
PLECOPTERA	Capniidae			x	
PLECOPTERA	Nemouridae			x	
PLECOPTERA	Perlodidae			x	x
PODOCOPIDA			x	x	
TRICHOPTERA	Glossosomatidae	*Agapetus sp.*	x		
TRICHOPTERA	Glossosomatidae	*Anagapetus sp.*	x		
TRICHOPTERA	Hydropsychidae	*Arctopsyche sp.*	x	x	
TRICHOPTERA	Brachycentridae	*Brachycentrus sp.*	x	x	
TRICHOPTERA		*Ceraclea sp.*			x
TRICHOPTERA	Hydropsychidae	*Cheumatophyche sp.*	x		x
TRICHOPTERA	Limnephilidae	*Dicosmoecus sp.*	x	x	
TRICHOPTERA	Philopotamidae	*Dolophilodes sp.*	x		
TRICHOPTERA	Limnephilidae	*Ecclisomyia sp.*	x		
TRICHOPTERA	Glossosomatidae	*Glossosoma sp.*	x	x	
TRICHOPTERA	Hydropsychidae	*Helicopsyche borealis*	x		
TRICHOPTERA	Hydropsychidae	*Helicopsyche sp.*			x
TRICHOPTERA	Limnephilidae	*Hesperophylax sp.*	x	x	
TRICHOPTERA	Hydropsychidae	*Hydropsyche oslari*			x
TRICHOPTERA	Hydropsychidae	*Hydropsyche sp.*	x	x	
TRICHOPTERA	Hydroptilidae	*Hydroptila sp.*	x		
TRICHOPTERA	Lepidostomatidae	*Lepidostoma sp.*	x	x	
TRICHOPTERA	Limnephilidae	*Limnephilus sp.*	x		
TRICHOPTERA	Brachycentridae	*Micrasema* sp.	x	x	x
TRICHOPTERA	Uenoidae	*Neophylax sp.*	x		
TRICHOPTERA	Uenoidae	*Neothremma sp.*	x		
TRICHOPTERA	Hydroptilidae	*Ochrotrichia* sp.	x		x
TRICHOPTERA	Leptoceridae	*Oecetis sp.*	x		
TRICHOPTERA	Uenoidae	*Oligophlebodes* sp.	x	x	
TRICHOPTERA	Hydropsychidae	*Parapsyche sp.*	x		
TRICHOPTERA	Limnephilidae	*Psychoglypha sp.*	x		
TRICHOPTERA	Rhyacophilidae	*Rhyacophila brunea cpx.*	x		
TRICHOPTERA	Rhyacophilidae	*Rhyacophila hyalinata*	x		
TRICHOPTERA	Rhyacophilidae	*Rhyacophila sp.*		x	
TRICHOPTERA	Hydropsychidae			x	
TRICHOPTERA	Leptoceridae			x	
TRICHOPTERA	Limnephilidae			x	
TRICHOPTERA				x	
TROMBIDIFORMES			x		
TROMBIDIFORMES				x	
VENEROIDEA	Pisidiidae	*Pisidiums sp.*	x		
VENEROIDEA	Pisidiidae			x	

Appendix 3. Water Quality Data.

Table 3-1. Water quality monitoring sites in the Valle Vidal.

Station Name	Study Yr	Longitude	Latitude
Middle Ponil Creek @FR 1950	1989	-105.2136	36.7764
Middle Ponil Creek @FR 1950	1998		
North Ponil Creek @ FR 1950	1989	-105.0983	36.7756
North Ponil Creek @ FR 1950	1998		
Middle Ponil above South Ponil Creek	1989	-105.0381	36.6222
Middle Ponil above South Ponil Creek	1998		
North Ponil Creek above Ponil Creek	1989	-104.9656	36.5881
North Ponil Creek above Ponil Creek	1998		
Ponil Creek @ USGS gage	1989	-104.9464	36.5733
Ponil Creek @ USGS gage	1998		
Comanche Creek below Exposure*	2000	-105.2753	36.7792
Comanche Creek above Costilla Creek*	1989	-105.3186	36.8319
Comanche Creek above Costilla Creek	2000		
Costilla Creek above Comanche Creek*	1989	-105.3162	36.8326
Costilla Creek above Comanche Creek	2000		
Costilla Creek below Comanche Creek	1989	-105.3194	36.8319
Costilla Creek below Comanche Creek	2000		

*Temperature and Turbidity measurements taken 4 times/year 1990 to 1995

Table 3-2. Exceedence ratios (the number of exceedences of the water quality criteria divided by the total number of samples taken). Shaded cells indicate ratios >0.15.

	Study	Temp.	Turbidity	PH	Diss Al	TOC	TP	DO
Applicable standard		>23°C	25 NTU	>8.8or <6.6	hardness dependent		0.10mg/L	<6
Station Name								
Middle Ponil Creek @FR 1950	1989	0/5	0/5	0/5	NA	0/1	3/5	0/4
Middle Ponil Creek @FR 1950	1998	0/10	4/10	0/10	NA	0/6	0/6	0/10
North Ponil Creek @ FR 1950	1989	0/5	0/5	0/5	1/4	0/1	1/6	0/4
North Ponil Creek @ FR 1950	1998	0/10	7/10	0/10	NA	2/6	1/6	0/10
Middle Ponil above South Ponil Creek	1989	0/5	0/5	0/5	NA	0/1	0/5	0/4
Middle Ponil above South Ponil Creek	1998	0/10	6/10	0/10	NA	2/6	0/7	0/10
North Ponil Creek above Ponil Creek	1989	1/5	0/5	0/5	NA	0/1	0/5	0/4
North Ponil Creek above Ponil Creek	1998	0/10	6/10	0/10	NA	2/5	1/6	0/10
Ponil Creek @ USGS gage	1989	2/5	0/5	0/5	NA	0/1	0/5	0/4
Ponil Creek @ USGS gage	1998	0/10	6/10	0/10	6/8	1/6	0/7	0/10
Comanche Creek below Exposure	2000	0/8	0/8	0/8	0/8	0/7	0/8	0/8
Comanche Creek above Costilla Creek	1989	0/2	NA	1/2	NA	NA	0/2	NA
Comanche Creek above Costilla Creek	2000	0/8*	0/8	0/8	0/8	0/7	0/8	0/8
Costilla Creek above Comanche Creek	1989	0/3	0/1	0/3	NA	NA	0/4	0/1
Costilla Creek above Comanche Creek	2000	0/8*	0/8	0/8	1/8	0/7	0/8	0/8
Costilla Creek below Comanche Creek	1989	0/4	0/4	0/4	NA	NA	0/4	0/4
Costilla Creek below Comanche Creek	2000	0/8	0/8	0/8	1/8	0/7	0/8	0/8

* While grab samples did not show exceedences, thermographs deployed in 2002 and 2003 did.

Table 3-3. Summary of select water quality parameters from Costilla watershed. Shaded values exceed the applicable criteria.

Station Name	Date	Time	Temp. (°C)	D.O. (mg/L)	Total N (mg/L)	Total P (mg/L)	Turbidity (NTU)	Dissolved Aluminum (ug/L)
COMANCHE CREEK- above Costilla Creek	12-Sep-86	1645	17.5		0.14	0.02	2.50	
	14-Sep-86	1310	15.5		0.14	0.02	2.70	
	21-Aug-87	1135	17.0		0.18	0.02	2.70	
	11-Oct-87	1035	7.5		0.38	0.01	0.90	
	17-Jun-89	1315	18.0		0.17	0.06	3.00	
	29-Aug-89	1240	17.5		0.27	0.01	4.00	
	28-Mar-90	1050	3.0		0.83	0.12	8.70	
	31-May-90	1500	17.0		0.53	0.04	5.00	
	17-Jul-90	1250	18.0		0.26	0.01	3.20	50.00
	19-Sep-90	1350	17.0		0.17	0.01	4.00	300.00
	1-May-91	1235	8.0	9.60	0.31	0.08	6.50	400.00
	29-Jul-91	1245	13.9	7.50	0.50	0.02	4.00	100.00
	24-Oct-91	1240	8.5	8.80	0.36	0.03	2.70	100.00
	15-Apr-92	1140	4.1	12.10	1.20	0.09	29.00	1600.00
	29-Jul-92	1410	20.0	8.80	0.26	0.03	4.55	
	23-Oct-92	945	3.0	11.40	0.14	0.01	3.10	
	21-Sep-93	1800	15.0	7.10		0.09	2.40	0.10
	19-Oct-93	1500	9.0			0.09	3.29	
	28-Oct-93	1145	3.0			0.09	24.60	
	6-May-94	1200	9.0	8.10		0.09	22.20	1.00
	3-Jun-94	1045	12.0				7.80	
	18-Jun-94	1347	18.0				5.40	
	10-Nov-94	1325	1.0				5.80	
	12-Jun-95	1405	11.0				13.50	
	6-Jul-95	1745	19.5				8.27	
	28-Sep-95	1311	8.0				4.40	
COSTILLA CREEK - above Comanche Creek	12-Sep-86	1650	17.8		0.14	0.01	2.40	
	14-Sep-86	1315	15.8		0.25	0.01	2.70	
	31-Mar-87	1345	8.2	9.00	0.17	0.01		
	1-Apr-87	900			0.21	0.03		
	21-Aug-87	1145	17.8		0.51	0.06	7.90	
	11-Oct-87	1040	6.0		0.18	0.01	0.40	
	28-Mar-90	1050	6.0		0.55	0.04	5.30	
	31-May-90	1150	12.8		0.56	0.05	10.00	
	17-Jul-90	1210	18.0		0.42	0.63	3.70	60.00
	19-Sep-90	1245	15.0		0.24	0.05		300.00
	1-May-91	1125	5.0	10.10	0.33	0.09	11.50	600.00
	29-Jul-91	1155	16.0	7.00	0.23	0.05	4.80	200.00
	24-Oct-91	1145	6.7	8.70	0.35	0.03	2.10	100.00
	15-Apr-92	1110	6.0	12.50	0.52	0.10	11.00	900.00
	15-Apr-92	1111	6.0	12.50	0.58	0.07	11.00	900.00

Table 3-3 cont. Summary of select water quality parameters from Costilla watershed. Shaded values exceed the applicable criteria.

Station Name	Date	Time	Temp. (°C)	D.O. (mg/L)	Total N (mg/L)	Total P (mg/L)	Turbidity (NTU)	Dissolved Aluminum (ug/L)
COSTILLA CREEK - above Comanche Creek	29-Jul-92	1310	17.0	8.50	0.15	0.03	6.20	
	22-Oct-92	1345	8.0	9.10	0.14	0.01	0.90	
	22-Oct-92	1346	8.0	9.10	0.15	0.01	0.90	
	21-Sep-93	1645						0.10
	22-Sep-93	1300	17.0	7.20			0.68	
	4-Oct-93	1350				0.09		
	19-Oct-93	1430	10.0			0.09	0.63	
	6-May-94	1000						0.60
	6-May-94	1310	12.0	7.40		0.09	22.80	
	3-Jun-94	1450	13.0				10.10	
	10-Nov-94	1215	2.0				1.20	
	13-Jun-95	1120	12.0				7.90	
	7-Jul-95	1245	18.0				5.10	
	29-Sep-95	1030	11.0				8.20	
UPPER COMANCHE CRK	17-Jun-89	1245	19.0		0.25	0.09	6.00	
	29-Aug-89	1145	11.0		0.30	0.01	7.00	
	28-Mar-90	1005	2.0		0.97	0.13	9.00	
	31-May-90	1415	17.5		0.57	0.04	5.80	
	17-Jul-90	1345	19.0		0.46	0.07	6.80	60.00
	19-Sep-90	1435	18.8		0.34	0.09	7.00	30.00
	1-May-91	1325	10.2	8.10	0.33	0.14	7.10	400.00
	29-Jul-91	1350	13.0	6.90	0.53	0.05	15.00	100.00
	24-Oct-91	1315	8.5	8.80	0.27	0.06	5.40	100.00
	15-Apr-92	1240	5.9	11.60	0.85	0.15	28.00	800.00
	29-Jul-92	1500	20.0	8.20	0.60	0.05	13.50	
	23-Oct-92	1220	7.5	10.30	0.15	0.02	7.20	
	21-Sep-93	1600		7.90			16.00	0.10
	6-May-94	930	4.0	8.70		0.09	15.40	0.80
	3-Jun-94	940	11.0				6.10	
	18-Jun-94	1230	18.0				9.30	
	26-Aug-94	920					17.50	
	10-Nov-94	1610	0.9				8.30	
	12-Jun-95	1710	20.0				10.30	
	6-Jul-95	1820	20.0				8.00	
	28-Sep-95	1625	10.0				197.00	

Table 3-4. Summary of select water quality parameters Ponil watershed. Shaded cells indicate exceedence of the water quality criteria.

Station Name	Date	Time	Temp. (°C)	D.O. (mg/L)	Total N (mg/L)	Total P (mg/L)	Turbidity (NTU)	Diss. Al (UG/L)
PONIL CREEK AT NM 58	11-Sep-89	1410	14.00	8.50	0.30	0.14	28.00	
	12-Sep-89	925	11.90	8.60	0.27	0.21	44.00	
	12-Sep-89	1220	12.20	8.80	0.37	0.21	50.50	
	13-Sep-89	925	9.90	9.00	0.69	1.01	260.00	
	13-Sep-89	1245	12.40	8.80	0.63	0.90	272.00	
	11-May-98	1735	18.10	7.05			98.20	
	12-May-98	1440	15.60	7.60			112.00	
	13-May-98	1150	12.80	8.20			88.00	
	14-May-98	1410	15.90	7.80			104.00	
	28-Jul-98	1505	23.90	6.60	0.90	0.07	86.50	
	29-Jul-98	1350	26.80	8.30	0.62	0.05	48.80	
	6-Oct-98	1520	13.10	10.10	0.22	0.16	16.60	
	7-Oct-98	1540	16.90	8.90	0.45	0.05	17.80	10.00
PONIL CREEK AT USGS GAGE	5-Jun-89	1225	19.00	7.90	0.20	0.02	15.00	
	6-Jun-89	1905	20.90	6.80	0.14	0.01	4.40	
	7-Jun-89	1305	23.50	7.30	0.14	0.01	3.90	
	7-Jun-89	1510	23.10	6.90	0.14	0.02	3.80	
	8-Jun-89	1135	20.20		0.26	0.02	7.20	
	11-May-98	1640	15.70	7.80			43.40	160.00
	12-May-98	1150	9.60	9.25			46.00	700.00
	13-May-98	1525	15.70	7.60			41.10	200.00
	14-May-98	1130	11.40	8.60			52.10	40.00
	28-Jul-98	1415	20.50	7.00	1.20	0.09	99.40	110.00
	29-Jul-98	1250	21.50	7.60	0.30	0.05	56.90	90.00
	6-Oct-98	1415	12.20	8.20	0.25	0.05	5.86	10.00
	7-Oct-98	1400	13.20	8.50	0.37	0.05	4.60	10.00
	7-Oct-98	1500	14.70	9.40	0.29	0.05	9.03	
NORTH PONIL CREEK - ABOVE PONIL CREEK	5-Jun-89	1350	22.80	7.30	0.14	0.04	13.00	
	6-Jun-89	1850	19.90	6.70	0.14	0.01	4.60	
	7-Jun-89	1320	24.10	7.00	0.14	0.01	5.30	
	7-Jun-89	1450	23.00	6.80	0.14	0.01	5.70	
	11-May-98	1500	18.60	7.40			85.40	
	12-May-98	1220	13.10	8.15			148.00	
	13-May-98	1510	18.90	6.90			135.00	
	14-May-98	1210	14.60	7.90			219.00	
	28-Jul-98	1320	21.00	6.90	1.30	0.28	224.00	
	29-Jul-98	1230	21.90	7.60	0.60	0.09	117.00	
	6-Oct-98	1350	11.50	8.60	0.31	0.05	9.04	
	7-Oct-98	1330	12.40	8.70	0.36	0.05	13.60	

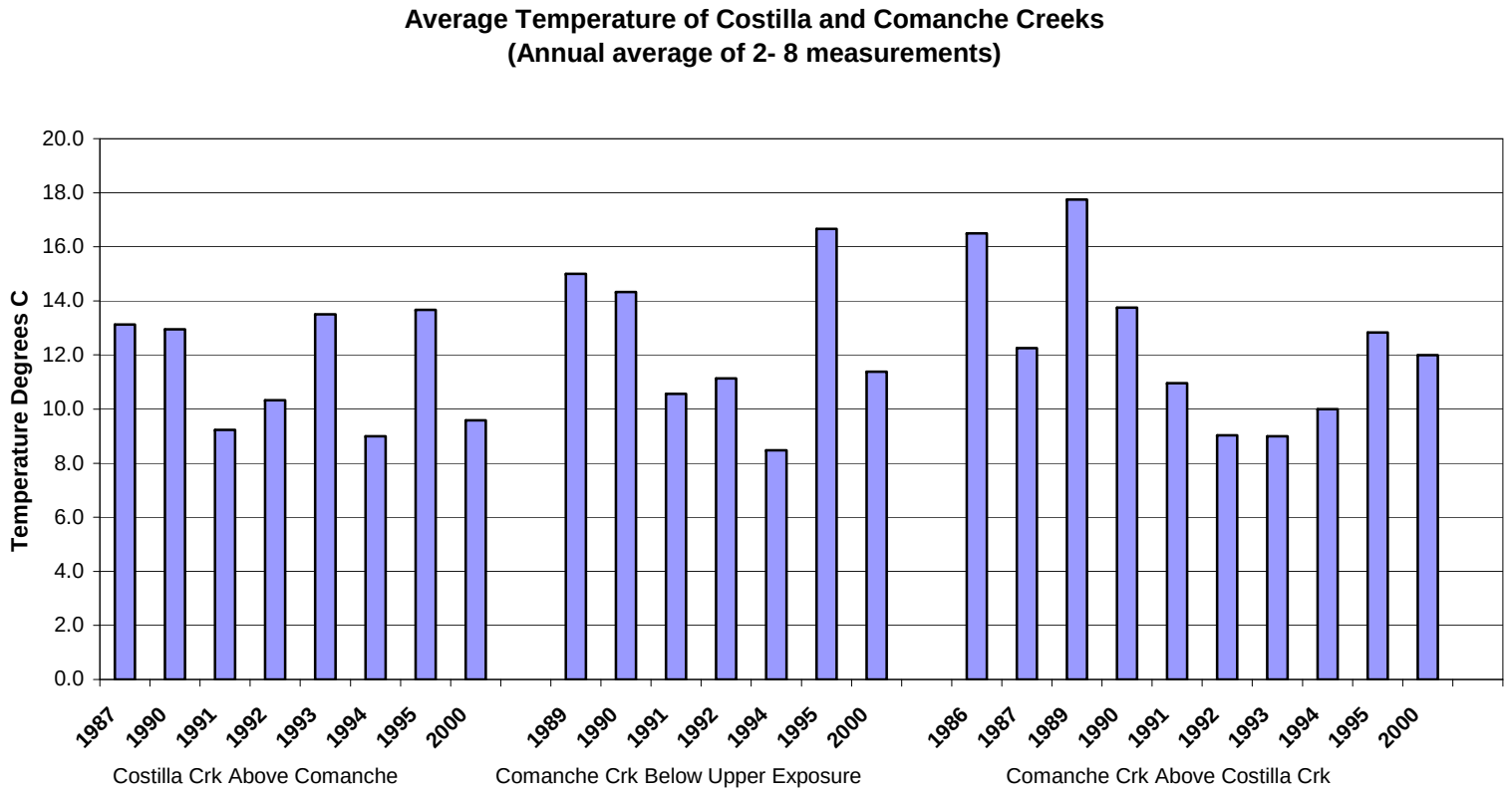


Figure 3-1. Average temperature collected in grab samples in Costilla and Comanche Creeks.

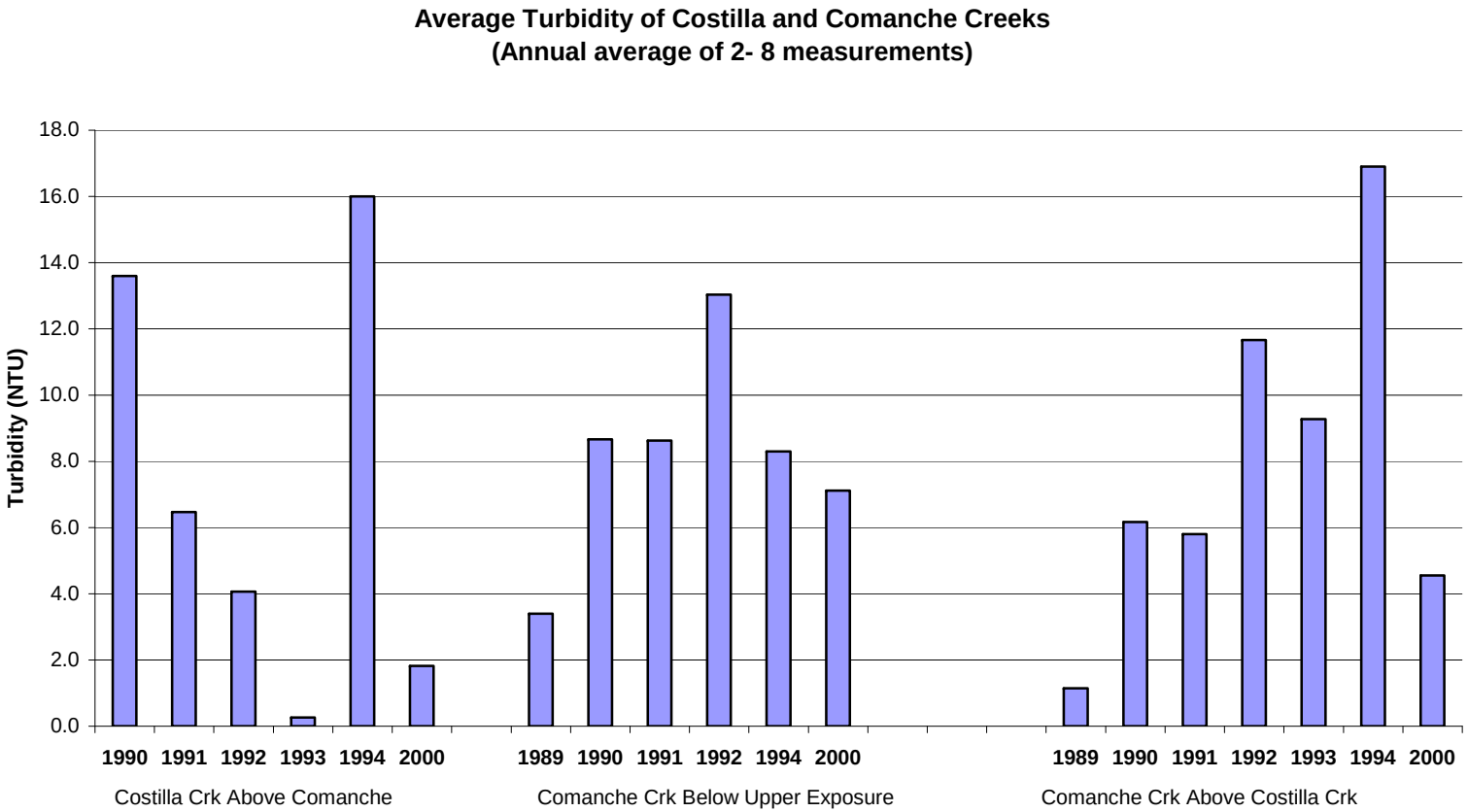


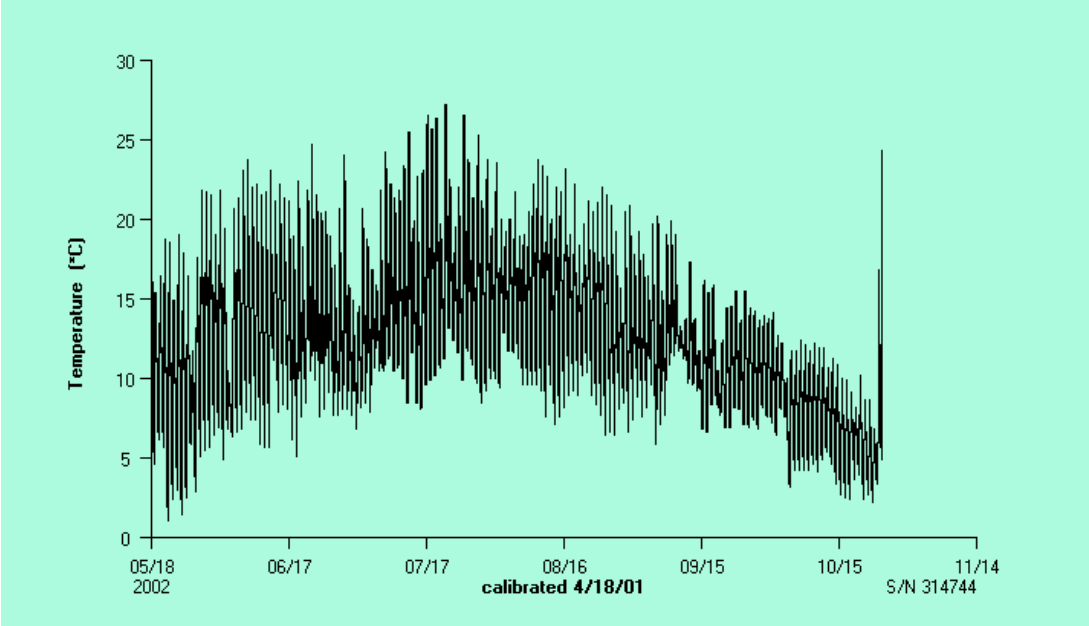
Figure 3-2. Average turbidity in grab samples collected in Costilla and Comanche Creeks.

Figure 3-3. Comanche Creek Thermograph Summary

Comanche Creek (below upper exclosure) - 4.0 miles upstream along Comanche Creek from intersection of Forest Roads 1900 and 1950.

Deployed - 18 May – 23 Oct 2002
Maximum temperature = 27.09 ^{0}C

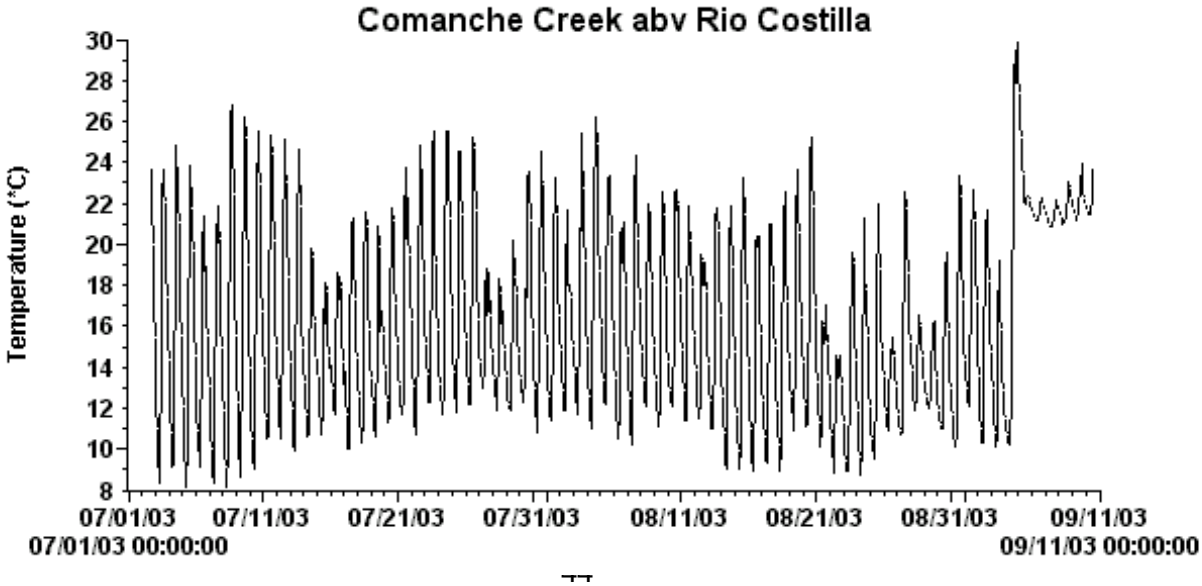
Data points >20 ^{0}C = 291
Data points >23 ^{0}C = 55



Comanche Creek (above confluence with Rio Costilla)
Immediately above the confluence of Comanche Creek and Rio Costilla.

Deployed - 2 Jul – 4 Sep 2003
Maximum Temperature = 26.89 ^{0}C

Data points >20 ^{0}C = 287
Data points >23 ^{0}C = 85



Appendix 4. Testimonials of the unique value of the Valle Vidal

1. Philmont Scout Ranch

February 24, 2005

Philmont Scout Ranch
17 Deer Run Road
Cimarron,NM 87714

505-376-2281

Mark Andersen, Director of Program

Philmont Scout Ranch operates as a 136,000 acre High Adventure Base for the Boy Scouts of America. Since the property was donated to the Boy Scouts of America in 1938 by Waite Phillips more than 800,000 people from throughout the United States have enjoyed backcountry wilderness adventures.

In 2004, 22,029 participants visited the Ranch during the summer. The majority of the participants enjoyed 12-day backpacking treks. Approximately 350 people arrive each day and after reaching our peak 12 days latter 350 people depart each day. These participants are supported by a summer seasonal staff of 1016 people. In addition to the backcountry program, Philmont operates the national training facility for the Boy Scouts of America and welcomed 5,324 participants in 2004 who took part in training and activities as families.

Crews arrive at the Ranch and follow one of 35 specified itineraries. During the trek they have an opportunity to camp at staff camps and trail camps. Each of the 34 staff camp conducts a program that hikers can participate in. Half of the staff camp conduct programs in outdoor skills like mountain hiking, rock climbing, challenge course, 12-gauge shotgun shooting, land navigation, archery and search and rescue. The other half offer historical programs where we depict various historical settings across the Ranch that occurred during the exploration of the west. These programs include mountain men, gold miners of the 1860, homesteaders and cowboys. We also have an archeology camp that studies the life of the Anasazi and one camp that celebrates the life of the Jicarilla Apache. In the North Ponil and Middle Ponil areas on Philmont we have identified around 1000 historical sites some dating to 400 AD, in addition to the only T-Rex footprint in the world.

In 1988 we began hiking participants in the Valle Vidal. During the first summer 200 Scouts experienced the beauty of the land, practicing Leave No Trace skills, and navigating through the road less areas of the Valle. In 1993 we entered into our first Special Use Permit with the United States Forest Service and have renewed the agreement again in 1998 and 2004. Our permit allows up to 3000 hikers each summer to backpack through the Valle. Since 1988, 23J86 participants have enjoyed a portion of their trek in the Valle.

Last summer we camped 700 participants. We expect 2000 to hike through the area this

summer. We have slowly returned to the area after the 2002 Ponil Fire Complex that burned 93,000 acres, 28,000 acres on Philmont and 23,900 acres on the Forest Service.

Our current use includes:

- Our participants enjoy hiking in an area with minimal roads and improvements.
- We practice Leave No Trace principals. Each crew receives special instruction before they begin their journey across the Valle Vidal.
- We ask each hiker to spend at least three hours working on specific conservation projects. Since 1988 we have contributed over 69,558 hours of service to the Forest Service. In 1995 we were selected as one of four groups to receive the Chiefs Volunteers Program National Award - "Caring for the Land and Serving People." Over the years our projects have included fire rehabilitation efforts, prescribed bum preparation, stream bed and water shed improvements, animal exclosure on McCrystal Creek, Seally Creek erosion barriers, and construction of Gabion Baskets.
- Three Staff Camps operate during the summer:
    - o Whiteman Vega - Mountain Biking, Tread Lightly, Conservation.
    - o Ring Place - Astronomy, historical presentation the Valle Vidal and the Ring Family and their unique cabin, environmental awareness, weather.

      Scouts often get the chance to enjoy wildlife watching in the Valle. The chance to observe the magnificent Elk herd is especially exciting.
    - o Seally Canyon - Search and Rescue and Conservation Awareness

  Allowing young people to experience the history of the Great Southwest has been a significant part of a Philmont experience. Sharing the early life of the Ring Family and the inhabitants of Ponil Park and Seally are important parts of our program. One of our full time employees' grandfather is buried in the Pioneer Cemetery at Seally.

  Another of our historical staff camps is the Rich Family homestead on the Middle Ponil bordering the Valle Vidal. We depict a living history program of Homesteading at the Rich Family Cabin. This past summer we hosted a family reunion of 33 decedents of the Rich Brothers. This was a first experience for most of them to enjoy the beauty of the area and appreciate the life of their early ancestors.

Trail camps include McCrystal Creek, Shuree Ponds, Middle Ponil/Greenwood Canyon, and Iris Park.

After the elk restrictions are lifted a few of our special treks make it to the top of Little Costilla to stand at 12,584 feet, "On Top of the World."

One of the highlights of our staff who spend their summer in the Valle Vidal is interacting with the public. We have an opportunity to share a great deal of history with those who camp at McCrystal Campground.
We also have been involved with numerous search and rescue activities for the

public (hikers, horse riders, and hunters) who find themselves in a difficult situation because of weather or inexperience.

We also provide the Forest Service with fire observers. This has been very important during the drought years. After the Ponil Fire we have been encouraged and supported by the Forest Service to develop a fire rehabilitation plan on the 28,000 acres which burned on Philmont. We have also been able to study and participate in the efforts that are taking place on the 23,900 acres of Forest lands that were impacted.

Our partnership for the past 16 years with the Forest Service has been a positive one. Our Scouts have been able to interact with Forest Service employees in many ways. It has allowed young people an opportunity to learn more about the management of the forest lands of America.

As you can tell, the Valle Vidal has become a very important part of the Philmont Scout Ranch backcountry operation. It provides Scouts from all fifty states and a number of foreign countries an opportunity to enjoy a wildland experience, one that can help to make a life changing experience. It has allowed us to serve up to an additional 3000 participants each year.

Recently, I received the following comments from a Scout from Elizabethtown, Pennsylvania. This Scout participated in one of our special treks through the Valle Vidal this past summer.

"For the first week we built trail at 10,000 feet near Baldy Mountain. The trail will connect Philmont Scout Ranch to the Valle Vidal. After completing a week of trail and friendship building, we were allowed to hike wherever we wanted as a reward for our service. We decide to leave the boundaries of Philmont and venture into the Valle. I was astonished. I love Philmont, I had been there once before in 2002, but I was awestruck by the beauty of the Valle."

"When I was at Philmont the first time, the Ponil Complex Fire was raging. This fire burned out much of the Valle region. It was amazing to venture, two years later, into the bumed area. The trees are still blackened with the soot from the fire. But even with the blackened trees, the scenery was breathtaking. One day of our trek we hiked to the top of Little Costilla. It is a 12,584 foot tall mountain in the Valle Region. Words don't exist that explain the beauty of the view. To the South is Philmont, to the North Colorado, to the West Wheeler Peak and to the East is the entire Valle."

"Hiking through the Valle had a huge impact on my life. Nowhere on earth have I felt closer to God and His creation. No words can express how beautiful this land is."

PETITIONERS' EXHIBIT

29

STATE OF NEW MEXICO

WATER QUALITY CONTROL COMMISSION

No. WQCC 05-04(R)

IN THE MATTER OF THE PETITION FOR PROPOSED AMENDMENTS TO 20.6.4.9 NMAC, DESIGNATION OF WATERS WITHIN THE VALLE VIDAL AS OUTSTANDING NATIONAL RESOURCE WATERS

TRANSCRIPT OF PROCEEDINGS

BE IT REMEMBERED that on the 13th day of December, 2005, the above-entitled matter came on for hearing before the New Mexico Water Quality Control Commission, taken at the PERA Building, Apodaca Hall, Santa Fe, New Mexico, at the hour of 1:23 p.m.

VOLUME 1

A P P E A R A N C E S

For the Water Quality Control Commission:

DERRITH WATCHMAN-MOORE
MIKE SLOAN
MAXINE GOAD
FRED LUJAN
PEGGY JOHNSON
STEVE GLASS
HOWARD HUTCHINSON
TIM DARDEN
CHERYL BADA
EDWARD VIGIL
WAYNE PRICE

ZACH SHANDLER
Assistant Attorney General
Office of the Attorney General
Post Office Box 1508
Bataan Memorial Building
Santa Fe, New Mexico 87504

For the New Mexico Environment Department:

J. BRENT MOORE
Assistant General Counsel
Office of General Counsel
New Mexico Environment Department
1190 St. Francis Drive
Santa Fe, New Mexico 87505

For the Coalition for the Valle Vidal:

ERIK SCHLENKER-GOODRICH
Western Environmental Law Center
Post Office Box 1507
Taos, New Mexico 87571

I N D E X

I N D E X (Continued)

I N D E X (Continued)

MS. ORTH: Good afternoon.

We'll begin the hearing in, again, the matter of proposed amendments to 20.6.4.9 NMAC, in the administrative code. This is nomination of the waters of the Valle Vidal as Outstanding National Resource Waters.

It is docketed by the WQCC administrator as 05-04, and it is a rule-making matter because it is a change to the standards.

The hearing will be conducted consistent with the Commission's rule-making guidelines, except to the extent that those rule-making guidelines were altered by a prehearing hearing guidelines order, which set out slightly more aggressive prehearing requirements for those wanting to present technical testimony.

Briefly, we will take public comment when I'm done with my opening statement here.

Then we will turn to the petitioners. These are joint petitioners from three state agencies, the Environment Department, the Game and Fish Department and Energy, Minerals and Natural Resources.

Then we will turn to the Western Environmental Law Center, another party filing a notice of intent to present technical evidence.

We will take additional public comment at 3:00

p.m. regardless of where we are in the technical case, because that request was made, and we'll take public comment again when all the -- all those presenting technical testimony have given their comment.

If you have not signed in, please do so. No salesmen call. We use the sign-in sheets as evidence of a public participation and for the correct spelling of your name if you give comment.

And if you would like to give comment, please indicate that on the sign-in sheet.

The record includes the petition and request for hearing, notice of docketing, hearing guidelines, letters from a variety of folks, affidavits certifying notification and evidence of publication, the notice of intent to present technical testimony from the Western Environmental Law Center and also from the New Mexico Environment Department and the joint petitioners.

The -- again, the technical evidence will be limited to that presented -- proposed, excuse me, and then the nontechnical public comment will be taken at several times.

Are there questions about the basic format of how we'll be proceeding this afternoon?

Again, we'll be jumping back and forth between public comment and technical comment based on the time

constraints folks have identified so far.

Testimony will be taken under oath, will be subject to cross-examination.

The Commission has an option at the end of all of the testimony. The Commission may decide at the close of the evidentiary record to convene again in its meeting and to make a decision without any further process, that is to say, without any posthearing process.

The parties and others were put on notice that that might happen, in which case we would not wait for a transcript or report, proposed findings and conclusions.

The Commission may also make a decision at the end of the evidence that they want to wait on a transcript, a Hearing Officer report, findings and conclusions, and take this up at a later meeting.

They can make either one of those two decisions.

No? All right.

This would be a good time to reach for your cell phones if you haven't already and turn them off or set them on stun.

And we are going to then leap into public comment. Again, I made a commitment to take public comment before we open the technical case.

I will call the names who indicated on earlier sign-in sheets that they wished to give public comment in the event they'd like to go now.

You can change your mind if you'd like to go later.

Joni Arends.

No.

Doug Shaw.

Sir, would you like to go now?

MR. SHAW: That would be fine.

MS. ORTH: All righty. If you would, come up, and -- I believe the microphone is live at that table there.

DOUG SHAW

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

MR. SHAW: Well, good afternoon, members of the Commission and Madam Hearing Officer.

Thank you for the opportunity to offer comments on the nomination of the Valle Vidal -- waters of the Valle Vidal as Outstanding National Resource Waters. I'm here to speak as a board member of the New Mexico Riparian Council.

The Riparian Council is a nonprofit

organization of New Mexico citizens that advocates for wise use and protection of the riparian areas in the streams and rivers of New Mexico, with riparian areas being those stream-side zones that include vegetation that is dependent on -- on moist soils and moist soil conditions and -- and the aquatic portion of the -- of the riparian area.

We're not against any particular use. We are advocates for wise use and any use that can maintain the function of the riparian area. That is our intent. We're dedicated to the continued survival, maintenance and enhancement of the riparian systems in New Mexico for present and future enjoyment and benefits.

We see that the nomination of the waters of the Valle Vidal as Outstanding National Resource Waters as being very consistent and supportive of our mission and objectives.

I think that the nondegradation requirement for the waters of the Valle Vidal will require to -- to achieve that, it would require the wise use of the riparian areas in the state -- well, in the waters of the Valle Vidal.

In my way of viewing things, it would be appropriate to designate the watershed of the Valle Vidal as outstanding national resource watersheds.

I see the Valle Vidal as being a very outstanding resource, both the land and the water, but understand that the water quality is a -- an indicator, an index of the -- of the way that we manage the watersheds that -- that that is one way in law to achieve the objectives of -- of wise watershed management, again, the riparian area being a very important part of the watershed.

The riparian area serves a number of functions. Therefore, it enhances or compliments and enables the meeting of the nondegradation component of the designation in that the wet meadows and the wet -- wetlands along the river feed the river during dry periods and absorb moisture during -- during the wet periods of the year.

This helps to moderate or regulate the flows within these streams and protects the water quality through filtration and -- and chemical action. The vegetation that grows along the rivers -- the waters cools the water temperatures and provides for very valuable habitat for a number of fairly unique species.

In terms of my personal knowledge of the Valle Vidal, I had the opportunity in 2001, after the Ponil fire, that burned about 90,000 acres in the Valle Vidal watershed on the east side, in the Ponil Basin -- I had

the opportunity to work for the Forest Service on putting together a plan to do some rehabilitation work within the watershed to try to mitigate the effects -- some of the effects of the fire.

This gave me a chance to -- to become fairly -- well, personally knowledgeable about some of the -- the small streams and headwaters along the east side of the -- of the Valle Vidal in the Ponil watershed, in the Canadian River watershed, and I came to really appreciate and enjoy the potential that there is there for making these waters a real jewel within the waters of New Mexico.

I think that the Valle Vidal and the watersheds within our -- are really examples of high elevation, southern Rocky Mountain watersheds that many of which are not accessible to a large portion of the population.

The Valle Vidal has a good water system -- or good road system that would allow people that may have limited capabilities in terms of access to view and to study a well managed and healthy aquatic and riparian system and the waters that -- that are produced by that system.

We have Philmont Scout Ranch as part of the Valle Vidal watersheds, and that brings young people

from all over the country, perhaps all over the world, and gives them an opportunity to -- to hike and even work and enjoy and understand the value and the beauty of -- of the Valle Vidal and the watershed -- you know, the ecosystem that is present there.

As such, it is somewhat -- somewhat unique in many of the high elevation watersheds in the west, in the southern Rockies are wilderness and don't have as much opportunity for people of limited mobility to view and enjoy.

I think if you've ever driven the road from -- you know, across the Valle Vidal from Cimarron, at any time of year, you would appreciate the beauty and the uniqueness of that watershed.

So for that reason, the Riparian Council would like to support the nomination.

MS. ORTH: Thank you, Mr. Shaw.

Do any of the Commissioners have questions of Mr. Shaw?

No.

I will say now that I do discourage cross-examination of public comment, but if the petitioners believe it's important, or if someone else believes it's critical, please raise your hand after I ask the Commissioners if they have questions.

Otherwise, I won't be inviting additional cross-examination, but it's available if you want to press the issue.

Thank you very much, Mr. Shaw.

Is there anyone else who would like to make public comment now?

Jim O'Donnell and then Barbara Thorne.

Mr. O'Donnell?

MR. O'DONNELL: I'll wait.

MS. ORTH: All right.

Ms. Thorne? Would you like to go now?

All right.

BARBARA THORNE

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

MS. THORNE: Madam Chairperson, Chairwoman, excuse me, Madam Hearing Officer, members of the Commission.

THE REPORTER: I need you to speak up, please.

MS. THORNE: I support the designation of the Valle Vidal as an Outstanding National Resource Water.

Without water, there is no life. Water is our most precious resource. Preserving water quality is much more efficient than processing it later to make it

usable.

The waters of the Valle Vidal go into the Rio Grande on the west and the Canadian River on the east. These river systems affect life and livelihoods for everything and everyone downstream. As I have seen from the fluctuating levels of Eagle Nest Lake this summer, the appetite or thirst, if you will, of the people downstream is voracious.

Any reduction of water will compromise downstream everything that exists. Extraction of water for coal bed methane mining empties aquifers. You have to extract the water and then inject saltwater which is a contaminant. Let's face it.

I was thinking about moving to Trinidad, Colorado, and I talked to some people that I met at Hacienda Martinez in Taos, and they said that a lot of people who had homes along Scenic Route 12 were having to leave because their wells had gone dry.

Now, not directly under their homes, but not too far away, they are doing coal bed methane extraction in the Raton basin.

I hate to think that our drinking water and our water for bathing and cooking and cleaning and all that is going to be reduced. I mean, New Mexico is very short on water to start with, and I just don't like the

idea of the coal bed methane extraction reducing the groundwater level. It takes years to put that water in the ground.

The other thing about the Valle Vidal is it is beautiful. It contains many types of ecosystems, all of which require clean water to survive and to thrive.

There's no way to quantify the value of large tracts of land with the health of the soul. The Valle Vidal is very little developed. It is more similar to the way the West used to be than most other places.

Our children, children's children, et cetera, can get a feel for part of what drew settlers west. That is irreplaceable and will take many, many years to repair if defaced.

To designate the Valle Vidal as an Outstanding National Resource Water would help keep it as beautiful and pristine as it is.

Thank you.

MS. ORTH: Thank you, Ms. Thorne.

Commissioners, questions?

Thank you very much.

Is there anyone else who would like to make public comment at this time?

Sir, if you'll come from the back.

RICHARD SCHRADER

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

MR. SCHRADER: Is this working for you guys? I don't know if that's turned off or not, because I couldn't hear her very well back there. I may be able to speak loudly enough.

MS. ORTH: And your name first.

MR. SCHRADER: Okay. My name is Richard Schrader. I have a company called River Source, and I do watershed education and restoration around the State of New Mexico for tribes, state agencies, such as the New Mexico Department of Game and Fish, for watershed groups and for federal agencies, many tribes.

Thank you very much for the opportunity to address you. This is my first time, but I've followed what the Water Quality Control Commission does closely, in part because of my education work with schools all over the state on the program called New Mexico Watershed Watch, which is sponsored by the New Mexico Department of Game and Fish.

And what I do is I take students out, and I do water quality monitoring and training essentially, looking at chemistry, biology and physical aspects.

And, of course, you know, when they get their data, I say compare it to what.

Well, it's the designated use, which is the designated use for that area that is really established by the State under the Clean Water Act, as I'm sure you're all familiar with.

When I think about this proposal, I think about how the headwaters are so critical for water quality and water quantity, and that, you know, these high mountain areas, they get up to 30 to 40 inches of rain, as compared to down here and, say, around 16 inches of rain, if it's not a drought, down to, you know, in Deming, another eight inches of rain.

So these are really the sponges of our -- of our water systems, the natural water systems in the state.

And so I just -- with that fact in mind, it seems to me it's a good policy decision, as policy being really in your jurisdiction, the Water Quality Control Commission, to implement the Clean Water Act.

These are policy choices, and that's -- when I think about that, I think it's good to lean towards being -- having precautions, taking precautions in our most valuable water source areas.

The precautionary principle being discussed

more often, which, in the scientific community, I think it's a good idea to think, at least weigh that when you're making your choices, whether it's important in our headwater areas, to be very careful about what land uses we might allow.

And in the policymaking decision which rests with you and in considering this issue, I think, also, about the dominant land use by New Mexicans, which I would -- I don't know if anybody's done a survey, but I would hazard a guess that most New Mexicans use that place for recreation and for hunting and spiritual renewal, or whatever you want -- it's a source area where people go to enjoy nature.

So with that in mind, I support the recommendation -- or the policy -- the proposed policy and would ask you to consider those things in making your choice.

Thank you very much for the opportunity to speak.

MS. ORTH: Thank you, Mr. Schrader.

Commission, questions?

No.

Thank you.

Is there anyone else who would like to make public comment at this time?

Ms. Abeyta.

CECILIA ABEYTA

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

MS. ABEYTA: Thank you.

Madam Officer, members of the Commission, my name is Cecilia Abeyta, and I'm here today representing the New Mexico Farm and Livestock Bureau.

I do have a message from B. J. Brock from the New Mexico Cattle Growers and Wool Growers Association. She is sick and sends her regards, her wishes, and there will be a couple of things I'll be adding to the comments, along with my comments, as well.

We did provide -- thank you for the opportunity to come before you this afternoon. We did provide some written comments, that being the Farm and Livestock Bureau, to the Department of Game and Fish.

And overall, we thought that the document was -- was a pretty good document. It did depict some of the activities that are going on in the Valle Vidal to a certain extent.

And our letter, our comments are submitted, it's my understanding, when I spoke to the Hearing Officer earlier today, in the record. But I would just

briefly like to go over this real quick. I won't go over it in detail.

And basically, we did ask that in addition to cooperation with federal and state agencies, that consultation and coordination, those two action -- pieces of action, would also be included into the document, as well.

And we were pleased to see that permittees on the Valle Vidal are being partnered up with the US Forest Service and the Game and Fish and other entities to -- for watershed restoration and to enhance the water quality along the river uses.

The other thing, in brief, that we discussed is that, in addition to cooperation with state and federal agencies, we asked that the Range Improvement Task Force, as well as New Mexico State University's Water Task Force and local soil and water conservation districts be added to the process.

Another point that we made is that it's important, again, to include in the management plans that are developed between the US Forest Service and the grazing permittees -- that they continue to be included in any watershed and riparian restoration.

One of the things that we also asked is that the forest health and watershed plan and regional water

plans, along with the local soil and water conservation districts, also be included in the document itself. I might have missed it, but I did not see anything that was referencing those documents right there.

And then, also, in the document, it talks about the economic impacts to the local region, and one of the things that you all included during the triennial review was process -- in the process for designating waters to ONRW is any additional evidence to substantiate such a designation, including a discussion of the economic impact of the designation on the local and regional economy in New Mexico, and how it benefits the state, as well.

And though that section on page 20 of the document does pretty much depict what's going on in terms of recreation, wildlife, fishing, bird watching and so forth, it fails to address the economic benefits of other uses that are allowed on Forest Service land, that being oil and gas and agricultural production.

I might have missed it, but I did not see it in there at all.

So we suggested that -- and we took our -- we suggested language on economic benefits that agriculture adds to the state's economy as a whole, and we took this information out of a study done by Nick Ashcroft, who is

with the Cooperative Extension Service at New Mexico State University, and it's called The Total Economic Value of Agriculture in New Mexico.

And we asked that this particular section be included, as well, to truly accurately depict the economic impacts that are going on. We asked that this particular section be amended.

And that language is in our letter. I'll be glad to read it if you need me to, but I'm not going to go into detail in our written comments.

We feel that this is very, very important.

And then, also, as we all know, environmental justice is playing a very big, important role in many of the decisions that the State of New Mexico is going to be making, as it did with the Rhino case and the designation of a landfill site and permitting and so forth.

When you look at the State Supreme Court's decision on that, it stressed that the Department must look at nontechnical testimony. It must be -- must be taken into consideration, nontechnical testimony.

And we have felt that in the past that has not happened, especially with the Water Quality Control Commission, that being the triennial review.

So we would really encourage the Commission to

look at nontechnical testimony that was submitted by the Farm Bureau, as well as the Cattle Growers and the Wool Growers and whoever else presented nontechnical testimony on that.

We ask -- and I know that there was an advertisement in the paper that Bureau -- or the Game and Fish Department did in designating the rivers of the Valle Vidal, but our question is were other property landowners contacted.

If we're going to be talking about environmental justice and talking about designation and what impact does this have to adjacent landowners, private landowners, water right holders and so forth -- we do not know that, but -- and I did not see, nor did I look for any advertisement in the paper, and I'm sure that the Game and Fish Department does have a clipping on that.

And then, last, we would also ask that the Commission look into the socioeconomic impacts I was describing earlier, but does NEPA need to be applied here, since this is -- even though it's a state action, on federal land.

But my question is, because the State and maybe other nonprofit organizations are going to be obtaining federal money, does that trigger off NEPA.

And I don't know that. So that's my question that I would ask the Commission to look into.

So with that, in closing, I want to thank you, everybody, for listening to me and taking our comments into consideration.

MS. ORTH: Thank you.

Commission, questions?

CROSS EXAMINATION

BY THE COMMISSION:

MS. ORTH: Oh, Ms. -- Commissioner Bada.

MS. BADA: Could you tell us who the grazing allottees of the Valle are? Do you know that? Do you know who the grazing allottees on the Valle Vidal are?

MS. ABEYTA: No, I don't, not by name. But if the Forest Service is here, we can probably get that information to you. I'll be glad to.

MS. BADA: Okay.

MS. ABEYTA: Thank you.

MS. ORTH: Okay. Thank you.

Other questions?

No.

Thank you, Ms. --

MS. WATCHMAN-MOORE: I have --

MS. ORTH: Oh, I'm sorry. Commissioner -- Madam Chair.

MS. WATCHMAN-MOORE: Ms. Abeyta, you mentioned the addition of the forest and watershed health plan and the water plan be included in the document.

MS. ABEYTA: For reference.

MS. WATCHMAN-MOORE: Or a reference.

And what is your intent for that?

MS. ABEYTA: Well, I know that it was a coordinated effort to develop this particular document, and so since we're going to be discussing -- or since we're looking at watershed health and riparian restoration and so forth for clean water, I think it would behoove the three agencies to include those two documents that the state agencies collaboratively worked on together to develop, as well as the soil and water conservation districts.

It's a valuable --

MS. WATCHMAN-MOORE: So you see this as a model for cooperation?

MS. ABEYTA: I beg your pardon?

MS. WATCHMAN-MOORE: You want to use this as a model for cooperation?

MS. ABEYTA: Well, that, but I didn't see any reference -- if we're going to be talking about watershed health and riparian restoration, I think it's important to look at other existing documents that are

out there, that the State has developed --

MS. WATCHMAN-MOORE: Okay.

MS. ABEYTA: -- with stakeholders and so forth.

MS. ORTH: Other Commissioner questions?

Other questions?

No.

Thank you, Ms. Abeyta.

MS. ABEYTA: Thank you.

MS. ORTH: Would anyone else like to make public comment at this time?

There will be a couple other opportunities.

Ms. Conn.

MS. CONN: Yeah.

RACHEL CONN

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

MS. CONN: Thank you for this opportunity for giving public testimony. I'll be brief. I have two -- two main points.

First, I would like to clarify and address some of the concern that was just brought out -- up about public outreach.

I was involved -- I was involved -- I work

with Amigos Bravos, Friends of the Wild Rivers. We're a river conservation organization based in Taos. We're a statewide group.

And we, in -- in conjunction with the Coalition for the Valle Vidal and the Western Environmental Law Center, we developed a fact sheet about ONRW designation, about what it means, and specifically about what it means for the Valle Vidal.

And we distributed this widely. We specifically approached the Valle Vidal Grazing Association and spoke to them about -- about this designation and gave them the fact sheet and had numerous conversations with them.

We also -- the fact sheet was also distributed to the Cimarron Watershed Association, a watershed group which is made up a lot -- of a lot of landowners in the area, ranchers and other citizens from the Cimarron area.

So there was an effort made to reach out to the -- to the local landowners and users of the Valle Vidal.

And another point real quick, I -- on the NEPA question, that, I do believe -- and maybe this will be addressed later. I do believe there's a section of the Clean Water Act which exempts Clean Water Act actions

from going through NEPA.

And then the third thing I wanted to say is that I personally have spent time recreating in the Valle Vidal, climbing Little Costilla Peak, and it is beautiful, a beautiful place to visit. The Ponil, McCrystal and Costilla Creeks watersheds are beautiful.

And I've experienced them personally, and I urge the Commission to take this important step to protect the waters.

Thank you.

MS. ORTH: Thank you, Ms. Conn.

Commission questions?

No others?

All right. Thank you very much.

THE REPORTER: Would you give me your full name and spell it for me, please?

MS. CONN: Rachel Conn, R-A-C-H-E-L C-O-N-N.

MS. ORTH: Other public comment?

There will be other opportunities, but is there anyone who would like to go now?

Just raise your hand.

Oh, Mr. Puglisi.

MR. PUGLISI: Thank you, Mrs. Hearing Officer.

I don't really have much to say other than --

ALEX PUGLISI

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Would you state and spell your name for me, please?

MR. PUGLISI: It's Alex Puglisi, A-L-E-X P-U-G-L-I-S-I.

I would just like to submit four letters into the record in support of the designation of the waters of the Valle Vidal as outstanding natural (sic) resource waters, and that's my only testimony.

MS. ORTH: All right. Thank you.

If you'd give them to the hearing clerk.

MR. PUGLISI: Thank you.

MS. ORTH: Thank you, Mr. Puglisi.

Is there anyone else who would like to make public comment or submit written comment for the record?

We'll be accepting written comment when we close the evidentiary hearing.

I see no hands.

At this time, then, we will open the technical case, and the petitioners will go first.

If the petitioners would come up to the table.

And I'll recognize Brent Moore, their counsel.

MR. MOORE: Madam Hearing Officer, members of the Commission, my name is Brent Moore, and I represent the New Mexico Environment Department, and today we are here, along with the Department of Game and Fish and the Energy and Natural Resources Department as joint petitioners.

My co-counsel is Jim Karp. He's not here today. And also Carol Leach, and she is busy with other matters today. So I just wanted to recognize them.

In lieu of making a very broad opening statement, I'm going to leave that to our first witness, and make one request before we get into our direct examinations, and that is in the -- in an effort to speed the hearing along, we would request that we be allowed to put all of our witnesses on for direct and then put them on as a panel for cross-examination, if there is any, in order to group it together, if it -- if it pleases the Hearing Officer and the Commission.

MS. ORTH: All right. I think the Commission will remember that we often do that. The panel cross is certainly suitable for technical testimony.

Thank you.

MR. HUTCHINSON: Madam Hearing Officer.

MS. ORTH: Oh, Commissioner Hutchinson.

MR. HUTCHINSON: If we can make sure that all

of the panel -- or all of the people that presented testimony are going to be available for the panel. Okay.

MS. ORTH: All right. I believe that's their intent.

MR. HUTCHINSON: Okay.

MS. ORTH: Okay.

MR. MOORE: Commissioner Hutchinson, yes, we'll make sure that all of our witnesses are available in one group.

MR. HUTCHINSON: Okay.

MR. MOORE: As our first witness, we would like to call Marcy Leavitt.

MARCY LEAVITT

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MOORE:

Q. Could you please state your name?

A. Marcy Leavitt.

Q. Ms. Leavitt, how are you currently employed?

A. I am the Bureau Chief of the Surface Water Quality Bureau of the Environment Department.

Q. Ms. Leavitt, what are some of your current job responsibilities as Bureau Chief?

A. As Bureau Chief of the Surface Water Bureau, I'm responsible for development of regulations, policies and guidelines. I participate in the review and approval of certification of national pollutant elimination system permits, NPDES permits.

I assist in the preparation for the triennial review, which is the review of surface water quality standards. And I coordinate all of the Bureau's activities, including activities of the Point Source Regulation Section, the Monitoring and Assessment Section and the Watershed Protection Section.

Q. Ms. Leavitt, could you briefly describe your educational background?

A. I have a bachelor's degree -- a bachelor's of science degree in geology from the University of Cincinnati and a master's degree in hydrology from New Mexico Tech.

Q. What did you do to prepare for today's hearing?

A. I reviewed all of the documents that were submitted as part of the petition, and I prepared written testimony.

MR. MOORE: Madam Hearing Officer, members of the Commission, at this time, I would request that Ms. Leavitt be allowed to read her direct testimony that

she's prepared.

MS. ORTH: Okay.

Any input?

No.

All right. Thank you. Go ahead.

MS. LEAVITT: My name is Marcy Leavitt, and I'm the Bureau Chief of the Surface Water Quality Bureau of the New Mexico Environment Department.

The purpose of today's hearing is to propose amendments to Subsection D of 20.6.4.9 NMAC that would designate all of the waters of the United States Forest Service Valle Vidal Management Unit as Outstanding National Resource Waters.

The nominated waters include the Rio Costilla, including Comanche, La Cueva, Fernandez, Chuckwagon, Little Costilla, 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.

Middle Ponil Creek, including the waters of Greenwood Canyon, from their headwaters downstream to the boundary of the Elliott S. Barker Wildlife Management Area.

Shuree Lakes.

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 Leandro Creek from its headwaters downstream to the boundary of the United States Forest Service Valle Vidal Special Management Unit.

Before we provide a detailed discussion of the evidence that supports the nomination, I would like to provide some background on the designation process.

An Outstanding National Resource Water, or ONRW, is a water that possesses outstanding ecological, recreational or natural resource values. The name, Outstanding National Resource Water, implies a pristine quality, and pristine waters certainly are candidates for the designation.

However, other waters that have exceptional recreational or ecological significance are candidates, as well.

The USEPA describes ONRWs in Section 4.7 of the Water Quality Standards Handbook. And an excerpt of the handbook is attached as Exhibit 2.

Section 4.7 states, "Outstanding National Resource Waters (or ONRWs) are provided the highest level of protection under the antidegradation policy. The policy provides for the protection of water quality

in high-quality waters that constitute an ONRW by prohibiting the lowering of water quality. ONRWs are often regarded as the highest quality waters of the United States: That is clearly the thrust of 40 CFR 131.12(a)(3).

"However, ONRW designation also offers special protection for waters of 'exceptional ecological significance.' These are water bodies that are important, unique or sensitive ecologically, but whose water quality, as measured by the traditional parameters such as dissolved oxygen or pH, may not be particularly high or whose characteristics cannot be adequately described by these parameters (such as wetlands)."

In New Mexico, for example, a lower mainstem wildlife refuge such as the Bitter Lake National Wildlife Refuge on the Pecos River near Roswell or the Bosque del Apache National Wildlife Refuge on the Rio Grande near Socorro might also be considered to be very important ecologically but might not be considered pristine water.

In the Valle Vidal, we have waters that are generally of good quality and, more importantly, make a major contribution to the ecological and recreational significance of the area. All of these waters are ecologically and recreationally important and valuable

as a natural resource, and ONRW designation would be beneficial to the state.

And that's really the point. ONRW designation should be applied to waters needing special protection regardless of having pristine water.

Designation as an ONRW ensures that water quality is maintained or improved in order to protect water for existing uses. ONRW designation does not limit ongoing, customary activities as long as those uses do not degrade water quality from levels at the time of designation.

Protection of ONRWs is recognized under the New Mexico water quality standards' antidegradation policy, which can be found in 20.6.4.8 NMAC. The policy states, "No degradation shall be allowed in high quality waters designated by the commission as outstanding national resource waters."

Section 20.6.4.9 NMAC describes the procedures and criteria for ONRW designation. The procedural requirements in 20.6.4.9 NMAC were carefully reviewed and amended by the WQCC in the most recent triennial review of the water quality standards.

This nomination is being made pursuant to the petition requirements set forth in Subsection A of 20.6.4.9 NMAC. The Valle Vidal ONRW nomination petition

has been jointly submitted by the New Mexico Department of Game and Fish, the New Mexico Environment Department and the Energy, Minerals and Natural Resources Department.

As required by paragraph A of 20.6.4.9 NMAC, the petition, in our testimony today, will present:

One, a map showing the locations of the waters of the Valle Vidal. The Commission should refer to the map in Exhibit 3 for the purposes of this requirement.

Number two, evidence to support the criteria in Subsections B.(1), B.(2) or B.(3) of Section 20.6.4.9. Please note that while the petitioners have included information supporting designation based on all criteria, only one criteria must be met for ONRW designation.

Number three, available water quality data for waters of the Valle Vidal.

Number four, a discussion of the activities that could contribute to a reduction in water quality.

Number five, a discussion of the economic impacts and benefits of ONRW designation. Note that as it states in the standards, this is a discussion, not an analysis.

And, finally, number six, an affidavit of publication, which is contained in Exhibit 4. This

affidavit verifies that notice of the petition was published in the newspapers in the affected counties and in a newspaper of general statewide circulation.

In addition, Exhibit 5 contains an affidavit of additional notice that was provided to the public regarding the petition. This notice complies with the requirements in the Water Quality Act and the Commission guidelines and also in the standards.

A draft of the nomination was made available to the public, and a public comment period was initiated on August 21st, 2005.

Additionally, a public meeting was held at the Philmont Scout Ranch in Cimarron on September 14, 2005, to provide an overview of the nomination and to answer questions from the public.

The Department of Game and Fish received 78 comments on the draft petition. All of these comments supported the ONRW designation except four.

Three entities expressed concern in a form letter from the New Mexico Federal Lands Council, the New Mexico Cattle Growers' Association and the New Mexico Wool Growers Association. One additional entity, the New Mexico Farm and Livestock Bureau, also expressed concerns about the designation.

Entities in favor of the designation include

New Mexico Trout, Philmont Scout Ranch, Mesilla Valley Flyfishers, San Luis Valley Ecosystem Council, Albuquerque Wildlife Federation, Taos Pueblo Environment Office, New Mexico Audubon Council, Oil and Gas Accountability Project, Amigos Bravos, Defenders of Wildlife, Coalition for the Valle Vidal, Southwest Environmental Center, Forest Guardians, New Mexico Wilderness Alliance, Four Corners Institute, Truchas Chapter of Trout Unlimited, the Rio Grande Chapter of the Sierra Club, the New Mexico herpetological Society, the New Mexico Council of Trout Unlimited and numerous individuals.

The comments have been provided as Exhibit 6 and are part of the official record for this hearing.

During this hearing, representatives of the Department of Game and Fish, the Environment Department and the Energy, Minerals and Natural Resources Department will provide testimony on the ONRW nomination and justification for the proposed changes to Subsection D of 20.6.9 -- 20.6.4.9 NMAC.

First, Dr. David Propst from the Department of Game and Fish will summarize information that was provided in the petition to address the requirements of Subsection A.(5) of 20.6.4.9 and the criteria within Subsections B.(1) and B.(2) of 20.6.4.9.

The next witness will be Lynette Guevara of NMED's Surface Water Quality Bureau. She will testify about water quality, activities that might contribute to a reduction in water quality and additional evidence to substantiate designation as required by Subsections A.(3), A.(4) and A.(5) of 20.6.4.9.

Ms. Guevara will also provide testimony on the water quality criterion within Subsection B.(3) of 20.6.4.9.

The last witness will be Mark Fesmire, Director of the Oil Conservation Division. Mr. Fesmire will testify regarding activities that might degrade water quality in the Valle Vidal and will provide a discussion of economic impacts as required by Subsections A.(4) and A.(5) of 20.6.4.9.

One last note. During the hearing, witnesses may refer to the standards by the subsection letters alone. For example, a witness may say that a particular piece of evidence supports criteria B.(3). When you hear this shorthand notation, please note that the witness is referring to a particular subsection within Section 20.6.4.9 NMAC, the provisions regarding ONRWs.

And that concludes my direct testimony.

MS. ORTH: Thank you.

Q. (BY MR. MOORE) Just a few more questions,

Ms. Leavitt, if we could.

I'd like to address some of the things that were brought up by Ms. Abeyta when she was providing some public comment and fill in some of those gaps, if we could.

So the first thing that I'd like to get into with you is the question of NEPA review.

So the first question I would have is, are you familiar with Section 511.(c)(1) of the Clean Water Act?

A. I am.

Q. And what does that provision of the Clean Water Act provide?

A. It talks about the limited circumstances in which NEPA applies to Clean Water Act decisions.

Q. And would those decisions include ONRW designations?

A. No. There is -- the only case in which NEPA would apply is -- I can actually just read this.

Q. Could you go ahead and just read it into the record for us?

A. Okay. This is Section (c)(1) of Section 511.

"Except for the provision of Federal financial assistance for the purpose of assisting the construction of publicly owned treatment works as authorized by section 201 of this Act, and the issuance of a permit

under section 402 of this Act for the discharge of any pollutant by a new source as defined in section 306 of this Act, no action of the Administrator taken pursuant to this Act shall be deemed a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969."

Q. Based on that language, do you need to do a NEPA review for an ONRW designation?

A. No, I don't believe that you do.

And I'd also like to point out that this is a state decision being made under state laws and standards, and the Water Quality Control Commission is a state body, so NEPA wouldn't apply in that situation, either.

Q. Okay.

And just a few other questions on some of the comments that were made.

The Farm and Livestock Bureau submitted some comments.

Were those included in the record?

A. They are. They are included in the exhibits that were attached to our notice of intent.

Q. And so they're available for the Commission to consider in making a decision on this designation?

A. Absolutely.

MR. MOORE: No further questions.

MS. ORTH: Thank you.

MR. MOORE: Our next witness will be Dr. David Propst.

If we could have just a few minutes to set up the computer. Dr. Propst has a presentation. We want to make sure that that can run.

MS. ORTH: Will that involve the screen here?

MR. MOORE: I think that's how we've set it up.

DAVID L. PROPST

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MOORE:

Q. Could you please state your name?

A. David Propst.

Q. And, Dr. Propst, where are you currently employed?

A. I'm a fish biologist with New Mexico Department of Game and Fish --

Q. And --

A. -- and --

Q. Go ahead.

A. -- also adjunct professor at University of New Mexico.

Q. And what are some of your current job responsibilities?

A. I'm basically -- with the New Mexico Department of Game and Fish, I direct research and management on nine Game and Fishes throughout the State of New Mexico, particularly on federal and state protected species.

I also direct implementation recovery efforts for protected species within the state and represent the Department of Game and Fish on various interagency panels and entities that work towards recovery of native fishes.

Q. Dr. Propst, could you briefly describe for us your educational background?

A. I have a bachelor of arts in history and economics from Hampden-Sydney College in Virginia. I have a master's from Colorado State University and a PhD from Colorado State University.

Q. And what are the master's and PhD in?

A. Oh, I'm sorry. Zoology and fishery biology.

Q. Did you do anything to prepare for today's hearing?

A. Yes. I reviewed the petition and exhibits

that have been provided to the Commissioners and prepared written testimony.

MR. MOORE: Madam Hearing Officer, members of the Commission, at this time, I would request that Dr. Propst be allowed to present his direct testimony and the PowerPoint presentation that he's prepared.

MS. ORTH: If you would, please.

MR. PROPST: Madam Chairman and Commission, I'd like to thank you for the opportunity to speak today regarding the nomination of the waters of the Valle Vidal as Outstanding National Resource Water.

Previously, you were provided a copy of a petition prepared by the Department of Game and Fish, New Mexico Environment Department and the New Mexico Department of Energy, Minerals and Natural Resources for nomination of the waters of the Valle Vidal as Outstanding National Resource Water.

That document, which follows the procedures outlined in 20.6.4.9 New Mexico Administrative Code, provides considerable detail supporting the proposed designation.

The petition includes a written statement and evidence in support of the nomination as required in paragraph (2) of Subsection A of 20.6.4.9 NMAC on how waters meet at least one of the three criteria for

Outstanding National Resource Waters in Subsection B.

Today I will provide testimony regarding the discussion of the economic value of recreational activities on the Valle Vidal as required under Section A.(5) and testimony to demonstrate that the waters of the Valle Vidal satisfy the criteria contained in Subsections B.(1) and B.(2).

Under criterion B.(1), a water may be designated an ONRW if it is a significant attribute of a state gold medal trout fishery.

My testimony today will demonstrate that while the State of New Mexico does not have an official gold medal trout fishery designation, all waters in the Valle Vidal are designated special trout waters, and as such these waters should be interpreted by the WQCC to satisfy the criterion listed in Subsection B.(1).

Under B.(2), a water may be designated an ONRW if it has exceptional recreational or ecological significance.

My testimony today will demonstrate that the waters of the Valle Vidal have both exceptional recreational significance and exceptional ecological significance.

Lying astride the Sangre de Cristo Mountains of Northern New Mexico, the Valle Vidal contains a lush

and varied landscape supporting a rich diversity of montane plants and animals.

Additionally, the mountain and valley vistas, picturesque trout streams, diverse habitats and variety of wildlife species are magnets for the thousands of outdoor enthusiasts that visit Valle Vidal annually.

Central to the allure of Valle Vidal are its streams. The recreational, scenic and wildlife values of Comanche Creek and its tributaries, Middle Ponil, North Ponil, McCrystal and Rio Costilla were such that all have been deemed eligible for recognition of the federal Wild and Scenic Rivers Act.

Although none has been designated a wild and scenic river, each is managed by the Carson National Forest as though it were formally designated a wild and scenic river. Collectively, these streams include almost all perennial rivers within the Valle Vidal.

From their origins in the alpine tundra and mountain meadows, streams of the Valle Vidal flow through and connect the varied habitats of the 100,000-acre special management unit of the Carson National Forest.

Headwaters of Comanche, Middle Ponil, Leandro and McCrystal Creeks arise on Costilla and Little Costilla Peaks at elevations exceeding 12,000 feet.

Subalpine forests of corkbark fir, Engelmann spruce and bristlecone pine cover higher elevation slopes, giving way to extensive mixed conifer stands of Ponderosa pine, limber pine, Douglas fir, white fir and blue spruce, sprinkled with aspen glades at mid elevations.

Low elevation Ponderosa pine forests are interspersed with expansive mountain meadow grasslands. In addition to conifers, higher elevation streams are bordered by mountain alder and red-osier dogwood while narrow-leaf cottonwood and willows are common along lower elevation streams.

Numerous springs and wetlands having an array of sedges, grasses and other herbaceous plants are associated with Valle Vidal streams.

In addition to providing habitat for numerous animals, these riparian and wetland plant communities serve critical ecological functions by slowing flows when elevated during spring snow melt or summer storm spates, trapping organic debris, reducing erosion and filtering suspended sediments.

Although not directly associated with surface waters of the Valle Vidal, a stand of bristlecone pine on the south flank of Little Costilla Peak contains a member of the national Big Tree Register.

With its diversity of habitats, the Valle Vidal is home to a broad array of terrestrial animals typical of the southern Rocky Mountains. Over 50 mammal species, more than 200 bird species and 16 reptiles and amphibians have been documented on the Valle Vidal by the Department of Game and Fish.

Among the most visible mammals are the large herds of elk that roam the broad meadows and conifer forests.

Less visible, but commonly observed, are mule deer, black bear, coyote, beaver, porcupine, red squirrel, pika, rock squirrel, least chipmunk and numerous others. Hmm. That's an interesting comment on the wildlife. I think that was supposed to be a yellow-bellied marmot. So use your imagination.

Less visible -- skip ahead.

Several mammal species, such as yellow-bellied marmot, northern pocket gopher and American martin, are considered sensitive or threatened species by the US Forest Service or New Mexico Game and Fish.

Riparian and wetland habitats are essential for little brown bat, long-eared myotis bat, fringed myotis bag, long-legged myotis bat, western small-footed myotis bat and heather vole. Each of these species is listed as sensitive by the US Forest Service.

The bird life of Valle Vidal changes with elevation, habitat and season. Bald eagles may be seen near streams and lakes during winter, Mexican spotted owls are found in woodlands, and peregrine falcons may be seen coursing along cliffs.

Marsh wren, northern water thrush and red-winged blackbird are typically seen in the riparian plant communities found along Valle Vidal streams. American dippers are frequently encountered as they fly from rock to rock in streams, searching for aquatic insects.

Although the image of an area dominated by coniferous forests and upland meadows do not evoke thoughts of reptiles or amphibians, 16 species are found in the Valle Vidal.

Most of the 13 species of reptiles, such as mountain short-horned lizards, plateau striped whiptails and prairie rattlesnakes, are not directly dependent upon streams or wetlands, but three garter snakes, blackneck, wandering and plains, gain much of their sustenance from small stream fishes.

All three amphibian species, tiger salamander, chorus frog and northern leopard frog, are restricted for at least part of their lives to aquatic habitats. Northern leopard frog is considered a sensitive species

by the US Forest Service.

Three native New Mexico fishes, including Rio Grande cutthroat trout, the state fish, are found in the waters of the Valle Vidal. Rio Grande cutthroat trout is the only native fish in higher elevation, coldwater streams, but native creek chub and longnose dace are common in lower elevation, coolwater streams.

Nonnative rainbow trout, brown trout, brook trout, hybrid cutthroat trout, white sucker and longnose sucker are also found in Valle Vidal's streams.

In its six-mile course through the Valle Vidal, the Rio Costilla supports a hybrid cutthroat, brown and rainbow trout population, as well as longnose dace and white sucker. The trout population is numerically dominated by cutthroat trout, and individuals between 200 and 300 meters -- millimeters, or eight to 12 inches, are comparatively common.

Of equal importance to having reproductive adults is annual recruitment of young fish to the population. Recruitment means the survival of eggs and fingerlings to a point where an individual has a moderate probability of surviving to maturity. In 2003, about 18 percent of the cutthroat trout captured were recent recruits to the population.

Following removal of nonnative fishes above a

waterfall barrier in 1997, Powderhouse Creek was stocked with pure Rio Grande cutthroat trout. By 2004, the stream supported about 810 Rio Grande cutthroat trout per surface acre, with individuals ranging in size from 50 to 170 millimeters.

This graph illustrates several differences in size structure of native versus nonnative trout populations. Most nonnative brook trout, which are represented by the light blue bars in this graph, are rather small, whereas native Rio Grande cutthroat trout are more evenly distributed among the size classes.

In the North Ponil drainage, McCrystal Creek supports a pure population of Rio Grande cutthroat trout, with individuals ranging from 50 to 280 millimeters. Leandro Creek, a Vermejo River tributary, was renovated in 1998 and now contains a viable population of Rio Grande cutthroat trout.

The demographics of trout populations vary among streams and are dependent upon numerous physical and biological factors, such as stream size, gradient, water quality, food availability and competitors.

The importance of Valle Vidal waters for conservation of Rio Grande cutthroat trout has been detailed in the New Mexico Department of Game and Fish Rio Grande Cutthroat Trout Management Plan, which is

available to you as Exhibit 19.

Currently, efforts are underway to remove nonnative trouts from the Rio Costilla drainage, including at the Comanche Creek drainage, both within and outside of the Valle Vidal.

The goal of this state and federal and private partnership is to restore Rio Grande cutthroat trout to more than 100 miles of streams and numerous small lakes within the historical range of Rio Grande cutthroat trout. Achievement of this goal will be a major contribution to security and conservation of New Mexico's state fish.

Table 2.2 of the petition provides data on the aquatic macroinvertebrates of Valle Vidal streams. Aquatic insects of nine orders and over 40 families are present, an impressive degree of aquatic macroinvertebrate diversity and richness. These aquatic insects are the primary food source for its resident fishes.

In addition to aquatic insects, several species of amphipods, snails and mollusks are present. Knobbedlip fairy and Packard's fairy shrimps are found in the ephemeral aquatic habitats within Valle Vidal. Surveys by the Department of Game and Fish have documented the rarity of both species, and Packard's

fairy shrimp is found at only six other locations in New Mexico.

The reports of these surveys are provided in Exhibits 27 and 28.

Even before becoming part of the Carson National Forest in 1982, the Valle Vidal was renowned for its elk. To help ensure retention of its large elk herds and famous trophy bulls, the Valle Vidal has been managed as a once-in-a-lifetime hunting opportunity.

The number of licensed elk hunters is limited to 270 per year. Only those who draw an elk permit may purchase a bear permit. Turkey hunting occurs only in spring and is limited to 20 individuals who successfully draw a permit.

Hunting regulations on Valle Vidal are provided as Exhibit 11.

The waters of the Valle Vidal are a mecca for fishing enthusiasts from throughout New Mexico and the US. Upper reaches of Comanche Creek and several of its tributaries, Powderhouse Creek, Upper McCrystal Creek and Leandro Creek support populations of Rio Grande cutthroat trout. Elsewhere, anglers may land hybrid cutthroat, rainbow, brook or brown trouts.

The New Mexico Department of Game and Fish does not have a gold medal trout fishery designation but

believes its special trout water designation is equivalent. All waters of Valle Vidal are designated special trout water.

Under special trout water regulations, only single, barbless hook artificial flies or lures may be used, and all trout must be returned to the water immediately after capture. The only exception is Shuree Ponds, where two fish may be kept.

Valle Vidal fishing regulations are detailed in Exhibit 10.

Angler visitation varies among Valle Vidal streams. Based upon New Mexico Department of Game and Fish angler surveys, the Rio Costilla receives about 7,700 angler-use days per year. Angler use of small and less accessible streams, such as Powderhouse Creek, is between 100 and 300 days per year.

As previously indicated, all waters are catch-and-release except Shuree Ponds. These ponds are annually stocked with rainbow trout, and two trout over 15 inches may be creeled. One of Shuree Ponds may be fished only by anglers less than 12 years of age. Collectively, the waters of the Valle Vidal provide about 15,000 angler-use days per year.

Bird watching, camping, hiking, horseback riding, snowshoeing and cross-country skiing are other

activities that many visitors to the Valle Vidal enjoy. Over the course of a year, bird watchers might see over 200 species, many uncommon or rare elsewhere in New Mexico.

Trails provide hikers and horseback riders access to secluded meadows, cobbled streams and panoramic views. Two campgrounds, Cimarron and McCrystal, were voted among the 10 best US campgrounds by Great Outdoor Recreation Pages. Scouts from the adjoining Philmont Scout Ranch hone their outdoor skills while on treks through the Valle Vidal.

During the public comment period on the petition for nomination of the waters of Valle Vidal as an Outstanding National Resource Water, the Department of Game and Fish received over 70 letters and E-mails supporting its designation as an Outstanding National Resource Water.

Annually, thousands of visitors are drawn to the Valle Vidal for hunting, fishing and several nonconsumptive outdoor activities, such as wildlife viewing, hiking and camping.

Key elements of its attraction are high quality waters and scenic landscapes little modified by humans. Regardless of recreation activity pursued, each has a positive economic contribution. Two examples

illustrate the direct economic impact -- or value of Valle Vidal to local and regional economies.

In 2005, five -- 270 five-day elk permits were issued by the New Mexico Department of Game and Fish. Of permits issued, 188 were for state residents and 82 for nonresidents.

Based upon the US Fish and Wildlife Service 2001 National Survey of Fishing, Hunting and Wildlife-Associated Recreation, provided as Exhibit 21, resident elk hunters spend $108 per day and nonresidents $92 per day. Thus, about $100,000 was spent by resident elk hunters in 2005 and $35,000 by nonresidents.

If a guide is used, a hunter will pay about $4,500 for the five-day hunt, according to the New Mexico Council of Guides and Outfitters. If 40 Valle Vidal elk hunters use guides, about $180,000 is paid annually for these services. A conservative estimate of the direct economic value of Valle Vidal elk hunting is about $315,000 annually.

Between 1997 and 2003, angler surveys by the Department of Game and Fish estimated that about 5,000 anglers fish the waters of Valle Vidal each year. Each hunter -- or each angler spent about three days on Valle Vidal, for a total of 15,000 angler days each year.

The 2001 National Survey of Fishing, Hunting

and Wildlife-Associated Recreation estimated that resident anglers spent about $82 each day and nonresidents about $71. During 2003-2004, about two-thirds of the anglers were nonresidents.

Based on these data, angling directly contributed over $1.1 million to the New Mexico economy. This figure does not include that spent on guides.

In just two of the numerous activities that attract visitors to the Valle Vidal, at least $1.4 million is directly contributed to local and regional economies each year. Inclusion of dollars generated by all other outdoor recreational activities would likely yield a much greater economic value of Valle Vidal under current management.

Designation of its streams and lakes as Outstanding National Resource Waters will enhance protection of those ecological attributes, the varied recreational -- 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.

Any activity, such as oil and gas extraction activities, road construction or increased heavy vehicle traffic that diminishes quality of Valle Vidal habitats directly and negatively affects -- and negatively

affects fish and wildlife. Conservation of its fish and wildlife resources is essential to ensuring the long-term economic value of Valle Vidal.

In summary, the waters of Valle Vidal provide the ecological foundation for a lush and varied landscape that supports a diverse fauna. The ecological and recreational significance of the Valle Vidal extends beyond its boundaries and make its waters worthy of designation as an Outstanding National Resource Water.

The waters of the Valle Vidal are a significant attribute of a high quality special trout fishery. All perennial waters on the Valle Vidal are defined as special trout waters by the New Mexico Department of Game and Fish and should therefore satisfy Subsection B.(1) criterion.

In addition, the waters of the Valle Vidal have both exceptional recreational significance and exceptional ecological significance, and as such, these waters should be deemed to satisfy the criterion listed in Subsection B.(2).

Finally, designation as ONRW will only enhance the current ecological, recreational and economic value of Valle Vidal and, therefore, will be beneficial to the State of New Mexico.

And that concludes my testimony. Thank you.

MR. MOORE: Thank you, Dr. Propst.

I have no further questions for this witness.

MS. ORTH: All right.

MR. MOORE: Our next witness will be Lynette Guevara.

LYNETTE GUEVARA

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MOORE:

MR. MOORE: She has some slides, too, so you --

MS. GUEVARA: There's just the two slides toward the end, so --

Q. (BY MR. MOORE) Could you please state your name?

A. My name is Lynette Guevara.

Q. Ms. Guevara, how are you currently employed?

A. I am the Program Manager for the Monitoring and Assessment Section of the Surface Water Quality Bureau.

Q. And what are some of your current job responsibilities in that position?

A. I direct a group of 16 technical staff, and we're responsible for the monitoring, assessment and

reporting of surface waters around the state. We also implement and design research projects to improve our water quality standards.

The section also develops total maximum daily load planning documents, and we also coordinate the outreach activities for the Bureau.

Q. What is your educational background?

A. I have a bachelor's of business administration from Gonzaga University in Spokane, Washington, and a master's of science in watershed science from Colorado State.

Q. Ms. Guevara, did you do anything to prepare for today's hearing?

A. I reviewed the petition and the exhibits, and I prepared written testimony.

MR. MOORE: Madam Hearing Officer, members of the Commission, at this time, I would request that Ms. Guevara be allowed to present her written testimony.

MS. ORTH: Please proceed.

MS. GUEVARA: My name is Lynette Guevara, and I am the Program Manager of the Monitoring and Assessment Section of the Surface Water Quality Bureau.

The purpose of my testimony is to provide information regarding Subsections A.(3), B.(3), A.(4) and, to some extent, A.(5) of 20.6.4.9 NMAC.

I will first discuss Subsection A.(3) by discussing available chemical, physical and biological water quality data in order to establish a baseline condition for the proposed waters.

I have provided several exhibits of available data. These exhibits include information previously provided in Appendix 3 of the petition, as well as additional water quality data that was collated during the development of this testimony.

For the purposes of satisfying the requirement in Subsection A.(3), the Commission should refer to Exhibits 30 through 38.

Exhibit 39 is a map of the main water quality stations in the Valle Vidal to orient you during my testimony.

Exhibits 32 through 36 provide available chemical and physical data.

Exhibit 37 summarizes the results of benthic macroinvertebrate surveys in the area. And as a reminder, benthic macroinvertebrates are basically bugs that spend some portion of their lives in the stream bed and are commonly used to determine the health of aquatic ecosystems.

Exhibit 38 summarizes available physical habitat data.

The Bureau monitored water quality for a variety of parameters at several stations in the Valle Vidal between 1989 and 2003. The primary focus of these surveys was to determine whether or not aquatic life uses were being met, to gather data necessary to develop any subsequent total maximum daily load planning documents and to determine whether current water quality criteria are appropriate.

Data from stations within the boundaries of the Valle Vidal will be the focus of my testimony.

The data indicate that the quality of surface waters in the Valle Vidal is generally good based on chemical/physical measurements and chemical laboratory results. The Bureau also deployed continuously-recording temperature devices, referred to as thermographs, at select stations for several weeks at a time to gather diurnal and seasonal temperature data.

Thermograph data are presented in Exhibit 36.

The Bureau did determine a few water quality impairments based on these numeric data, but these are in limited areas. It is important to note that some of these impairments are already being addressed through water restoration projects.

Biological data and physical habitat data were also collected at select sites during intensive surveys.

Specifically, the Bureau collected benthic macroinvertebrate samples at select study sites and reference sites during surveys of the Valle Vidal. The composition and density of these aquatic organisms compared to a reference site provides information on the attainment of aquatic life uses.

Benthic macroinvertebrates can often provide a better indication of aquatic life uses than infrequent chemical measurements because these organisms live in the aquatic ecosystem for up to two years and are, therefore, in a sense, continuously monitoring water quality.

The Bureau also collects limited data on physical habitat parameters of streams during intensive surveys. Physical habitat data available for the Valle Vidal waters include information on stream bed particle size distribution and stream channel dimensions.

I will now provide evidence in support of criteria Subsection B.(3) and explain how these data are utilized to assess water quality condition.

The Bureau has collected a large amount of data related to aquatic life use and, therefore, has a good understanding of whether aquatic life uses are attained in waters in the Valle Vidal. Existing chemical data indicate Subsection B.(3) criterion is met

for the vast majority of numeric water quality criteria associated with aquatic life uses.

This is supported by Exhibit 31, which shows the number of times, if any, a particular numeric water quality criterion was not met. As you can see in this exhibit, exceedances of numeric water quality criteria were rarely measured in waters of the Valle Vidal.

My testimony will cover more than numeric criteria because the overall consideration is whether or not existing water quality is protective of aquatic life uses.

The Bureau looks at biological and habitat data as well as numeric chemical data to determine whether both numeric and narrative aquatic life water quality standards are met. Examining the health of the aquatic community along with the associated physical and chemical parameters provides a more comprehensive picture of water quality.

To determine whether existing water quality is protective of designated use, the Bureau assesses available data by comparing these data to numeric criteria as detailed in our Assessment Protocols.

Relevant excerpts of our Assessment Protocol for traditional and toxic parameters are provided as Exhibit 40.

When thermograph data are available, the Bureau utilizes a separate assessment protocol that considers both duration and magnitude of recorded temperatures that are higher than the associated numeric criteria.

Relevant excerpts of this protocol are provided as Exhibit 41.

Also, New Mexico currently has a narrative standard related to sedimentation and bottom deposits that is used to evaluate potential impacts to aquatic life uses. The Bureau therefore developed an assessment protocol to determine whether potential sedimentation impairment based on both benthic macroinvertebrate data and stream substrate particle size data as compared to a reference site.

Relevant excerpts of this protocol are provided as Exhibit 42.

I will now briefly discuss each stream reach within the Valle Vidal boundary for which the Bureau has water quality data associated with aquatic life uses. It might be helpful to refer to the map in Exhibit 39 during this portion of the testimony.

Also, the water quality condition based on available data, the applicable current New Mexico water quality standards and the current New Mexico assessment

protocols for each of these reaches is summarized in Exhibit 43. This exhibit also summarizes water quality within the Valle Vidal for the purposes of the B.(3) criterion.

The Bureau has collected data associated with aquatic life uses in Costilla Creek within the Valle Vidal boundaries. These raw data are presented in Exhibit 32 and summarized in Exhibit 31.

The Subsection B.(3) criterion was met with regards to aquatic life use for all parameters except aluminum, zinc and lead.

Available bioassessment data from the station Costilla Creek below Comanche Creek also indicated full support for aquatic life uses as compared to a reference site, as shown in Exhibit 37.

The Bureau has collected data associated with aquatic life uses in Comanche Creek within the Valle Vidal boundaries. These raw data are presented in Exhibit 32 and summarized in Exhibit 31.

The Subsection B.(3) criterion was met with regards to aquatic life use for all but temperature. Thermographs deployed at Comanche Creek below the Upper Exclosure in 2002 and Comanche Creek above Rio Costilla in 2003 recorded temperatures greater than 23 degrees C. A thermograph deployed in 2003 at Comanche Creek below

Little Costilla Creek did not indicate temperature impairment.

Thermograph data are presented in Exhibit 36.

Combined geomorphic and benthic macroinvertebrate data from 2000 indicated potential impairment due to excessive sedimentation, as shown in Exhibits 37 and 38.

It is important to acknowledge that there are several successful ongoing projects underway to improve water quality in the Comanche Creek basin. These will be discussed further later in my testimony.

The Bureau has not collected chemical data associated with aquatic life uses at McCrystal Creek. The Subsection B.(3) criterion was not met with regards to aquatic life use for temperature. In 1999, a thermograph deployed at McCrystal Creek above McCrystal Campground recorded temperatures that were higher than 20 degrees C.

These data are presented in Exhibit 36.

The Bureau has collected data associated with aquatic life uses at Middle Ponil Creek within the Valle Vidal boundaries. These raw data are presented in Exhibit 33 and summarized in Exhibit 31.

The Subsection B.(3) criterion was fully met with regards to aquatic life uses. Benthic

macroinvertebrate data collected at Middle Ponil Creek at Forest Road 1950 also indicated aquatic life uses were being met, as noted in Exhibit 37.

Applying the current sedimentation assessment protocol to the 1998 data, this reach is also deemed fully supporting with respect to the sedimentation standard.

New Mexico's current water quality standards contain a new turbidity standard found at 20.6.4.13.J NMAC, which requires the determination of background turbidity levels. These data are not available, so the status of the stream with regards to turbidity is undetermined at this time.

The Bureau has collected data associated with aquatic life uses at North Ponil Creek within the Valle Vidal boundary. These raw data are presented in Exhibit 33 and summarized in Exhibit 31.

The Subsection B.(3) criterion was met with regards to aquatic life use for all but temperature. In 1999, the thermograph deployed at North Ponil at Forest Road 1950 recorded temperatures higher than 23 degrees C.

Benthic macroinvertebrate data collected at North Ponil Creek at Forest Road 1950 indicated that aquatic life uses were being met, as noted in

Exhibit 37.

Applying the current sedimentation assessment protocol to the 1998 data, this reach is deemed fully supporting with respect to the narrative sedimentation standard.

Turbidity was also not evaluated in this stream reach for the reasons mentioned above.

Now I will address the second portion of Subsection B.(3) by discussing current human activities in the area and whether or not these activities substantially detract from the waters' value as a natural resource.

Human-controlled activities currently occurring in the Valle Vidal include, but are not limited to, fishing, limited hunting, camping, hiking, bird watching, rangeland grazing and road maintenance associated with these activities.

The ONRW designation will not limit existing uses as long as these uses do not degrade water quality from the levels at the time of designation. The petitioners believe that these existing uses have not caused significant modification to the area based on available water quality data discussed above.

Activities that may typically cause significant modification include construction of large

dams or diversions and/or developments that include large networks of roads, such as oil and gas development and timber harvest. Neither of these types of modifications is currently occurring within the Valle Vidal boundaries.

Ongoing, proactive improvements in grazing best management practices are currently being implemented to protect and potentially improve water quality. Several federal, state and local resources are available, and individuals involved with grazing already work together to sustain and improve best management practices in the area.

Specifically, a Comanche Creek working group has formed to address water quality concerns in the basin. This group includes individuals from the Quivira Coalition, New Mexico Department of Game and Fish, Carson National Forest and the New Mexico Environment Department, as well as grazing permittees.

The Watershed Implementation Plan for the Comanche Creek Watershed, provided as Exhibit 14, provides a summary of some of the projects designed to improve water quality in Comanche Creek.

As pointed out in comments received from the New Mexico Farm and Livestock Bureau on the petition, it is important to acknowledge that grazing permittees will

be part of the process to improve water quality in the Comanche Creek area, as well as other areas of the Valle Vidal, through coordination, cooperation and consultation on ongoing and future on-the-ground projects.

Best management practices for grazing activities as well as other existing uses will continue to be incorporated into management plans as part of the overall process of improving water quality.

Also, organizations, such as the Range Improvement Task Force, New Mexico State University's Water Task Force and the local soil and water conservation districts are available and to be encouraged to assist with these efforts, as well.

If proactive measures continue as anticipated, water quality is expected to improve in the Valle Vidal with respect to turbidity, sedimentation and temperature. The ONRW -- sorry. The ONRW designation is not expected to negatively impact rangeland grazing in the Valle Vidal, especially in light of ongoing projects expected to improve water quality.

Next I would like to discuss the requirements of Subsection A.(4), specifically related to potential water quality impacts from increased road density.

As stated on page 6 of the petition, the Valle

Vidal is currently managed as a special wildlife area, containing many large roadless areas. The Valle Vidal contains some of New Mexico's best aquatic resources. As stated in the petition, approximately 300 miles of roads have been closed or rerouted to mitigate the impacts to aquatic systems in the Valle Vidal.

Oil and gas production and timber harvest necessitate the development of roads and other impervious surfaces, such as well pads in the case of oil and gas development.

Please turn to Exhibit 44. I'm also going to put this up on the screen so you can see it better.

UNIDENTIFIED SPEAKER: Can we -- can you turn down that light switch down there?

Thanks, Commissioner Bada.

MS. GUEVARA: I guess -- oh.

This USGS Landsat imagery shows road activity in the adjacent Vermejo Park Ranch area on October 14th, 1999, prior to coal bed methane drilling.

Now please turn to Exhibit 45.

This imagery shows road development and well pads associated with coal bed methane drilling as of October 6, 2002. In this exhibit, notice the increased road development seen as light lines that branch out throughout the area and terminate at numerous well pads.

Roads are one of the largest threats to water quality. Road construction activities as well as inadequate maintenance and/or poor road design or placement can lead to increased erosion and subsequent movement of sediment into aquatic systems.

Degradation of the aquatic system occurs when important habitat, such as spawning gravels, cobble surfaces and interstitial spaces where aquatic organisms live and forage, are physically covered by fine sediment particles, such as sands, silts and clays, thereby decreasing intergravel oxygen and reducing or sometimes eliminating the quality and quantity of habitat for fish, aquatic insects and algae.

In addition, sediment loads that are greater than a particular stream's sediment transport capacity can trigger changes in stream morphology, or shape. Streams that become overwhelmed with excess sediment loads often go through a period of accelerated channel widening.

These changes can accelerate erosion, therefore further reducing habitat diversity and availability, and placing additional stress on the stream's aquatic life use.

Additional information on the impacts of excessive sediment to aquatic life is provided in

Exhibit 42.

As noted in my testimony and the testimony of Dr. Propst, available benthic macroinvertebrate and fisheries data indicate a healthy diverse aquatic ecosystem for the majority of waters in the Valle Vidal. The limited amount of open roads in the Valle Vidal is a contributor to the quality of water and the health of the ecosystem.

In summary, based on available data, existing water quality in the Valle Vidal is equal to or better than the vast majority of numeric water quality criteria associated with aquatic life uses and will benefit from the protections afforded by ONRW designation.

Although the specific Subsection B.(3) criterion with regards to numeric criteria was not met for a few parameters at a few stations in the Valle Vidal, determining whether or not aquatic life uses are met is a broader question that requires consideration of nonchemical data.

Incorporation of biological and habitat data indicate that surface waters to the Valle Vidal, by and large, contain good water quality and healthy aquatic life communities that warrant the additional protection afforded by ONRW designation.

This concludes my direct testimony. Thank

you.

MR. MOORE: Thank you, Ms. Guevara.

I have no further questions for this witness.

MS. ORTH: All right. Thank you, Mr. Moore.

We're going to take a short break. When we return from the break, we will be interrupting the technical case to take public comment. 3:05, back here.

Thank you.

(Proceedings in recess.)

MS. ORTH: Let's come back from the break, please.

All righty. We're coming back from the break.

We're going to interrupt the technical case to take nontechnical public comment.

If you have not signed in, please do so, give us the proper spelling of your name.

We have heard from some commenters already.

Let me ask at this point if there's someone else who would like to make public comment, please raise your hand.

I saw the gentleman there first and then the gentleman here in the brown sweater, and then Mr. Shields will be third, and the woman in the denim will be fourth, and then I'll ask again.

Please come up.

DEXTER COOLIDGE

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Would you state and spell your name, please.

MR. COOLIDGE: Dexter Coolidge, D-E-X-T-E-R C-O-O-L-I-D-G-E.

MS. ORTH: Whenever you're ready.

MR. COOLIDGE: I am a private citizen. I moved here two years ago for two reasons, and one of those is because of the natural beauty of this state. I love the beauty of this state. I love the mountains.

Valle Vidal is one of the most beautiful areas I've seen here. It's the kind of reason and one of the reasons I moved here.

I believe designating it as ONRW would help preserve it and help keep something that keeps me and many other people coming here and staying here. I support designation.

Thank you.

MS. ORTH: Thank you, Mr. Coolidge.

Commission, any questions?

No.

Thank you.

Sir, if you would.

JON KLINGEL

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Would you state and spell your name, please?

MR. KLINGEL: Jon Klingel, J-O-N K-L-I-N-G-E-L.

My name is Jon Klingel, and I've been a resident of New Mexico for 31 years, currently reside in Santa Fe.

I am familiar with Valle Vidal, use the area for hiking, wildlife watching, horseback riding and skiing. I introduced my daughter to fishing on the Valle Vidal. While employed by the State Department of Game and Fish, I worked with the Forest Service in developing a land management plan for the Valle.

In my opinion, the waters of the Valle Vidal are an important resource, deserving protection by the State of New Mexico. These waters are important ecologically, especially with reference to Rio Grande cutthroat trout, but also for the wildlife that use them and the associated riparian.

They're important for recreation from the

standpoint of fish, wildlife and esthetics. They're important for livestock watering. The quality and quantity of water coming from the Valle is important to people in downstream communities.

In summary, I believe the waters of the Valle are an important resource of the State of New Mexico and should be protected by the State.

Thank you.

MS. ORTH: Thank you.

Questions?

Thank you, Mr. Klingel.

Mr. Shields.

BRIAN SHIELDS

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

MR. SHIELDS: Thank you, Madam Hearing Officer.

Thank you, Mr. Chairman and members of the Commission.

My name is Brian Shields. I am the Executive Director of Amigos Bravos, and it is my pleasure to come before this Commission in support of the proposed designation.

My statement will focus on the importance of

the Valle Vidal's water resources and the need to ensure that those resources are maintained for the health and sustainability of both the native wildlife and downstream communities.

Before I go any further, I want to thank Governor Bill Richardson for having had the foresight and wisdom to initiate the proposed designation as a way to ensure the protection and sustainability of the waters of the Valle Vidal.

And I wish -- in addition, I wish to commend the Department of Game and Fish and the partner agencies for having prepared a thorough, timely and exemplary nomination.

Madam Hearing Officer, Madam Chair and members of the Commission, Amigos Bravos is a well established, nationally recognized river conservation organization, guided by social justice principles.

Amigos Bravos' mission is to protect and restore rivers of New Mexico and ensure that those rivers provide a reliable source of clean water to the communities and the farmers that depend on them, as well as a safe place to swim, fish and go boating.

Our work is inspired by New Mexico's traditional water users, the Hispanic acequia users, the people of Native American pueblos and tribes, farmers

and ranchers who see water as both a cultural and natural resource to be managed in a fair and sustainable way to assure a safe and secure supply of water for the future.

Amigos Bravos is not a stranger to this Commission. For the past 15 years, we have been at many of the proceedings held by this Commission.

In working to preserve and restore the ecological and cultural integrity of New Mexico's rivers and watersheds, for the joint and economic sustainability of present and future generations, Amigos Bravos has identified ONRW designation as a critical component of water quality protection.

Until last year, Amigos Bravos was very concerned that New Mexico had not designated a single ONRW. So we were especially gratified in January of this year when this Commission endorsed our nomination of the Rio Santa Barbara as the state's first ONRW.

The Amigos Bravos members, board of directors and staff thanks this Commission for having taken that critical step.

Today, we are further gratified by the State's initiative to identify and nominate the state's second Outstanding National Resource Water. We hope that in the future the State will identify additional waters of

outstanding values that deserve full protection.

Many of the 1,600 members of Amigos Bravos and their families use the Valle Vidal, the Valley of Abundant Life, to fish, hike, take photographs, ski, camp and hunt, and they appreciate the spectacular scenery and wildlife of the area.

In addition, some of our members live in the communities downstream that depend on waters from the Valle Vidal for domestic and wildlife uses, including the raising of food.

For over 15 years, members of Amigos Bravos have worked with the Carson National Forest as well as state agencies and nongovernmental organizations to restore and reclaim portions of the Valle Vidal watershed for the purpose of enhancing habitat for survival of the Rio Grande cutthroat trout, the New Mexico state fish.

All of these activities are contingent on maintaining a healthy and sustainable water supply that the numerous rivers and streams of the Valle Vidal presently provide.

For these reasons and many more, ONRW designation of the waters of the Valle Vidal is beneficial to the State of New Mexico. We urge the Commission to take this crucial step towards furthering

the interests of the state by protecting these special waters. Amigos Bravos wholeheartedly supports the proposed ONRW designation for all the waters in the Valle Vidal.

Thank you again for the opportunity to present our views.

MS. ORTH: Thank you.

Questions?

No.

Thank you, Mr. Shields.

Ma'am.

MOIRA O'HANLON

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: And your name, please.

MS. O'HANLON: Moira O'Hanlon, M-O-I-R-A O-apostrophe-HANLON.

Well, today I'd like to speak about the Valle Vidal because it's a place that my family loves to go. My parents and I go there, and my son, nieces and nephews. We go to fish. We go there because it's an important place for us.

And for us, it means -- we have this saying, salore wesya, which is a still place. It's a place

where you can find your solitude and sanctuary. And that's why we go there. And I think a lot of people use it for that.

And it's important in all our lives that we have some place like that to go to. Everything is so busy everywhere. We're ruining everything. Just please leave this place.

And I also want to tell you a story about my friend, Sandy. He's a cowboy. He wears a hat all the time and one of those loud, gaudy shirts, and he wears, you know, his -- his spurs everywhere in Taos.

And I saw him the other day. He just got back from Valle Vidal where he took his horse to lunch.

So that's important, too.

Thank you.

MS. ORTH: Thank you, Ms. O'Hanlon.

I'll start over here.

Mr. Simpson, did you have your hand up?

MR. SIMPSON: Yes, ma'am.

MS. ORTH: And who else after Mr. Simpson would like to make a nontechnical public comment?

Sir, I see you in the back.

Anyone else?

And I see the lady there in the black sweater and then the gentleman in the front row.

If you would.

OSCAR SIMPSON

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: And your name, please.

MR. SIMPSON: Oscar Simpson, O-S-C-A-R S-I-M-P-S-O-N.

Thank you very much for having me here and being able to afford -- I mean to give public testimony to the Commission.

I represent the New Mexico Wildlife Federation. We are one of the oldest conservation sportsmen organizations in the -- in New Mexico. We were founded in 1914 by Aldo Leopold, was one of our founders. We have a long tradition of protecting our water resources, our wildlife resources and recreation in New Mexico.

I'm a native New Mexican, 58 years. I have been all over the country and all over New Mexico. The Valle Vidal represents a pristine -- almost pristine area that is unique to everyone, majestic views, lush, green valleys and abundant wildlife.

It is one of the only one places that I know of where you have a trophy elk hunt on public land. I

think this is the only place in -- it's the only place in New Mexico, but in the country that offers such an opportunity, not only for residents, but for nonresidents.

And it has been so managed since 1982 when it was given to the Carson National Forest. All the rules and regulations were set up to provide a quality experience, quality hunting and a diverse, low impact recreational opportunity.

That's why it is such an outstanding area, it's a great recreational area, that's I think it's why we call it the Yellowstone of New Mexico.

I also represent the Back Country Horsemen. I'm a member of that. Not only do New Mexico horsemen go and trail ride, but also lots of other nonresidents come, by the hundreds, and visit there every year to go trail riding from out of state. That brings in a lot of revenue. That brings in a lot of tourism.

It's generated -- I think from Tom Power's report, which you have on hand, it generates three to five million dollars a year from local recreation. That's a renewable resource that we need to protect.

Because of its outstanding resources, this area, along with the water quality in the streams are integrated very, I guess, uniquely to make it a unique

area, where you have abundant wildlife in a short geographical area.

You know, you have Picuris Peak, which is the third highest peak in New Mexico, and that has the headwaters of the Costilla Creek -- I mean Little -- McCrystal Creek flowing into the Ponil.

That eastern drainage is a huge unique area and the winter range for the elk. And the eastern 40,000 acres of the Valle Vidal is a critical winter range for the elk and the deer and other wildlife.

And it's a very ecologically important area as far as maintaining the ecosystem, not only for the aquatic wildlife, but also the interrelationship of other related wildlife. You cannot have one without the other.

The upper side, or the west side, is really intricate, because that is the summer and the fall range for the elk, but if they didn't have an eastern side, and you didn't have that water quality shed protected, that winter range would be there, and the wildlife would soon then fast disappear, because if we don't protect it, that relationship would disappear and eliminate.

And one of those aspects that would be, I guess, threatening that would be oil and gas development.

I used to regulate the oil and gas industry in the early '80s for the State of New Mexico. I've seen -- since then, I've regulated public water systems. But I've seen statewide what development can do if it goes unchecked.

And when you have a pristine area like that, you cannot afford to allow these areas and water quality sheds to be degraded through poor development or energy development. We need to protect these few special places in New Mexico.

The Back Country Horsemen are a nationwide organization. They represent 2,000 or 3,000 people in New Mexico. The New Mexico Wildlife Federation represents 5,000 sportsmen in New Mexico, and we're also part of a nationwide organization called the National Wildlife Federation. They are 4,000,000 strong and the biggest conservation organization in the world.

For these reasons, New Mexico has a pristine area, the Yellowstone of New Mexico, a hunter's paradise, a water quality area and watersheds and headwaters that are unique to New Mexico that need to be protected.

And I thank you very much.

MS. ORTH: Thank you.

Questions?

Thank you, Mr. Simpson.

Sir, in the back.

FRANCISCO ANTONIO GUEVARA

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Your name, please.

MR. GUEVARA: Francisco Antonio Guevara, F-R-A-N-C-I-S-C-O A-N-T-O-N-I-O G-U-E-V-A-R-A.

I'd like to comment on two things.

I am a native of Northern New Mexico, multi-generational. I've spent my entire life pursuing recreational opportunities in the area, and I have found none that match what is happening there in the Valle Vidal.

I first visited the Valle Vidal the day it was opened to the public many years ago. The fishing opportunities, the wildlife viewing opportunities, just the whole aspect of that area is so beautiful, incredible, and very, very hard to match anywhere else, probably in the world. It's a very, very special place and deserves to be protected.

I'm sure you've got volumes of information, hopefully, in front of you that will back up those claims. And if you've never been there, don't go. It's

okay without you.

I would also like to comment on the economic opportunity that exists because of the recreation. I'm in the recreation business. I guide a lot of different things, white-water rafting, skiing, fishing, snowshoeing.

And the Valle Vidal area presents a really wonderful base of opportunity to increase the guiding services in that poor part of New Mexico, and I fully look forward to helping develop that.

In going hand in hand with the recreational opportunity, which recreation is becoming a more important aspect of modern life, more and more people are realizing that they need to recreate to maintain some kind of happiness and balance in their lives.

And that brings me to the spiritual aspect of that special area.

When I visit there, which I've done for many, many years, I get a feeling of renewal and fulfillment and being closer to greater powers than spiritual beings. I thought long and hard about how to relate this to you important people on this Commission, but I'm unable to do that.

It's just in my heart, I am renewed when I'm allowed to look over vast fields of untouched beauty,

and huge herds of wild animals, and all the other opportunities that are there. This place needs to be protected.

When I first heard of the Valle Vidal, I never heard of that word before, so I went to my dad, and he said, "Well, it's kind of hard to translate, but I think what it means is forever. So I've always known that as the forever valley. It deserves to be protected now and forever.

Thank you.

MS. ORTH: Thank you, Mr. Guevara.

MR. HUTCHINSON: I have --

CROSS EXAMINATION

BY THE COMMISSION:

MS. ORTH: Commissioner Hutchinson. Excuse me.

Mr. Guevara, one of our Commissioners has a question.

MR. HUTCHINSON: Mr. Guevara, you're -- you say you're a lifelong resident there, you're born and raised in the area.

MR. GUEVARA: In Northern New Mexico, yes, sir.

MR. HUTCHINSON: And you said that you were allowed to go there at a certain point.

What was that point?

MR. GUEVARA: When Pennzoil got in trouble and they gave the land for back taxes.

MR. HUTCHINSON: Okay.

MR. GUEVARA: And they said, "Okay, public, you can come in here."

So we jumped in our Jeep and went, because we had heard all about it.

And the roads back then were really, really bad. There -- one of the unique aspects of that area is now it's got a good road, all-weather gravel road through there, so I can take my three-year-old son or my 80-year-old mom to experience similar things that I'm able to experience.

It's better if you can get out away from the road. But it really is a very unique opportunity to see wildlife and see vast expanses of beauty from a vehicle. That really doesn't exist very much anywhere else.

MR. HUTCHINSON: And before that was released and given to the public, what was the operation there?

MR. GUEVARA: It was a private ranch.

MR. HUTCHINSON: And there was livestock grazing, timber harvesting?

MR. GUEVARA: There was livestock grazing, and big game hunting was one of the most important things,

and also they had still -- those Shuree Ponds were well stocked with large fish as they still are.

MR. HUTCHINSON: And was the public allowed to go in there at all?

MR. GUEVARA: Not unless you had connections and bought your way in.

MR. HUTCHINSON: All right. Thank you.

Thank you very much.

MS. ORTH: Thank you.

Other questions?

No.

Thank you, Mr. Guevara.

Ma'am, in the black sweater.

NORMA MC CALLAN

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: And your name, please.

MS. MC CALLAN: Norma McCallan, M-C-C-A-L-L-A-N.

I'm here to represent the Rio Grande Chapter of the Sierra Club. And we have 8,000-some members scattered across the State of New Mexico and the El Paso area of West Texas.

And we have already filed comments, they are

on record, so I'll be very brief.

But we wanted to say that we enthusiastically and wholeheartedly support the designation of outstanding natural resources for the waters of the Valle Vidal, and we want to commend the Governor for taking this very important initiative.

As everybody knows, the Valle -- the State of New Mexico is a very arid state, it's a high desert state. Water is very precious life blood, and in most places, we don't have enough of it.

The Valle Vidal is particularly blessed to have headwaters of two important riverways and multiple streams, clear -- clear streams that support, you know, an abundant fish population, and the lush meadows fed by these streams support the prize elk herd and all the other wildlife that have sustained local people there for many, many generations and now bring in a significant amount of tourism dollars to the whole state.

It would be a dreadful shame if these special waters were to be degraded, and by this designation, it ensures that we keep them clean, and where needed, we can seek restoration of those waters that may be less than perfect.

So I think it is wonderful that you're having

this hearing today.

Thank you.

MS. ORTH: Thank you, Ms. McCallan.

Questions?

All right. Thank you.

Sir, in the front there.

JIM O'DONNELL

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Your name, please.

MR. O'DONNELL: My name is Jim O'Donnell, J-I-M, O-apostrophe-capital-D-O-N-N-E-L-L.

Again, my name is Jim O'Donnell. I'm from Taos, New Mexico. I'm here as a representative for the Coalition of the Valle Vidal.

The Coalition of the Valle Vidal is made up of well over 250 Northern New Mexico businesses, local governments and organizations. Our members include the Taos County Commission, the Santa Fe County Commission, the Town of Springer, the Town of Cimarron, the Village of Eagle Nest, the Town of Red River, the Village of Questa and the Town of Taos.

The Coalition for the Valle Vidal has developed a vision for the Valle Vidal. That vision is

the Valle Vidal -- the Valle Vidal is a frontier, wild landscape beloved by the people of Northern New Mexico, New Mexico in general and all Americans who have had the chance to see it.

The Valle Vidal shall therefore be restored, and once restored, protected to ensure that current and future generations can enjoy its unique combination of wildlife and resources and intrinsic beauty and value.

Of paramount value are the Valle Vidal's abundant fish and wildlife, an important watershed and water resources, which serve as indicators of the land's ecological health and integrity.

Without compromising this paramount value, the Valle Vidal shall be managed for the benefit of all the people. Management shall accordingly protect the Valle Vidal's natural solitude and scenic beauty in order to provide the people with the unique high quality, low impact recreational and sporting opportunities.

Also, to protect the important cultural resources of the Valle Vidal and acknowledge the Valle Vidal's importance to rural and agricultural communities by emphasizing the land's role in creating a thriving and sustainable economy.

Implementation of this guiding vision for the Valle Vidal shall be rooted in the precautionary

principle of land management in the face of uncertainty. It is better to prevent harm to the land than to attempt to repair it later.

The key to our vision is that the Valle Vidal's ecological health and integrity must be restored and, once restored, maintained and protected. Restoration in this context means essentially the repair of the Valle Vidal's and the broader landscape's natural ecological structure, function and composition.

The priority given to the restoration of ecological health and integrity does not necessarily mean that other resources and uses are less important.

Rather, it simply reflects the common sense proposition that the use and enjoyment of our public lands is derivative of an intact healthy ecosystem that here is indicated by the presence of healthy, abundant native quality and terrestrial wildlife populations, clean waters and ecologically sound -- and an ecologically sound watershed.

ONRW designation is a critical component of the Coalition's vision for the Valle Vidal.

I want to touch briefly on the issue of economics. It was mentioned earlier -- environmental justice was mentioned earlier, and ecological -- economic justice.

For us, this means allowing the nearby communities, the communities adjacent to the Valle Vidal, some of the ones who are members of the Coalition of the Valle Vidal, to develop their economic -- economies sustainably.

The economies of North Central New Mexico depend on clean waters, restored waters, protected waters to achieve their goal of economic -- sustainable economic development. ONRW designation would help assure economic justice for the communities of Northern New Mexico.

Right now, well over 50,000 people visit the Valle Vidal every year. 3,000 Boy Scouts a year go to the Valle Vidal for outside wilderness training. That brings in -- those people who visit the Valle Vidal bring in several million dollars a year to our local economy. So this is also an economic issue for us.

I know you're all not going to believe this, but I -- my family and I, we've seen an elephant actually in the Valle Vidal. At least that's what my -- my daughter described it as.

She's almost two years old, and in June, we were camping up on the -- on Holman Creek, and about 7:00 in the morning, we saw an elk pass nearby the tent, and my daughter yelled out, "Elephant," and she insists

that that's what it was to this day.

She also has seen a bear in the Valle Vidal, near the Ponil Creek. We actually were hiking and came over a hill, and there was a bear sitting in the creek. This was just about six weeks ago.

While I'm trying to teach my daughter that bears don't say "mook-mook," she does know that owls say "hoo-hoo," because she's seen one at Shuree Ponds. The first place my daughter ever swam was in McCrystal Creek.

The summer of 2006 will be the third summer of my daughter's life, and it will be the third summer in the Valle Vidal.

ONRW designation would help ensure that my daughter and all of our children and grandchildren will enjoy a sustainable economic future and have a place to go where the waters are clean, restored and protected, a place where they and we can go to recalibrate our internal compass.

Thank you for your time.

MS. ORTH: Thank you, Mr. O'Donnell.

Questions?

No.

Thank you.

Let's see. I need another round of hands.

Raise your hand, please, if you'd like to make public comment. There will be another opportunity at the end of the technical case, but if you'd like to make it now, please let me know.

Hands?

Oh, sir -- or ma'am, I'm sorry. I couldn't see where the hand was coming from.

GLENDA GLOSS

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Your name, please.

MS. GLOSS: Glenda Gloss, G-L-O-S-S, G-L-E-N-D-A G-L-O-S-S.

Water. We got to have it. And it's got to be pure. And so I'm all in favor of this becoming a destination for the ONRW.

Thank you so much. That's it.

MS. ORTH: Thank you, Ms. Gloss.

MS. GLOSS: I just really want to see it happen.

MS. ORTH: Thank you.

Anyone else at all before we return to the technical case?

I will ask again at the end of the technical

case.

All right, then. Let's return to the technical case.

Mr. Moore, I believe you have one more witness.

MR. MOORE: Yes, Madam Hearing Officer.

At this time, the petitioners call Mark Fesmire.

MARK FESMIRE

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MOORE:

Q. Could you please state your name?

A. It's Mark Fesmire, F-as-in-Frank-E-S-M-I-R-E.

Q. Mr. Fesmire, how are you currently employed?

A. I'm Chairman of the New Mexico Conservation Commission, Director of the New Mexico Oil Conservation Division and State Petroleum Engineer.

Q. And what are some of your current job responsibilities in those positions?

A. As Chairman of the Oil Conservation Commission, I work with the other two Commissioners, and together we're responsible for adopting the production and environmental rules regulating the oil, gas and high

temperature geothermal industry in the State of New Mexico.

The OCC is also the tribunal of appeal for the decisions of the Oil Conservation Division. The Oil Conservation Division is the state agency responsible for enforcing those rules. We have approximately 56 employees to handle permitting, monitoring and enforcement, and part of my job is to direct that effort.

Q. Could you please describe your educational background?

A. Yes. I have a BS in geological engineering from New Mexico State University, a BS in civil engineering from New Mexico State University, a JD from Texas Tech University School of Law.

I'm also licensed to practice petroleum engineering in the States of New Mexico, Texas and Michigan, and licensed to practice law in the States of New Mexico and Texas.

Prior to attending law school, I spent 12 years in the oil and gas industry, rising to the position of chief reservoir engineer for a very large independent oil company.

After law school, I practiced law for six years, before spending five years as the Chief of the

New Mexico Hydrographic Survey.

Q. Mr. Fesmire, did you do anything to prepare for today's hearing?

A. Yes. I reviewed the petition and the exhibits and prepared written testimony.

MR. MOORE: Madam Hearing Officer, members of the Commission, at this time, I would request that Mr. Fesmire be allowed to present his written testimony.

MS. ORTH: Please proceed.

MR. FESMIRE: Madam Hearing Officer, Madam Chairman, members of the Commission, as I stated previously, my name is Mark Fesmire, and I'm going to be discussing the requirement of Subsection A.(4).

Specifically, I will provide testimony that a reduction in the water quality would result from oil and gas activities using current drilling practices for coal bed methane. It is my opinion that future oil and gas activities in the Valle Vidal using current drilling practices will contribute to the reduction of water quality in the proposed ONRW.

The development of oil and gas in any part of the state will pose certain risk to the water resources in the area of development. The major concerns would arise from basically three -- three threats. I was afraid I'd do that.

First, surface discharges; second, subsurface discharges; and third, surface activities that would degrade the water sources.

Surface discharges are generally the result of spills or improper drilling or production practices. Surface discharges can seep into the ground and contaminate the soil, migrate to the groundwater table or run off into the surface waters.

Subsurface discharges can be the result of improper casing, cementing or drilling practices or leaks that develop from corrosion or mechanical problems.

Underground waters are generally segregated into horizons or strata, and they are often of different pressures, compositions and qualities. Allowing water from one strata to migrate into another can result in the permanent contamination of otherwise high quality waters.

It is especially wasteful if the water from deep, low quality horizons are allowed to migrate to the shallow freshwater aquifers that source surface springs or wells.

Surface activities that pose a threat would be any activity associated with oil and gas exploration that would generate sediment, damage vegetation or

otherwise negatively impact the water quality in the basin, including road building and use, off-road travel or venting streams of dust or particulate matter to the atmosphere.

The statewide rules now in place would not be sufficient to protect a resource like Valle Vidal. In the state, there are now approximately 1,400 active cases of contamination caused by oil and gas operations and associated fluid releases.

Any regulatory structure to protect the waters of the Valle Vidal would have to be more stringent than the rules currently in place. Oil and gas development necessarily brings with it increased road building, removal of vegetation from land surfaces, increased traffic, and other activities that impact water quality.

Even if the Oil Conservation Division were able to develop more stringent regulations to protect the waters of the Valle Vidal from direct impacts of oil and gas development, these corollary impacts would still be of great concern.

There may be some areas in the state that are not appropriate for oil and gas development. If the Commission determines that the Valle Vidal is one of these areas, then the ONRW designation is one step towards comprehensive protection.

Next I'll be discussing the requirements of Subsection A.(5). Specifically, I will address the economic impact of the designation on the local and regional economy within the state and the benefit to the state related to oil and gas development.

The economic impact of oil and gas development in the Valle Vidal has been extensively studied by Thomas Michael Power, Professor and Chair of the Economics Department at the University of Montana.

Dr. Power has produced a report for Carson National Forest which was prepared as a part of a larger project to study the socioeconomic impacts of energy development in the west.

This report is in your exhibits and is Exhibit 47.

The report made the following findings regarding the economic impact of the oil and gas development in Valle Vidal.

First, coal bed methane development will result in insignificant local employment and personal income. CBM development is land and capital intensive. It provides limited employment and pay opportunities relative to the economic value it creates.

At current -- at currently projected levels of natural gas development, the related employment and

payroll will be less than 1 percent of the current employment and personal income of the local economy. In 2001, only seven-tenths of 1 percent of New Mexico personal income came from labor earnings from oil and gas production.

If the experience so far in Colfax and Los Alamos -- and in Las Animas Counties is used to project employment associated with the development of Valle Vidal, 94 jobs would be created with a payroll of approximately $4.5 million per year. The 94 jobs associated with potential gas development in Valle Vidal represent a little over one-half of 1 percent of the jobs in the county.

Second, coal bed methane development requires specialized jobs not available to local residents. CBM development requires specialized, skilled workers who by necessity must move to wherever the gas fields are constructed.

Many of the development jobs will not be available to local residents. Some of the specialized jobs may go to highly mobile oil and gas field workers who will be leaving the adjacent Vermejo Park gas fields as the development phase there winds down.

Third, coal bed methane development will provide no continuing benefit to the local economy.

Coal bed methane development can be relatively short-term in duration. CBM development does not provide long-term, continuing support for the expansion of local businesses.

Fourth, coal bed methane development provides limited tax revenues for local governments. The impact of the projected level of gas development in Valle Vidal will not make a substantial contribution to the funding of the Colfax County governmental services.

Fifth, coal bed methane development will provide minimal tax benefits for municipalities. Because gas development rarely takes place within municipalities, it does not affect municipal tax revenues generally. Although the calculated total value of oil and gas production had a negative impact on tax rates, the impact was quite small.

Sixth, local and regional economies rely on nearby recreational lands. Most of the expanding sector -- permanently expanding sectors of the local economy rely on the attractiveness of the region as a place to live or visit. High quality natural landscapes contribute significantly to regional attractiveness and, through it, competitiveness.

Valle Vidal is an important part of Colfax County's economic base as it is, in its natural state.

Purchasing the small -- pursuing the small and temporary local economic gains that would accompany coal bed methane development is a significant economic risk because of the threat to convert a unique, valuable area into just another industrialized landscape.

Seventh, coal bed methane development will fundamentally degrade a unique natural landscape, its wildlife habitat and its recreational potential. This can only weaken the region's potential for ongoing, permanent sustained development.

That concludes my statement, and I guess when the panel's reconstituted, we'll stand for questions.

Thank you.

MR. MOORE: Thank you, Mr. Fesmire.

I have no more questions for this witness, and this is our last witness for direct testimony.

MS. ORTH: All right. Thank you, Mr. Moore.

Let me ask the Commissioners first if anyone has extensive cross-examination of the Bureau panel, of the Department panel, petitioners' panel, extensive.

MR. HUTCHINSON: What do you mean?

MS. ORTH: And I'm asking because if it is --

MR. HUTCHINSON: Is that substantial?

MS. ORTH: Lengthy. Let me put it that way.

I'm asking because the other folks who

submitted -- the Western Environmental Law Center, the other folks who submitted a notice of intent to present technical testimony, have one witness who has to go today.

So while I'd like to reconstitute the panel, take cross-examination, if it's going to go a very long time, we'll have to interrupt that for the other witness.

Especially lengthy, anyone, or just a little bit?

MR. HUTCHINSON: I would -- I don't know. It might go a little bit.

MS. ORTH: All right. Let's give it a try. I'm not forgetting Mr. Lackey, but let's give it a try while the petitioners' testimony is fresh in the Commissioners' mind.

MR. HUTCHINSON: Before we do that --

MS. ORTH: Yes.

MR. HUTCHINSON: -- what -- do you have any idea what time where we might have to leave out of here, or --

MS. ORTH: We do not have any time constraints. I like this building. We do not have time constraints.

MR. SLOAN: Other than our patience.

MS. ORTH: They will not be coming to us like they do at the Roundhouse.

Hmm?

MR. SLOAN: Other than our patience.

MS. ORTH: Other than your patience, yes.

So it's not a matter of being kicked out of the building.

So let's reconstitute the petitioners' panel, Ms. Leavitt, Ms. Guevara, Dr. Propst, Mr. Fesmire.

MR. SHANDLER: Madam Hearing Officer.

MS. ORTH: Mr. Shandler.

MR. SHANDLER: When will they admit the -- or tender the exhibits?

MS. ORTH: I would defer to you, but I've always taken the position that if the exhibits were attached to the NOI, which in this case they were, that they become part of the administrative record that the Commission considers.

If you would like me to ask Mr. Moore to proffer them, I will do that.

MR. SHANDLER: What I'm most interested in is the statements that they made. I can't find that in the exhibits, and I'm curious whether that -- the plan was to tender their written statements. I find that helpful in making a Statement of Reasons.

MS. ORTH: Okay.

Mr. Moore?

MR. MOORE: First of all, in answer to your -- in answer to your question about the exhibits, we were proceeding under the assumption that because we filed them with the NOI, they were part of the record, but if you would like, we can go ahead and move the admission of all of our exhibits into the record again, if you would like, on that point.

On the issue of our written statements, we did not have those in a form that was prepared until we came before the Commission today, but we do have those in a form where we could submit them, presumably, tomorrow. We have a few -- few edits to them, but we could submit them tomorrow into the record, if that's what you would like.

MS. ORTH: Okay.

Would the Commission find that helpful?

I mean, it will be in the transcript, but it -- could be another form.

All right, then. If you would, please --

MR. MOORE: Okay.

MS. ORTH: -- submit that to Sally Worthington, the hearing clerk.

MR. MOORE: Madam Hearing Officer, members of

the Commission, would you want us to move those into the record or just supply them?

MS. ORTH: Mr. Shandler, it's -- it's entirely in the transcript, but I'll follow you, your wishes.

MR. SHANDLER: I would be fine with -- if those statements were labeled as additional exhibits.

MS. ORTH: Okay.

If you would, pick up at -- we're in the 40s, right? 47?

Pick up at 48, Exhibit 48, then.

MR. MOORE: Okay. I'm assuming tomorrow we'll have an opportunity to open the record for a moment and move the admission of all of those exhibits.

MS. ORTH: I will leave the record open for that especially.

MR. MOORE: Thank you, Madam Hearing Officer.

MS. ORTH: All right.

Questions. I'll just go this way.

Mr. Shandler, do you have questions of the petitioners' panel?

MR. SHANDLER: I do.

MARCY LEAVITT, DAVID L. PROPST
LYNETTE GUEVARA and MARK E. FESMIRE
having been previously duly sworn or affirmed, were examined and testified further as follows:

CROSS EXAMINATION

BY THE COMMISSION:

MR. SHANDLER: Under D, what would be the new language?

MS. LEAVITT: Our language is included in the petition, the specific language.

We would be adding a new subsection -- or I guess it's a paragraph D.(2), and it would be, "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, 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 at 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."

MR. SHANDLER: Okay.

Presuming the Commission adopts this and then, at the January meeting, they adopt the Statement of Reasons, then what -- what's the ramification of these changes?

MS. LEAVITT: Well, the changes would go into effect in accordance with the Water Quality Act, which says that -- I think that there's 130 days from the time the Commission adopts its Statement of Reasons until the time it goes into effect.

And at that point, the ONRW is designated, and water quality would have to remain at that level at the time of designation.

MR. SHANDLER: Thank you. That's all I wanted to establish for the record.

MS. ORTH: Thank you, Mr. Shandler.

Mr. Lujan, do you have questions?

MR. LUJAN: I have no questions at this point.

Thank you.

MS. ORTH: Thank you.

Commissioner Johnson.

MS. JOHNSON: No questions.

MS. ORTH: Thank you.

Commissioner Hutchinson.

MR. HUTCHINSON: I guess I'll address these to the whole panel, and you can pick out who you might want to, and then I have some specific ones for the individual panelists.

In the beginning of the petition, in the executive summary, it says that the Valle Vidal is one of New Mexico's most prized areas for those -- for those individuals that appreciate the splendor of the outdoors.

Do we have other areas in the state that fit that description?

MR. PROPST: I would think so, areas such as the Gila Wilderness, San Pedro Parks in Northern New Mexico, I think many of the areas within the National Forest, and some of them are designated wildernesses.

MR. HUTCHINSON: So I -- you know, my normal reaction to a lot of these places is it's just another really beautiful place in New Mexico. Okay.

In the -- again, we're still, I believe, in

the executive summary. Yes, on page 2. And this is next to the last paragraph, last sentence, ONRW designation would not limit the existing uses.

And Mr. Shandler talked about that, but I'd like to maybe have that expanded a little bit.

I was looking at the antidegradation policy, and it says that -- says, "No degradation shall be allowed in high quality waters designated by the commission as outstanding national resource waters."

So is that -- is this interpretation here -- is this an interpretation of -- of the regulations? This statement?

MS. LEAVITT: Commissioner Hutchinson, certainly, any time we implement the regulations, we are interpreting them, but I think that the understanding that we have is consistent with the statements made in the Clean Water Act, in the Water Quality Management Handbook, that was developed under the Clean Water Act, and I think it's consistent with this language here.

There has to be a baseline at which the ONRW goes into place, and at that point, no degradation can be allowed to occur from that level. It wouldn't make sense otherwise.

MR. HUTCHINSON: And the other thing that I suppose can get confusing is the term "use." We have a

use that we have set for these waters, and then there are uses in the normal human context of use, hiking, fishing, hunting, timber harvesting.

So we're not talking about use from the sense of a -- of a standard here, are we?

MS. LEAVITT: We're -- when we're talking about the uses that would be allowed to continue --

MR. HUTCHINSON: Um-hum.

MS. LEAVITT: -- that are established there, we're talking about sort of the normal understanding of people, we're talking about the hiking, fishing, grazing, those sorts of uses of the area.

We're not talking about the designated use, which is the term used in the standards.

MR. HUTCHINSON: Okay.

And I -- I'm going to try to keep these going in the same context, so I'll go to Mr. Fesmire with this specific one.

And you testified that the current designated uses in standards do not offer sufficient protection from oil and gas development.

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, the point I was trying to make with that is that our practices in the past have been such that there is a risk to water when we develop

oil and gas in the region.

Like I said, we have over 1,400 sites in the state right now where there has been water -- I mean where there has been contamination due to oil and gas operations under the current rules and regulations. Therefore, I am making the jump that our rules and regulations would not be sufficient to protect waters like those in the Valle Vidal.

MR. HUTCHINSON: Okay.

Lynette gave us two maps -- or two actual satellite shots that indicated that -- I believe it was 2002 was the second map, that indicated that there had been road development, and it would appear to be platform drilling sites.

Are those currently gas wells that are being developed or drilling that is being -- or activity that is taking place?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, those maps were of the adjacent Vermejo Ranch --

MR. HUTCHINSON: Right.

MR. FESMIRE: -- that has been developed for coal bed methane. There are approximately 300 wells on that ranch now, and they are projecting approximately another 100 in the next year.

MR. HUTCHINSON: It appeared that a corner of that depiction in the highlighted area actually extends into the Valle Vidal area.

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, there is some of that property that extends into what would geographically be called the Valle Vidal. Off the top of my head, I do not know whether there's been any development there or not.

MR. HUTCHINSON: Okay.

Going back to some general concepts here, a number of -- a number of you testified regarding the -- the criteria and referred to B.(1), (2) and (3), and so I'll ask each of you the same question, would like an answer from all -- from all of you.

Are those the extent of the criteria? And any one of those selected can -- can be the criteria for selecting a -- or for designating an ONRW?

MS. LEAVITT: Would you like to start with me?

MR. HUTCHINSON: Yes.

MS. LEAVITT: Yes. I mean, the criteria are spelled out. There are three of them. There is an "or" after number 2, so when you read those, any one of those criteria could be used to justify designation as an ONRW.

We've chosen here to talk about all three, but we could have also selected one and just talked about that one criteria.

MR. HUTCHINSON: Well, Lynette, that's your same interpretation?

MS. GUEVARA: Yes.

MR. PROPST: Yes.

MR. FESMIRE: Yes, Commissioner.

MR. HUTCHINSON: Okay.

If we read Section B, it would appear to me from the reading that we actually have four criteria here, B being the first.

MS. LEAVITT: You're speaking of the designation as beneficial to the state?

MR. HUTCHINSON: Yes.

MS. LEAVITT: And I believe that in each of our testimony we did talk about that, as well. We did indicate that we believe that the designation is beneficial to the state.

MR. HUTCHINSON: Okay.

And so -- I guess I'll start with Marcy again.

What -- can you -- can you specifically point out the benefit -- or summarize again what you stated -- what's the benefit to the state from the designation?

MS. LEAVITT: Well, in our testimony, we -- I

think we all discussed criteria B.(1), B.(2) and B.(3) and believe that those three criteria -- that if you meet those three criteria, then there is benefits to the state of this designation. So I think that they're linked.

So I think a benefit to the state is to preserve the attributes of the state gold medal trout fishery, I think a benefit to the state is to preserve the exceptional recreational and ecological significance, and I also think that a benefit to the state is to preserve the existing water quality, to make sure that it isn't degraded.

So all of those provide benefits to the state.

MR. HUTCHINSON: Okay.

Lynette, you testified to basically the water quality area of this criteria.

What kind of improvement of water quality can we expect to see with a designation of ONRW?

MS. GUEVARA: In my testimony, I stressed that there are already ongoing projects in the area through Clean Water Act 319 grants and other activities. We expect those to continue, and I believe that the ONRW designation will just bring more awareness to the area and the high quality waters that are there and encourage additional restoration in the area.

MR. HUTCHINSON: So you're saying that the designation of ONRW will increase those groups' desire to restore those streams?

MS. GUEVARA: Well, it will definitely encourage it to keep going, because we can't allow for any degradation at the time of designation. So I think that it will be a benefit in that area, as well.

MR. HUTCHINSON: Okay.

Were there any -- and this is going to Lynette again.

Were there any water quality impacts detected on the petition streams? And this is in particular in your Exhibit 44 or 45? Were there any impacts detected on the petition streams within that area due to the road development depicted in the exhibits?

MS. GUEVARA: So you're asking if we have any data on water quality impacts between '99 and 2002 --

MR. HUTCHINSON: Right.

MS. GUEVARA: -- in that Vermejo Park Ranch area.

MR. HUTCHINSON: Yes.

MS. GUEVARA: We don't have any data towards that.

MR. HUTCHINSON: So there was no -- there was no monitoring set up -- I guess I'll direct this one to

Mr. Fesmire.

There was no monitoring set up in the stream areas below those road developments, to determine if there was any potential impact to the streams?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, we have not done any work in the -- in the Valle Vidal, because we, as of yet, have not had an application for a permit to drill there. So I -- I'm sorry. You'll have to address that to one of the other members of the panel.

MR. HUTCHINSON: Lynette? I guess the same question.

I mean, the road development was taking place adjacent to some of these streams. Was there -- is there any intention of setting up monitoring sites there?

MS. GUEVARA: Yeah.

The Vermejo Park Ranch area is the area you're referring to, correct?

MR. HUTCHINSON: Um-hum.

MS. GUEVARA: It's all on private land, so first of all, we have to get permission to do that.

Secondly is -- as the Commission knows, we have limited resources, and we sample water quality around the state on a rotational basis, and we don't

have the resources to jump into an area when this sort of activity begins.

When we get back in that area, if we have permission to sample on the private lands, we can look into that. But as of such, we haven't been up in that area in this time frame.

We are actually -- I should mention our Bureau is going to do an intensive survey of the rest of the Canadian next year, so we will be in the Ponil watershed, and we can be sure to look at that at that time.

MR. HUTCHINSON: Mr. Fesmire, in the paper that was Exhibit 47 -- was Mr. Power's paper a peer-reviewed document?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, I'm not aware of that. I assumed that it was a -- it had been reviewed when it was made part of the presentation to the Carson Forest -- Carson National Forest, but I cannot speak to that.

MR. HUTCHINSON: Okay.

And did Mr. Power's paper indicate who owns the mineral rights in the Valle Vidal?

MR. FESMIRE: No, sir, it didn't. It did not specifically mention that. No, sir.

MR. HUTCHINSON: And those were retained by the previous landowner before it was transferred?

MR. FESMIRE: I assume so, but I'm not -- I'm not aware of that, Mr. Commissioner.

MR. HUTCHINSON: I didn't see where there was any examination of the potential value of those mineral rights and the resulting liability of the inability of the holder of those mineral rights to extract them.

MR. FESMIRE: I don't believe Dr. -- that was in the scope of Dr. Power's examination, sir.

MR. HUTCHINSON: Did any of the petitioners look at that part of the situation under the Valle Vidal, as far as examining the economic impact?

MS. LEAVITT: Commissioner Hutchinson, we did not. We provided a summary, a discussion of the economic studies that have been done. We expected that if the oil and gas industry was concerned about loss of revenue or a particular company, that they would have been here, submitting a notice of intent and testifying in this hearing.

But since they didn't participate, we don't have that information.

MR. HUTCHINSON: Okay.

Mr. Fesmire, is there any other oil-and-gas-producing area in the state that is not a

unique ecoregion?

MR. FESMIRE: Could you rephrase that question, sir?

I guess I didn't follow you.

MR. HUTCHINSON: Okay.

MR. FESMIRE: Is --

MR. HUTCHINSON: There's testimony that this is a unique ecoregion and was one of the primary bases for the economic evaluation of Mr. Powers.

Do oil-and-gas-producing areas not occur in unique ecoregions in the rest of the state?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, yes. I know of at least one other that's drawn a lot of attention recently. That would be Otero Mesa. It is a unique Chihuahuan Desert area as opposed to the high mountain valley in Valle Vidal.

As oil and gas prices climb, we're liable to find more and more conflict between some of the values that we -- that we derive from Valle Vidal and the value of oil and gas production to the state. So while those two areas jump immediately to mind, I imagine as oil and gas development continues in the state, there are going to be other conflicts like this.

MR. HUTCHINSON: I guess the point I'm getting

to is that oil and gas deposits don't go out and pick an area and say, "I'm going to deposit myself here because it's not a unique ecoregion." They just happen to occur where they occur.

MR. FESMIRE: Absolutely. Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, that's absolutely right. Especially as gas prices continue to rise, we will be developing more and more what is phrased unconventional gas resources, specifically coals and shales, and we're going to get away from the traditional oil and gas region of which we have two big ones in the state.

So I would expect things like this to develop, you know, these conflicts to develop, as we explore the more unconventional resource areas.

MR. HUTCHINSON: This is to go to Mr. Propst.

You mentioned in your testimony, and it's also in the petition, that the Rio Costilla is one of the most used areas and has a fairly high percentage of the area -- or percentage of the use.

Is there any explanation for that?

MR. PROPST: I think at least part of the explanation is that, one, that's one of the larger streams within the Valle Vidal. Two, it's comparatively easily accessed, it's sort of in a central part of the

Valle Vidal, and it also produces some of the larger fish.

Most anglers tend to prefer larger fish, and that seems to be where they find them on the Valle Vidal. So I suspect that's -- I won't try to get into the mind of the fisherman too much, but I suspect that's part of it.

MR. HUTCHINSON: Now, I'm -- I'll stay with Mr. Propst.

Would the ONRW designation impact or potentially impact the number of visitors if stream bank trampling were found to be impacting water quality or stream bank vegetation?

MR. FESMIRE: I think I caught the beginning of your question, Commissioner.

That's always an issue, of anglers going along streams and trampling the banks. That's one reason why there's a comparatively brief season for fishing on the Valle Vidal, is at least, in part, an effort to control or limit the amount of damage that might occur by trampling.

There's a number of other things that can be -- some things can be done to try to disperse it more. Most of it -- or a lot of the anglers there are necessarily fishing from the bank or in the stream, fly

fishermen and whatnot.

So part of that is public education, part of it is trying to get people to spread out to diminish that impact. But it certainly is something that has to be considered.

MR. HUTCHINSON: Okay.

We heard testimony from Mr. O'Donnell, and I believe it's -- well, it's also in the -- in the petition here somewhere, that about 50,000 visitors a year are going in there.

And there is limitation on a hunt --

MR. PROPST: That's correct.

MR. HUTCHINSON: -- there is limitation on time of year that people can fish, there is limitation -- seasonal limitations and place limitations on camping and hiking and motorized vehicle use.

MR. PROPST: That's my understanding, Commissioner. Yes.

MR. HUTCHINSON: Okay.

And so this 50,000 visitors a year are fit into each one of those time frames and place restrictions, correct?

MR. PROPST: I'm not -- excuse me. I'm not sure I'm following you.

MR. HUTCHINSON: Okay.

So those 50,000 visitors a year are fit into those restrictions on time accessibility and place accessibility within the Valle Vidal?

MR. PROPST: I think I'm understanding your point, is not all -- we didn't use the figure 50,000 in our testimony, but accepting that that is the correct figure, that's not all anglers, and that's not all hunters. There are a number of other uses.

And the other uses -- bird watching, for example, it's not my understanding that there's any limit on season or numbers that can go do that.

MR. HUTCHINSON: So we've -- if this 50,000 visitors a year is kind of the accurate number, then have we -- have we reached essentially a ceiling at this point, or at what point would we get to -- can we -- can we go to 100,000 visitors a year or 200,000 visitors a year?

MR. PROPST: Are you still directing that to me, Commissioner?

MR. HUTCHINSON: Yes.

MR. PROPST: Since I'm not an expert in outdoor recreation, nor do I know what the Forest Service projections are for use or anything like that, I think it wouldn't be appropriate for me to answer, and any answer I gave you probably wouldn't be accurate. So

I'll say that I really can't provide you with an answer on that.

MR. HUTCHINSON: I guess I'll just throw this one out to the whole panel.

Would ONRW designation impact the availability of roads for hunting and recreation access for the elderly or limited mobility persons?

MS. LEAVITT: Commissioner Hutchinson, it's our understanding that the roads that are there provide access for those uses and that those roads would remain in place.

MR. HUTCHINSON: And if those roads were found to be creating a degradation for those waters, then would they have to be restricted or some kind of mitigation put into place?

MS. LEAVITT: Commissioner Hutchinson, I believe that we would use the tools that we're using right now to look at restoration activities, working with Forest Service and other users of the area to put plans in place to make sure that roads don't -- aren't a significant contributor to the degradation of streams.

So I think we'd be using the same coalitions that we have now to look at roads as a source of contamination, just as we look at other activities.

MR. HUTCHINSON: Okay. What I'm trying to

keep in my mind here is -- is looking for answers that allow this Commission to determine that the designation has been official.

Are you saying that the current standards, water quality standards, that we have are protective, and that there are people out there implementing best management practices in order to bring those waters up to those standards, and ONRW designation would, like a magic wand, make that better for the state or better for that area?

MS. LEAVITT: Commissioner Hutchinson, if I understand your question correctly, there are restoration activities that are occurring within the Valle Vidal right now. Those restoration activities have had some success in mitigating some of the historic impacts to the area.

And we believe that those restoration activities will continue and that ONRW designation will bring more attention to this area, more people will be involved, as we've seen a number of people involved in this hearing today, to ensure that the activities in the area do not degrade water quality, and, in fact, that water quality is improved.

MR. HUTCHINSON: Okay.

And I'll go back to Mr. Fesmire.

I took it from your testimony, and so you may correct me if my -- if I'm wrong in my interpretation of your testimony, that the primary reason for making the ONRW designation is to prohibit the development of oil and gas in the area.

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, that's absolutely not correct. The ONRW will not prevent oil and gas development in the area.

What we are -- what we see as the major advantage to this designation is that it would give us a specific reason to -- to try to achieve certain water standards, so that any rule that we would create would not be arbitrary or capricious, but would have a definitive objective.

And that's what we see as the benefit of the ONRW designation, as far as the OCD is concerned.

MR. HUTCHINSON: Okay. So I'm finally getting responses to look at benefit. Okay. Thank you, Mr. Fesmire.

MR. FESMIRE: Yes, Commissioner.

MR. HUTCHINSON: I guess this one's going to David.

What is the Game and Fish Department doing to reduce the elk grazing impacts on the Valle Vidal?

MR. PROPST: As a fish biologist, I'm definitely not the person to ask that. I'm not sure that we have anyone here in the meeting today that could answer that question directly.

MR. HUTCHINSON: Okay.

MS. GUEVARA: I could maybe address that briefly, and maybe I think some other testimony from the Coalition will address that, as well.

It's my understanding that there have been some elk exclosures to address elk impacts in the riparian area as part of the 319 grants.

MR. HUTCHINSON: Well, yeah. The effect of an elk exclosure means that you reduce the amount of area that an animal can graze, and so they're going to graze more in other areas. So if you don't control the size of the herd, all you're doing is transferring the overgrazing back to another area, by creating an exclosure somewhere.

So I -- I was asking this question to understand, you know, who's in charge of -- I would assume it's the Game Department that's in charge of determining the proper carrying -- or the carrying capacity of the -- of the area, and would be working to make sure that that problem -- I would assume that an ONRW classification in that it increases the protection

for the streams and has the antidegradation rule -- that the Department would have to reduce numbers if it found that those numbers were impacting stream water quality.

MR. PROPST: Commissioner, I can at least partially answer that.

The decision as to how many permits to -- to be drawn each year is based on what is the herd census. It's also a decision that's made among the different agencies. Particularly the Forest Service is also involved in it.

And keep in mind that one of the primary principles of the Valle Vidal -- managing the elk herd in Valle Vidal is to provide a quality elk hunt that the average citizen can't get elsewhere. At least it's not on public lands.

So there's a number of objectives in managing the elk herd on the Valle Vidal. Certainly, one of them is that you don't want animals to become -- or the herd to become so large that there's degradation of aquatic habitat.

So it's a constantly -- constant process where you're evaluating the numbers, plus fitting those numbers with the various objectives that you have in the overall management. So no, it's not an absolute static figure that the Department and its cooperating agencies

stick with.

MR. HUTCHINSON: That was something that I was getting out of the -- out of the exhibits and the petition itself, that it seemed like, you know, that the object of the management was trophy -- trophy elk hunting, and that the herd was being maintained at a large size in order to guarantee that quality of a hunt.

MR. PROPST: Are you wanting a response?

MR. HUTCHINSON: No. I'm just -- that was just a comment.

MR. PROPST: Okay.

MR. HUTCHINSON: I guess we can go to Lynette with this, and maybe Marcy if you want to answer on this.

In the -- in the petition and in different exhibits, there were photographs of some of the activities that are going on in regards to making exclosures and doing other stream restoration type of work.

What impacts would designation of ONRW have on acquiring permits to do that type of watershed and riparian restoration work, not just within the stream areas, but in the upland watersheds, as well?

MS. LEAVITT: Commissioner Hutchinson, the types of restoration activities that I believe you're

referring to in the photographs would continue in this area. Those restoration activities are designed to ensure long-term water quality in the area.

ONRW designation does allow short-term degradation in order to -- if it's short-term and it's part of a plan to improve water quality overall.

So that is -- that sort of short-term degradation is contemplated in the Water Quality Management Handbook, and that's actually part of our Exhibit Number 2. There's a discussion of the sorts of short-term activities that would be allowed.

MR. HUTCHINSON: Okay.

MS. LEAVITT: Would you like me to read some of those to you?

MR. HUTCHINSON: That might be good for the record.

MS. LEAVITT: Okay.

So I'm looking at Exhibit 2, on page 4-10, and it's the column on the far right.

It says here, "The only exception to this prohibition, as discussed in the preamble to the Water Quality Standards Regulation, permits States to allow some limited activities that result in temporary and short-term changes in the water quality of ONRW. Such activities must not permanently degrade water quality or

result in water quality lower than that necessary to protect the existing uses in the ONRW."

It goes on to say -- I'm going to skip a little bit.

"EPA's view of temporary is weeks and months, not years. The intent of each of EPA's provision clearly is to limit water quality degradation to the shortest possible time. If a construction activity is involved, for example, temporary is defined as the length of time necessary to construct the facility and make it operational."

MR. HUTCHINSON: Okay. I guess that's one of the things I was really looking at and concerned about, from the standpoint of the soil and water conservation districts, and right now with the state being that -- one of the high priorities is looking at the condition of the watersheds and watershed restoration activities, such as thinning in the woodland and forest lands.

So things like constructing a temporary road to remove materials or bring in equipment, with the object of watershed restoration would fit into that criteria that you've described?

MS. LEAVITT: Those sorts of short-term impacts would be allowed. Yes.

MR. HUTCHINSON: I think we're about there. I

just have to check through my notes here real quick and see if there's anything else I have.

Oh, there's one.

One thing that I -- I didn't get out of the petition, and maybe I missed it in the host of exhibits, and -- let's see.

This is on the petition, page 15, the Roads and OHV Use. "Since 1982, approximately 300 miles of roads have been closed."

How many -- how many miles of roads currently exist in the Valle?

MS. GUEVARA: Yeah. I believe it's between 40 and 50. I think it's 42.

MR. HUTCHINSON: And how many miles? 40 to 50 miles of roads that are in --

MS. GUEVARA: I think I saw that in the watershed implementation plan. It talked about there was about -- between 40 and 50 miles of road still open.

MR. HUTCHINSON: And they've closed 300?

MS. GUEVARA: Um-hum.

MR. HUTCHINSON: And left 40 or 50 miles of roads in the whole --

MS. GUEVARA: Yeah. I think one of the reasons that number 300 is pretty high is there is one area that was heavily logged, and they skid logged it,

so it was just a criss-cross of roads, and I think that adding all that up was probably a big chunk of that 300 that was closed.

MR. HUTCHINSON: Oh, okay.

There's a picture of a well pad site on the Vermejo Park Ranch.

What oil and gas development impacts have been observed on the Vermejo Park Ranch?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, Mr. -- the surface owner out there, as most of you know, is Mr. Ted Turner. He has his own group of people who are -- it's their job to basically do what the OCD would do off of his ranch.

The impacts that have been out there, that are basically inescapable, we have to build pads on that ranch, but minimize the size of the pads. So while it has been minimized, there is some effect from -- from pads and locations.

There is also equipment. He has to have injection pumps to dispose of the water. They have to have roads and pipeline right-of-ways both for the gathering systems and the -- the water system that -- that gathers the water for disposal.

They do -- they have some very strict rules about the number of trucks and the number of people that

can be on that ranch at any one time. It's very strictly enforced, but still, there is some impact from traffic and people being out there.

Those are the -- those are the major effects that we would see.

There have been a couple of spills that occurred out there. They have an advantage that the -- the water is relatively fresh and easy to clean up, but basically, Mr. Turner and his organization stays on top of it.

MR. HUTCHINSON: Okay.

And I think that just about -- there was a description -- here, let's see.

This comes -- this is on page 16 (sic). There's a quote from a -- apparently a newspaper article, and it says, "Along the Fruitland Coal Outcrop, early methane production."

And I guess this goes to the statement that you just gave, Mr. Fesmire.

Do you know when that Fruitland Coal Outcrop was developed?

MR. FESMIRE: It's the Fruitland coal, and it started being developed in the -- if I'm not mistaken, it started being developed in the -- our part of the Raton Basin around 1999, sir.

MR. HUTCHINSON: And -- and has there been any changes in the method of development since that time, or is that standard operating procedure, and compare that to what you're seeing on Mr. Turner's property?

MR. FESMIRE: Madam Chair -- Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, yes, the methods of producing coal bed methane have been changing very, very quickly, I think mostly for the better.

The one thing that would disturb me is that in order to stimulate the well upon initial production, they go through a process called cavitation. There is some -- in my mind, there is some problem with that in that it generates an awful lot of dust and coal fines to the surface that would have a potential to damage surface waters.

MR. HUTCHINSON: In the Timber and Harvest -- and Forest Management, there is a statement there, "There are, however, no large mills within an economical haul distance to support an extensive cut of this resource."

What was considered to be an economic haul distance?

MS. LEAVITT: Commissioner Hutchinson, we're not sure what that distance would be.

MR. HUTCHINSON: Okay.

MS. LEAVITT: We may have someone else who can answer that question or have additional information.

MR. MOORE: Madam Hearing Officer, Commissioner Hutchinson, we have a representative from the Forest Service here who could provide rebuttal testimony on some of those things if it's needed.

MS. ORTH: All right.

MR. HUTCHINSON: Okay.

MS. ORTH: We'll do that later.

MR. HUTCHINSON: Okay.

MS. ORTH: Are you nearly done, Commissioner Hutchinson?

MR. HUTCHINSON: Yeah. It looks like there's a couple of more, and I'd like to revisit that question when we have someone available to answer that question. There's a couple of questions that are tied to that.

And I guess if we're going to have a Forest Service person up to testify, maybe they can address this question, too, and we'll find out here, I guess.

How would ONRW designation increase protection -- overprotection afforded by wild and scenic river eligibility or designated for high quality coldwater use?

MS. LEAVITT: Could you repeat that question?

MR. HUTCHINSON: Okay.

The Forest Service is mandated to manage these streams as if they were wild and scenic, since they have -- they have the potential to, and they've been identified as potential wild and scenic, so they have to be managed.

What benefit do we get out of ONRW above a wild and scenic river classification? I mean, that's a pretty stringent protection under wild and scenic.

MS. LEAVITT: Commissioner Hutchinson, I'm not completely familiar with the protections that the Wild and Scenic River Act provides, but an ONRW designation is very specific in that it protects water quality, and I don't know that the wild and scenic status would provide that same level of water quality protection or if it even focuses on water quality at all.

MR. HUTCHINSON: Well, maybe we can have someone go to that question.

MS. ORTH: Commissioner Hutchinson, I'd like to honor the commitment I made --

MR. HUTCHINSON: Okay.

MS. ORTH: -- to Mr. Schlenker-Goodrich. I had hoped we would be able to finish the petitioner panel. I'm sorry that we're not able to do that, but I did make a commitment that Mr. Lackey would be able to give his testimony.

Do we need a short break before we begin with Mr. Lackey?

MR. SLOAN: We do.

MS. ORTH: All right.

Let's take a short break.

(Proceedings in recess.)

MS. ORTH: Let's come back from the break, please.

We are back from the break.

And let me say, so that those of you with other commitments this evening know this now, because those of us up here know this now, we're going to take Mr. Lackey, because he's available just today, we will take his direct and his cross-examination, and then we will break for the day and reconvene in the morning at 9:00 a.m.

When we will finish the Bureau -- I'm sorry -- petitioner panel cross-examination, we'll take more public comment, we'll hear the rest of the witnesses from the Environmental Law Center and any other comment that wishes -- that would like to be given.

So Mr. Schlenker-Goodrich.

MR. SCHLENKER-GOODRICH: Thank you, Madam Hearing Officer.

My name is Erik Schlenker-Goodrich. I'm an

attorney with the Western Environmental Law Center in Taos. I represent the Coalition for the Valle Vidal.

And just to clarify, the Western Environmental Law Center is not the formal party, rather it's the Coalition for the Valle Vidal that submitted the notice of intent.

I'll sort of refrain from giving any opening statement and just immediately call Al Lackey as our witness.

Alan is a rancher, hunter, and he lives in the Raton area, in Springer right now.

ALAN LACKEY

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. SCHLENKER-GOODRICH:

Q. Mr. Lackey, could you please state your name for the record?

A. Alan Lackey. It's A-L-A-N L-A-C-K-E-Y.

Q. And can you give basic background information about who you are for the Commission?

A. Yes. I'm -- I was born and raised in Raton, New Mexico. I'm a business owner. I'm a former president of the Chamber and Economic Development Council in Raton. I ranch for a living.

And I've been a hunting guide for 22 years, and I still guide for Vermejo Park Ranch. I also am a member of the New Mexico Cattle Growers' Association.

Q. And Mr. Lackey, in preparation for today's hearing, did you review the state's ONRW petition?

A. I did. I did review it.

Q. As an initial matter, I'd like to clarify an issue that Commissioner Hutchinson has raised regarding the ownership rights underneath the Valle Vidal.

Are you familiar with that situation?

A. Yeah. I have some familiarity. Yes.

Q. Could you clarify for the record who is the owner of the mineral rights beneath the Valle Vidal?

A. The oil and gas belong to the people of the United States. It was transferred with the -- gifted from Pennzoil to the Forest Service.

Q. Thank you, Mr. Lackey.

And is there a distinction between the mineral rights underneath the Valle Vidal and the mineral rights under the Vermejo Park Ranch adjacent to the Valle Vidal?

A. The Vermejo Park was a split state. The surface was purchased by Ted Turner, and the mineral rights were retained by Pennzoil and subsequently sold to mineral -- development -- oil and gas companies

currently owned by El Paso Natural Gas.

Q. Thank you, Mr. Lackey.

May it please the Commission, Mr. Lackey has a PowerPoint presentation, obviously, on the screen, if he could proceed.

MS. ORTH: Thank you.

MR. SCHLENKER-GOODRICH: Thank you, Madam Hearing Officer.

MR. LACKEY: Madam Hearing Officer and members of the committee, thank you for -- I know it's getting late, and I'll try to get through this as quickly as I can, but I sure thank you for your time this evening.

I want to thank you also for the opportunity to present my views on the subject of the Outstanding National Resource Water designations for the waters of the Valle Vidal.

Again, my name is Alan Lackey. I was born in Raton. I already did -- I'll skip that, so --

I have been intimately familiar with the Valle Vidal from the days I was a young cowboy, cowboying for Vermejo Park Ranch, to the years I spent as an outfitter permittee, packing summer campers and fall hunters to my camps scattered throughout the Valle Vidal.

I'm also a founding member of the Coalition for the Valle Vidal, and the testimony provided on

behalf of the Coalition is in strong support of the state's nomination of the Valle Vidal's waters as ONRW.

At the outset, I would like to emphasize that the ONRW designation empowers long-term efforts to restore the Valle Vidal as a critical component of our intertwined natural and cultural heritage and as a critical component of Northern New Mexico's economy.

Accordingly, my testimony will cover a discussion of activities that might contribute to the reduction of water quality, the economic impact of the designation and the beneficial nature of the designation and the recreational and ecological significance of the Valle Vidal.

The Coalition for the Valle Vidal is an ad hoc alliance of over 250 local governments, area businesses and organizations dedicated to the protection and restoration of the Valle Vidal.

As you see Exhibit A, that's a list of all the members of the Coalition.

Importantly, our members include several local government and business representatives, including the Santa Fe County Commission, Taos County Commission, Taos Town Council, Town of Springer, Town of Red River, Village of Cimarron, Council -- Village of Cimarron Council, the Village of Eagle Nest Council, Village of

Questa, Cimarron Chamber of Commerce and Questa Chamber of Commerce.

Exhibit B in your information has a brochure that describes a little more -- more information about the Coalition.

Covering the political spectrum from left to right, the Coalition represents the voices of thousands of elected official, sportsmen, ranchers, outfitters and guides, local businesses, concerned citizens, outdoor enthusiasts and conservation groups.

The broad-based nature of the Coalition reflects a diverse spectrum of interest with a common love for the land, united to ensure the economic and ecological integrity of the Valle Vidal. Our unity is demonstrated by our adherence to a common set of Core Values.

The Valle Vidal's watersheds are of paramount value and its waters the lifeblood of the land's wildlife and our communities.

The Valle Vidal is a vital resource to the sustainable future of Northern New Mexico's rural and agricultural communities.

The Valle Vidal provides unique recreational and sporting opportunities for families, hunters, anglers, Boy Scouts and other outdoor enthusiasts.

The Valle Vidal should be managed for the benefit of the people, all of the people.

Fundamentally -- fundamentally, these Core Values are reflected in the State's nomination of the Valle Vidal's waters for ONRW protection. The Coalition values the waters of the Valle Vidal for both their ecological and recreational significance and, by extension, their economic importance to the communities of Northern New Mexico.

The Coalition believes that the nomination, if successful, will provide a critical component in achieving the Clean Water Act's objective to restore and maintain the chemical, physical and biological integrity of the nation's waters.

Members of the Coalition value the waters of Valle Vidal such as the Rio Costilla, McCrystal Creek, the Ponil and others for their outstanding ecological values, such as the Rio Grande cutthroat trout habitat, habitat and watering for elk, bear and other large game animals and the rich riparian areas that support many of New Mexico -- many New Mexican species.

The lush meadows of the Valle Vidal also provide water and high quality grazing for New Mexico's agricultural community.

ONRW designation would ensure that the Valle

Vidal's lifeblood, its water, is not further degraded. Such protection helps ensure that the hard work by the Coalition, in conjunction with its allies to achieve the goals of our Core Values, will not go to waste.

In fact, we feel that the ONRW designation would empower and restore efforts by preventing further degradation and by focusing attention on conservation efforts in the Valle Vidal.

Several of the restoration efforts deserve mention.

Since 2004, Amigos Bravos, through a three-year contract with the New Mexico Environmental Department and a Memorandum of Understanding with the Forest Service, have assisted -- and assistance from the New Mexico Wilderness Alliance, have assisted in two separate watershed and riparian restoration process -- projects expressly designed to, among other things, protect the Valle Vidal from illegal off-highway vehicle intrusions from actual access points located on the upper Red River watershed.

This work involves providing clean -- the federal clean water -- excuse me -- federal Clean Water Act grant monies to the Forest Service to enforce off-highway vehicle regulations.

Amigos Bravos -- Amigos Bravos has also

focused on creating winter flows below the Costilla Dam, restoring cutthroat trout habitat on Comanche Creek, and ensuring -- ensuring Forest Service compliance with its duties of the Wild Scenic and River -- Wild and Scenic Rivers Act, filing a lawsuit against the EPA to ensure water quality improvements on Cordova Creek and ensuring river flows below Cerro Canal diversion structure.

The Boy Scouts' Philmont Scout Ranch requires each of its approximately 3,000 yearly campers on its staffed camps in the Valle Vidal, the Whitman Vega, Seally Canyon and Ring Place, to perform four hours of conservation work on Forest Service-approved projects. Such work therefore totals approximately 12,000 hours of service to the Valle Vidal each year.

Several entities, including New Mexico Trout Unlimited, Truchas Chapter, Amigos Bravos, Quivira Coalition, US Forest Service, New Mexico Game and Fish, Rocky Mountain Youth Corps, Boy Scouts of America and other organizations have been working for more than six years on restoration of riparian habitat on Comanche Creek near Rio Costilla in the Valle Vidal.

These groups have engaged in tree planting and the construction of elk and cattle exclosures, stream weirs and water diversion structures.

The Forest Service has undertaken efforts to

close, rip and seed unnecessary roads within the Valle Vidal.

Since 1982, New Mexico Wildlife Federation and its affiliate chapter, the Albuquerque Wildlife Federation, have been involved in yearly restoration projects that have enhanced and helped restore numerous segments of streams and wetlands in the Valle Vidal.

Their aquatic and terrestrial habitat projects have greatly supplemented coldwater fishery restoration for the Rio Grande cutthroat trout and other wildlife in the Valle Vidal. Their persistent conservation work over the years has transformed several dry, denuded areas into lush, wet meadows.

We strongly believe that these sorts of efforts should continue and be encouraged and that the ONRW designation will do just that.

Importantly, the Valle Vidal's waters, clean air, magnificent scenery and ecological resources are also irreplaceable assets for the area's communities whose economies are heavily dependent on the Valle Vidal for recreational income.

Ensuring the protection and restoration of the Valle Vidal through ONRW designation -- designation therefore makes good sense economically. What doesn't make sense is converting the Valle Vidal into a single

use that compromises its unique ecological values and denies the people access to the Valle Vidal for its many other uses, many of which are -- as stated, are economically significant.

This fear is based on a very real threat, that the possibility of the Valle Vidal's landscape will be industrialized by coal bed methane development.

As a general -- as a general proposition, economic studies of rural western communities are now supporting what many take as common sense. Protecting, not exploiting, public lands creates thriving and sustainable rural communities.

To determine whether or not this principle applied to the Valle Vidal, the Coalition commissioned a report, completed in early 2005, prepared by Dr. Thomas Michael Power, a professor and chair of the University of Montana's Economics Department.

Dr. Power's report demonstrates that the industrialization of the Valle Vidal would have serious negative impacts for the economies of North Central New Mexico.

The report, Local Economic Impacts of Gas Development in the Valle Vidal, New Mexico, reviews economic trends in Colfax County, New Mexico, Las Animas County, Colorado, counties based on the Forest Service's

projected level of gas development for the Valle Vidal.

Key findings are:

Colfax County is blessed with substantial economic vitality, found in the service sectors, retirement and investment income and the visitor and recreation sectors.

Most of the expanding sectors of the local economy rely on the attractiveness of the region as a place to live and visit. High quality natural landscapes contribute significantly to the regional attractiveness and, through it, competitiveness.

Valle Vidal is an important part of Colfax County's economic base as it is in its natural state. Risking damage to it in the pursuit of the small and temporary local economic gains that would accompany developing it as a natural gas field threatens to convert that which is unique, valuable and of long-term significance into something that is cheap and common, another industrialized landscape.

The impact of the high -- the impact of the high quality natural landscapes along the Sangre de Cristo Mountains, of which the Valle Vidal is an important part, is already apparent in the Colfax County property tax base.

Natural gas development provides limited

employment and pay opportunities relative to the economic value it creates. The employment and payroll associated with that gas development will be less than 1 percent of the current employment and personal income in the local economy.

Many of the development jobs will not be available to local residents given the fact that natural gas development requires specialized skills -- specialized, skilled workers who by necessity must move to where gas fields are under development.

Coal bed methane development does not provide long-term support for the expansion of local businesses, nor will it make a substantial contribution to the funding of Colfax County government services.

Local economies that rely heavily on mineral development face instability and downward cycles of boom and bust.

When it comes to the Valle Vidal, coal bed methane development is almost certain to fundamentally degrade a unique natural landscape, its wildlife habitat and its recreational potential. This can only weaken the region's potential for ongoing, sustained development.

Dr. Power, after comprehensively evaluating the local economic impacts of drilling the Valle Vidal,

concludes that committing the spectacular natural landscapes of the Valle Vidal to commercial mineral development will not bring real economic development to Colfax County.

It will condemn the region to ongoing boom and -- boom and bust and systematic decline that it has wrestled with over the last quarter century and which characterizes other mineral-dependent regions.

Consciously managing the county's natural landscape for the environmental services -- services they can provide, protecting those natural landscapes that are unique to the region and approving only those commercial developments that do not seriously damage -- do serious damage to those environmental services need to be the guiding principles if diversification and economic development of Colfax County is the objective.

Power reports -- the -- excuse me. The Power report builds upon other studies that come to similar conclusions regarding resource extraction industries. In particular, the Sonoran Institute completed a report in July, 2004, entitled Prosperity in the 21st Century: The Role of Protected Public Lands.

It's Exhibit C in your attached information.

The Sonoran Institute report presents a powerful argument that communities with access to larger

markets and nearby protected public lands are ideally positioned to attract fast-growing industries and that communities which rely on resource extraction industries are most likely to suffer from the slowest long-term economic growth rates.

See Exhibit B at 1.

Based on an in-depth analysis of the role of public lands and local economies, the Sonoran Institute report observes that for decades now the Western experience has been feeling a major transformation of the region's economic landscape.

It also continues to ignite the debate over resource development versus preservation, but that debate is driven largely by a misunderstanding of what spurs economic growth today and what it takes to succeed in the future.

Our vast expanses of open lands are a fundamental asset. They define the West. They are something the rest of the world does not have. And as our analysis shows, the more public lands a county has, the faster its economy grows. If the land is protected -- in protected status or immediately next to protected lands, the growth is even faster.

The Coalition, based -- based on its own members' experiences and knowledge of the Valle Vidal,

firmly believes that the Power -- that Dr. Power's and the Sonoran Institute's work demonstrates that efforts to protect the Valle Vidal will promote economically and ecologically sustainable economic growth greater than short-term boom and bust growth provided by mineral extraction.

Expenditures that would flow to Colfax and Taos Counties from recreation uses of the Valle Vidal would therefore be in serious risk, if not completely lost, if the eastern half became an industrialized gas field.

Such losses would not be temporary, because after coal bed methane production ends, it would be decades before the Valle Vidal would recover to once again become a place frequented by outdoor enthusiasts, that is if it ever does.

In the meantime, considerable monies, including public taxpayer dollars, will be expended in attempting to restore the landscape, streams and groundwater destroyed by roads, pipelines, well pads, water removal and other impacts of coal bed methane production.

If the Valle Vidal were industrialized, elk hunters, trout anglers, horseback riders, hikers, skiers and campers would shift their attention and dollars to

other destinations. Thousands of Boy Scouts who hike into the area from the adjacent Philmont Scout Ranch would lose an outdoor classroom where they learn about nature and outdoor skills.

The Coalition has been heartened by the outpouring of support from the public in our efforts to protect and restore the Valle Vidal. During the Forest Service's scoping process for their Forest Plan Amendment for the Valle Vidal, 55,000 comments called for the protection of the Valle Vidal.

This is an example of the citizens speaking up to protect the ecological and recreational value of the Valle Vidal and of how the public believes that protecting the Valle Vidal, in particular its waters, is beneficial to the State of New Mexico.

The Coalition therefore fully supports designation of the waters of the Valle Vidal as an ONRW. The waters of the Valle Vidal are some of the most ecologically and recreationally significant waters in our entire state and deserve protection.

Importantly, these waters deserve protection regardless of the threat posed by coal bed methane industrialization. This threat simply means -- or that time is of the essence. The integrity of the waters of the Valle Vidal must be protected for the future

ecological, recreational and economic well-being of our communities.

ONRW designation ensures that these outstanding ecological and recreational values are preserved and will directly and significantly benefit residents of New Mexico.

The Valle Vidal is where waters begin, nourishing life, their entire -- on their entire journey down to the bigger rivers below. Protecting these waters is protecting life itself.

Thank you for your time. I will be happy to take any questions.

MR. SCHLENKER-GOODRICH: And if I may answer -- Alan Lackey is unable to be here tomorrow, so if the Commission has questions for him, they have to ask them now. My apologies for him being unable to be here tomorrow.

MS. ORTH: All right. Thank you, Mr. Lackey.

Could we maybe turn off that light?

Thank you.

CROSS EXAMINATION

BY THE COMMISSION:

MS. ORTH: All right. Questions from the Commission. I'll start on this side.

And I know that some of you would like to

leave, and this is the last thing we're doing today, so if you need to leave, you can certainly do so.

Commissioner Sloan.

MR. SLOAN: I have none. Thanks.

MS. ORTH: Thank you.

Commissioner Vigil.

MR. VIGIL: I just have one question.

In the Coalition for the Valle Vidal, you have the Valle Vidal Grazing Association.

How many permittees is in that association?

MR. LACKEY: There's -- I believe there's 16 permittees.

MR. VIGIL: 16.

MR. LACKEY: That's give -- that's a close number, but I'm not sure. They may have added some or -- since I've known that number.

MR. VIGIL: And one other question.

Are the local soil and water conservation districts involved in any of the restoration projects that you have, or --

MR. LACKEY: The local -- there is a local watershed group that they -- they do solicit the services from the Soil and Water Conservation, or Natural Resources Conservation.

As far as on projects, I'm -- they are trying

to -- they did receive quite a bit of federal money to restore and help with turbidity in the watersheds on the Ponil Creek, so -- but as I -- I don't know if I answered your question, but there's --

MR. VIGIL: Well, like I say, you know, there are 47 soil and water conservation districts throughout the state, and through cooperation of the Natural Resources Conservation Service, they would be a great asset to any of your -- of your watershed groups up there, and I would elicit you all to definitely get them involved with these projects, because, I mean, they do have the state resources to help.

MR. LACKEY: That's a good point, sir. That --

MS. ORTH: Thank you.

MR. VIGIL: That's all. Thank you.

MS. ORTH: Thank you.

Commissioner Goad.

MS. GOAD: Oh, no questions. Thank you.

MS. ORTH: Thank you.

Commissioner Darden.

MR. DARDEN: Can I pass for a minute?

MS. ORTH: Yes, you can.

Commissioner Bada.

MS. BADA: I have no questions.

MS. ORTH: All right.

Madam Chair.

MS. WATCHMAN-MOORE: No questions.

MS. ORTH: All right.

Commissioner Price.

No.

Commissioner Glass.

MR. GLASS: No questions.

MS. ORTH: Commissioner Hutchinson.

MR. HUTCHINSON: I think I just have two questions.

One of them is kind of a comment. I was kind of curious on your presentation, on your printed out one, on page 6, the statement in the lower left-hand box, "The greatest economic diversity and stronger job and income growth in rural communities in the West."

Where is that coming from? I mean, what does that statement come from, in your experience?

MR. LACKEY: Well, in my experience, if I just may go back, as the president of the chamber -- and we are a coal town, if you're familiar with Raton at all. We depended on coal mines. And it was my obligation and duty to evaluate the assets and look to the future and what assets that we had.

And about the same time, I was -- got involved

with the Coalition for the Valle Vidal.

So when we looked at the assets we had and started looking at other communities that were successful that had similar assets of Raton, what made them successful, then that's when we became familiar with studies done by the Sonoran Institute, and -- and then we -- to try to prove our point on -- we contracted Dr. Power from the University of Montana to do the extensive economic study.

And that's where that -- those comments come from.

MR. HUTCHINSON: Because one of the things that I've experienced in New Mexico, the greatest decline in economic diversity, jobs and income growth in New Mexico is in the rural communities that are closest to the protected public lands.

And that's -- their indicators for that are, you know, looking at the unemployment numbers, the highest unemployment numbers are in those particular type of areas.

I think -- I think that's all I have.

MS. ORTH: Thank you.

Commissioner Johnson.

MS. JOHNSON: I have one question.

Mr. Lackey, could you please clarify for me

the early statement that you made in response to questions from counsel regarding ownership of the mineral rights?

At one point, you mentioned they were owned by the public, the people of the United States, but then I heard that they had been transferred to El Paso.

Can you just clarify that?

MR. LACKEY: Yes, ma'am. He asked me on the adjacent property, Vermejo Park, what the mineral ownership was there, and that was my response to that question --

MS. JOHNSON: Okay.

MR. LACKEY: -- that that ownership is owned by El Paso Corporation.

MS. JOHNSON: So then on Valle Vidal --

MR. LACKEY: That belongs to the people of the United States. Yes, ma'am.

MS. JOHNSON: That they were transferred from Pennzoil to the Forest Service; is that correct?

MR. LACKEY: Yes, ma'am.

MS. ORTH: All right. Thank you.

MR. HUTCHINSON: I just -- I did have one other.

MS. ORTH: Commissioner Hutchinson.

MR. HUTCHINSON: And now I forgot it again.

Okay.

MS. ORTH: Counsel Shandler.

MR. SHANDLER: I would just ask that the written statement be admitted as an exhibit, if possible.

MS. ORTH: All right.

Mr. Lackey --

MR. HUTCHINSON: Now I --

MS. ORTH: Excuse me.

His written statement, actually, is one of the exhibits in the -- attached to the notice of intent, and I will accept the PowerPoint. I usually accept it as demonstrative evidence. But this will become part of the record, as well.

Thank you.

Commissioner Hutchinson.

MR. HUTCHINSON: I was just wondering, that the adjacent property on the Vermejo Ranch that's being developed, I'm assuming you have a lot of familiarity in that --

MR. LACKEY: Yes, sir.

MR. HUTCHINSON: -- in that area.

Is that within the -- that's within Colfax County, as well, right?

MR. LACKEY: Yes. The entire development on

Vermejo Park is entirely within Colfax County.

MR. HUTCHINSON: Right.

MR. LACKEY: Well, I take that back. They do have property in Colorado that extends over the state line into Las Animas County, Colorado.

MR. HUTCHINSON: And so from your experience there, can you validate what Dr. Power was saying in his papers? Has the development there not resulted in any beneficial impact to Colfax County?

MR. LACKEY: It has provided some jobs for local contractors, mainly that do earth moving and heavy equipment work. Most of the labor was brought in from other -- there's lots of Wyoming, Texas and Oklahoma plates in Raton right now.

But I do have several friends and people I know that are working, so it did provide some jobs, but not as -- in as significant manner that everybody was hoping.

MR. HUTCHINSON: Thank you.

MR. LACKEY: It didn't replace the lost coal mine jobs at all, in any certain amount, so --

MR. HUTCHINSON: Okay. Thank you.

MR. LACKEY: Thank you.

MS. ORTH: All right.

Commissioner Darden, are you ready?

MR. DARDEN: Mr. Lackey, do you have an allotment on the Valle Vidal?

MR. LACKEY: No, sir, I don't.

MR. DARDEN: Maybe -- maybe you can answer this question, maybe not.

Do you know if those permittees that do -- if this designation will decrease or increase uncertainties associated with grazing in the forest?

MR. LACKEY: As -- it's my understanding that when the areas don't designate, that it's a snapshot of the current -- what -- what the quality of the water in a current situation is.

They are -- they work very closely with the Forest Service, and they manage the grazing very well up there, and I don't see that -- and I've talked to some of the permittees, that as long as they're doing what they're doing now, they're very happy, they're -- they're not really too shy in that deal, so --

MR. DARDEN: Thank you.

MR. LACKEY: You're welcome.

MS. ORTH: Other Commissioner questions?

MR. HUTCHINSON: On that --

MS. ORTH: Commissioner Hutchinson.

MR. HUTCHINSON: On that point, have any of the permittees recently gone through their permit

renewal process with the Forest Service?

MR. LACKEY: I couldn't answer that. I'm not a permittee, and I'm not sure when the renewal is. I'm sure it starts at the beginning of every year, is my understanding.

MR. HUTCHINSON: I think it's a 10-year -- 10-year permitting process, so --

MR. LACKEY: I didn't know it was even that. So that's -- I won't even venture to guess on that one. I don't operate on public lands.

MR. HUTCHINSON: Okay.

MS. ORTH: All right.

Other Commission questions?

Other questions of Mr. Lackey before we adjourn for the day?

MR. SCHLENKER-GOODRICH: If I may ask some redirect questions.

MS. ORTH: Yes, you may.

REDIRECT EXAMINATION

BY MR. SCHLENKER-GOODRICH:

Q. Mr. Lackey, you mentioned you were president of the Chamber of Commerce in the Raton area?

A. Yes, sir. That's correct.

Q. When taking a look at how public lands impact local economic dynamics, would you consider -- is it a

very site- and fact-specific determination? So you have to take a look at sort of the local communities, the local services, the history of economic development in the area?

A. Well, yes. That is a -- we were completely dependent on coal mining, and when that shut down, there was no economic engine. But Raton was blessed with three major assets, and that's the wild and scenic landscapes, wildlife and water. We have plenty of water for New Mexico standards.

And those were three key building blocks to building a new economy, because people that value those assets will bring themselves and hopefully their companies to an area. And that was -- that's why I'm here, and -- and I -- and as being the chamber president, I look to other communities that have similar situations and that are thriving.

I understand, Commissioner Hutchinson, if there are other things like highways and access that are -- which Raton has that maybe other communities don't that are associated with public lands.

But it is a very valuable asset for the area, and we noticed a significant increase in the area for people coming for that specific reason, the Carson National Forest and Valle Vidal.

Q. Mr. Lackey, now, you indicated that coal bed methane development would potentially create some jobs in the community; is that correct?

A. It did, and it is. Yes.

Q. But is it -- would there be a loss of jobs, as well? You indicated that you were a hunting guide out in the area. Would hunting guides still want to take people out onto the Valle Vidal to hunt for trophy elk in the middle of an oil patch?

A. Well, Vermejo Park -- if you're not familiar with it, it's one of the premier elk hunting ranches in the world, and very high dollar cost and very wealthy clientele.

And as more and more of the ranch gets developed, there's -- I think -- I get -- from my hunters, I get more and more grumblings of when they're trying to negotiate oil pads and roads and some of the tremendous infrastructure that is starting to appear up there.

It does diminish the hunting experience.

Q. So there would be -- if development went in, there would be a positive impact to a certain extent, but that might be outweighed by the negative impact to other outfitting operations, and also what you said about the water quality of life issues?

A. It's been my experience that people don't want to camp by a compressor station or picnic under a power line or hunt by a pump jack. And I'm seeing more and more of that, those kind of comments.

MR. SCHLENKER-GOODRICH: Thank you, Mr. Lackey.

That is all.

MS. ORTH: Thank you.

Are there questions of Mr. Lackey from anyone else? Other questions at all?

All right. We're going to adjourn for the evening. We will reconvene at 9:00 in the morning. And unless Mr. Moore tells me otherwise, we'll start again with the petitioners.

Thank you.

MR. SHANDLER: Just one piece of housekeeping.

MS. ORTH: Yes, sir.

MR. SHANDLER: I have to go to a legislative meeting about voting machines tomorrow, so -- that shouldn't last half a day, but if you are getting to your deliberations, I want to advise you, since it's a standard, when I either read the record or hear the tapes, however the deliberations are handled, I'd like to hear discussions about the use and value of the water for water supplies, the propagation of fish and wildlife

for recreational purposes, and certainly you can also consider the economic factors.

I also want to hear a lot of discussion about A.(5) and why it was stated that A.(5) was met in this specific exhibit, or I was persuaded that B.(2) was met because of this testimony. Those are the things that I want to hear that will help me prepare a Statement of Reasons.

Thank you.

MS. ORTH: Thank you, Mr. Shandler.

Thank you.

(Proceedings adjourned at 5:35 p.m.)

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

I, CHERYL ARREGUIN, the officer before whom the foregoing proceeding was taken, do hereby certify that the witnesses whose testimony appears in the foregoing transcript were duly sworn or affirmed; that I personally recorded the testimony by machine shorthand; that said transcript is a true record of the testimony given by said witnesses; that I am neither attorney nor counsel for, nor related to or employed by any of the parties to the action in which this proceeding is taken, and that I am not a relative or employee of any attorney or counsel employed by the parties hereto or financially interested in the action.

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My Commission Expires: 12/12/07

PETITIONERS' EXHIBIT

30

STATE OF NEW MEXICO

WATER QUALITY CONTROL COMMISSION

No. WQCC 05-04(R)

IN THE MATTER OF THE PETITION FOR PROPOSED AMENDMENTS TO 20.6.4.9 NMAC, DESIGNATION OF WATERS WITHIN THE VALLE VIDAL AS OUTSTANDING NATIONAL RESOURCE WATERS

TRANSCRIPT OF PROCEEDINGS

BE IT REMEMBERED that on the 14th day of December, 2005, the above-entitled matter came on for hearing before the New Mexico Water Quality Control Commission, taken at the PERA Building, Apodaca Hall, Santa Fe, New Mexico, at the hour of 9:06 a.m.

VOLUME 2

A P P E A R A N C E S

For the Water Quality Control Commission:

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MIKE SLOAN
MAXINE GOAD
FRED LUJAN
PEGGY JOHNSON
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I N D E X

I N D E X (Continued)

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MS. ORTH: Let's reconvene the hearing this morning.

We are reconvening in the matter of the proposed amendments to 20.6.4.9 NMAC, nomination for waters of the Valle Vidal as an Outstanding National Resource Water, docketed by the WQCC administrator as 05-04(R), for rule-making.

We took a number of public comments yesterday, heard the direct testimony from the petitioners' panel, one witness from the Coalition. We had some cross-examination of the petitioners' panel by the Commission.

We will continue with that this morning. Then we will turn to the other party presenting technical evidence, the Coalition, represented by Western Environmental Law Center. And then I will ask a last time for any public comment.

If you have any time constraints, please share them with Sally Worthington, the hearing clerk there in the box.

I forgot to mention yesterday that the hearing is being transcribed in its entirety by Cheryl Arreguín of Kathy Townsend Court Reporters, and if you'd like a copy of the transcript, please contact them directly.

So Mr. Moore.

MR. MOORE: Madam Hearing Officer, members of the Commission, I'm not sure exactly when you want to do it, but I've made copies of all of our witnesses' testimony. We can enter those into the record, and I can also move the admission of Petitioners' Exhibits 1 through 47.

But you can let me know when you would like me to do that.

MS. ORTH: We can do that now. Why don't we do that now.

MR. MOORE: All right.

MS. ORTH: Sally, will you facilitate that, please?

So when we broke the Commission questioning off -- hi, Commissioner Murray.

MR. MURRAY: Good morning, Madam Hearing Officer.

MS. ORTH: -- questioning, Commissioner Hutchinson may or may not have been finished.

Commissioner Hutchinson, do you have any questions of the petitioner panel?

MR. HUTCHINSON: Yes.

MS. ORTH: You do. All right. If you would, then.

And pull your microphone down.

MARCY LEAVITT, DAVID L. PROPST
LYNETTE GUEVARA and MARK E. FESMIRE
having been previously duly sworn or affirmed, were examined and testified further as follows:

CROSS EXAMINATION (Continued)

BY THE COMMISSION:

MR. HUTCHINSON: Okay. Where we left off yesterday, kind of we had talked about the timber harvesting and forest management, and we were going to have someone possibly available to answer those questions on -- on haul distance and -- and then I was getting ready to go into the other questions on other information.

This is on -- starting on page 19, going into 20, in the petition.

MS. ORTH: Commissioner Hutchinson, do you have other questions of this panel, because --

MR. HUTCHINSON: Yes.

MS. ORTH: Oh, okay.

MR. HUTCHINSON: I'm just finding them here.

MS. ORTH: Okay.

MR. SLOAN: Preamble.

MR. HUTCHINSON: Okay. I think I broached on this a little bit in some of the earlier questions, but at the bottom of page 19, it says, "If there were

impacts to the scenic and recreational experiences because of degradation of water quality, local businesses that cater to visitors of the Valle Vidal might experience large economic declines."

And the question I have is -- is, under the current regulations, would water quality -- water quality be allowed to decline to the point of affecting the local economy?

MS. LEAVITT: Commissioner Hutchinson, under -- the way the standards are written right now, water quality could decline to the standard.

What -- what the ONRW designation would do is set the current water quality essentially as the standard. So it would be situated -- in locations where the current water quality is better than the standard, that becomes another baseline that we're protecting for.

So that's the benefit of this designation.

And -- and if water quality went below that, I don't know what the impacts would be, but there could be -- I guess there could potentially be impacts to the fishing industry.

MR. HUTCHINSON: If -- and it's my understanding that these are now classified essentially at the highest level that we can classify waters, the coldwater -- high quality coldwater?

MS. LEAVITT: That's correct.

MR. HUTCHINSON: Okay.

And under current regulation, we would allow degradation that would affect that standard?

MS. LEAVITT: Excuse me. Could you repeat your question?

MR. HUTCHINSON: Under that classification, would we allow -- under the current regulations, allow that standard to be degraded?

MS. LEAVITT: No, we wouldn't.

And I also want to make the distinction between point sources of pollution and nonpoint sources of pollution. Point sources of pollution are much easier to control, but point sources of pollution are not the case in the Valle Vidal. We're talking about nonpoint sources of pollution.

So just by their very nature, sometimes you're not able to identify what the source is for a nonpoint source of pollution, and so it's more difficult to regulate those through the standards than the point source.

So one of the advantages that we talked about yesterday in this designation is that it -- it increases the profile of this area and all of the watershed restoration efforts that are geared towards addressing

nonpoint sources of pollution. Those are, in large part, voluntary efforts. They're not efforts that are mandated by the State.

And so we believe that by elevating the profile of this area, making everyone aware of the reasons that it needs to be protected, that nonpoint sources of pollution will be better addressed, which will help to ensure water quality isn't degraded below the level it's at now and also below the standards.

MR. HUTCHINSON: Okay.

According to Mr. Fesmire's testimony, the primary concern is -- is oil and gas development, primarily coal bed methane development.

MS. LEAVITT: Is that a question?

MR. HUTCHINSON: Well, is that -- was that -- is that a correct depiction of his testimony?

MS. LEAVITT: Well, he can characterize his testimony. I can speak for the Environment Department, and that is we're not looking at a specific use of the area. What we're looking at is the overall water quality and making sure that the water quality isn't degraded from any use.

So -- so we're looking at all of the uses of the area, including potential future uses, of which coal bed methane would be one.

MR. HUTCHINSON: Okay.

For coal bed methane development, the primary concern for surface water quality would be discharges from the actual development operation? That would be for Mr. Fesmire. Is that correct?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, that is one of three potential sources of discharges. The two potential sources of liquid discharges are the surface discharges that you talked about and subsurface discharges of pollution that would result from that.

MR. HUTCHINSON: And would -- would the Oil Conservation Division regulate both those surface and groundwater discharges?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, yes, that's true. That is part of our responsibility.

MR. HUTCHINSON: And so, you know, going back to that -- that original question, then, I think in your testimony you said that there -- there were limitations on how you can regulate at this point that would be enhanced by ONRW designation?

MR. FESMIRE: Yes, Mr. -- Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, that's true. The reason that OCD and the -- and one of the reasons

that the Energy and Minerals Department supported this designation is that we would be able to implement stricter regulations than we have in other parts of the state to protect this source without being subject to allegations that are -- that our actions were arbitrary or capricious.

MR. HUTCHINSON: Okay.

Going down now into the -- into the page 20, second paragraph, it says, "The US Fish and Wildlife Service estimates that in 2001, over 670,000 individuals participated in wildlife watching activities in New Mexico."

I was -- I was trying to take this statement and then go through the various exhibits and testimony and -- and try to determine what portion of this 670,000 is actually affected by the Valle Vidal, or what portion of this is -- is Valle Vidal figures.

MR. PROPST: Madam Hearing Officer, Madam Chair, Commissioner Hutchinson, we didn't have specific figures on visitation for nonconsumptive, in other words, bird watching, things like that, for Valle Vidal, so we did not break out exactly how many people visited Valle Vidal exclusive of hunting and fishing, so therefore did not put a figure, a dollar figure, on what that contributed to the local economy.

And within that 2001 document, you cannot pull out specifically how many people visited the Valle Vidal.

MR. HUTCHINSON: Okay.

So -- and there is fairly detailed discussion about the fishing and hunting visitation, so that's -- that's not really -- this 670,000 figure, in looking at the Fish and Wildlife Service document that -- that's in here, what percent of these numbers of people observing wildlife -- are observing wildlife in their backyard bird feeders?

MR. PROPST: I'm not sure you could -- I'm not sure that the document splits that out, but I'm certain that a portion of it is, but specifically, I can't tell you. Perhaps the document itself does.

MR. HUTCHINSON: Well, it does address it, but it -- it's not real clear on -- on how much of those expenditures are. You know, there is some breakout, but I've heard that that figure is -- is fairly -- it's a fairly high percentage of any -- of any of the dollar amounts that you begin calculating for wildlife watching, the actual purchase of bird feeders and animal feed and bird feed.

The -- when we start talking about economic impacts, the last sentence in that same paragraph says

the total impact to the state's economies is a bit less than 2.5 billion.

From the standpoint of economics, is this a positive, negative or neutral impact?

MR. PROPST: I believe the intent of that -- Commissioner, I believe the intent of that statement was to say that it's a positive impact.

MR. HUTCHINSON: Okay.

And would the expenditures on that as a portion of disposable income be spent in another sector of the economy if not on hunting, fishing or watching wildlife?

MR. PROPST: Commissioner Hutchinson, the 2001 Fish and Wildlife Service document does not break it out as what would be spent alternatively. So I can't specifically answer that.

MR. HUTCHINSON: Okay.

These types of economic impacts typically are economic neutral when you're talking about disposable income or discretionary spending. If they didn't spend it on this, they would have spent it somewhere else, going to a movie or, you know, doing something -- some other type of activity.

In the next paragraph, it states, "As one of New Mexico's prime public viewing, fishing, and hunting

areas, the Valle Vidal accounts for a substantial portion of this economic activity."

What constitutes a substantial portion? I guess that goes to the earlier question, is, how did you break out this concept?

MR. PROPST: Commissioner Hutchinson, at least part of the breakout of that was based on the hunting and fishing figures that we have.

And as I told you yesterday, the direct economic benefit was about $1.1 million, and that does, in fact, use the multiplier effect that economists typically apply to an infusion of funds or spending in a local community or regional community.

That 1.1 is a conservative estimate of the impact. That figure also does not include the money that would be spent by people just simply visiting the area. And as I indicated earlier, we did not break out that number because we did not have specific information to it.

But 1.1 million multiplied out -- 1.5 is one of the multipliers that's used, and if that's to the local, regional economy, that is a substantial amount. I'm not going to -- don't want to get on a debate of significant versus nonsignificant, but I think to most people, several million dollars is a substantial sum of

money.

MR. HUTCHINSON: Yeah. Those multipliers can be as high as about 1.8.

Going down -- and this is going into, I guess, now, page 21, second paragraph, last sentence, says, "Elk hunting on the Valle Vidal contributed more than a half million dollars to the economies of the communities and individuals of the surrounding area."

And that was the figure you were just referring to, that you were able to break out and not include the multiplier on.

Would the Game and Fish Department cut the number of elk permits if the Valle Vidal's streams were not classified as ONRWs?

MR. PROPST: Commissioner Hutchinson, I believe that, to some extent, would be a decision that would be made by the director, as well as the Game and Fish Commission. And the number of permits that are issued is based on the number of animals that are available, and that's going to shift somewhat from year to year.

But keep in mind the comments I made yesterday, that one of the primary considerations for the management of that elk herd is providing trophy elk hunting opportunities. So there's a number of factors

involved in it.

We have to go back to what the purpose of the listing is, and that's to protect water quality, and ultimately, that has some indirect benefit to the elk herd, but that's a number of steps removed from what we're talking about in terms of designating this Outstanding National Resource Water.

MR. HUTCHINSON: Okay.

But the question is, is -- you know, we're operating under current standards, there is a current elk hunt allowed.

Would the ONRW designation benefit by creating a -- or would -- would there be a cut in the number of those elk permits if ONRW designation occurs?

MR. PROPST: Again, that would be a decision made by others than me, but I do not see that that would really have an impact one way or the other on what the number of elk permits are.

MR. HUTCHINSON: Okay.

On page 22, the first sentence on the page there, "Undoubtedly, the attractiveness of the Valle Vidal for angling, hunting and other outdoor recreation would be decreased with oil and gas development."

I looked through the exhibit, which is Mr. Moore's paper, and tried to find numbers that

would -- that would qualify this statement.

How much of a decrease in economic activity has occurred -- occurred as a result of oil and gas development in Vermejo Park?

MR. PROPST: I'm assuming you're directing that to me, Commissioner Hutchinson.

MR. HUTCHINSON: Or any -- all of these are directed for anybody on the panel.

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Mr. Commissioner, if I might address that.

I don't think that that statement would be -- would be accurate. There's probably been some increase. I think we have testimony that the Commission -- that it wouldn't offset the problems that we've had with, you know, that fluctuating economy with coal mines and things like that, and the fact that the -- any increase from coal bed methane would be relatively short-lived and not a permanent change to the economy in the area.

I think that has to be weighed against the short-term influx, like I said. The Powers -- Power's study says that there will be 94 jobs created for a period of approximately 10 years and that the -- that that economic value would not offset the loss in the long-term of this pristine area.

And I think that is what has to be considered.

I don't think you can compare -- for the 10 years, gas production might improve the economy, but it's not going to be a permanent change to the economy in the area.

MR. HUTCHINSON: Okay. That goes to another question.

How long is the life of a field like this?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, coal bed methane production, like I said, in that part of the country has only been going since about 1999. The San Juan Basin, which is somewhat analogous, was probably two or three years ahead of that in development.

We don't know for sure how long it lasts. My numbers show between 10 and 20 years would be the life of a coal bed methane field.

MR. HUTCHINSON: And are they required to recover these areas or post any kind of bond for recovery of these areas after the extraction activity has ceased?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, oil companies are required to post a bond. Most of them are large enough that they post a statewide bond.

That bond is for plugging and remediating the well area itself. It's not for other long-term effects

that might occur on the property and does not pay the surface owner on private ownership for any -- anything that they're out.

MR. HUTCHINSON: I guess that would be another possible benefit in the -- in the designation. If -- if it didn't outright prohibit oil and gas development, it could be used to limit the number of pad areas that were put into place, would also limit the effect on some of the surface rights that are there.

MR. FESMIRE: Madam Hearing Examiner, Madam Chair, Mr. Commissioner, that is correct. Where we come in, for instance, in Otero Mesa, and have created special rules for that area, one of the objectives is to drill multiple wells from single pads and limit the number of locations like that.

MR. HUTCHINSON: I think, Madam Hearing Officer, I've gotten all the questions out of there. I've just got -- and I don't -- I don't know if these questions -- but since we don't get to go back to the panels, I'll see if this question has bearing here.

One of the -- one of the things that's been mentioned as a possible impact there is livestock grazing. I guess the statement really should be ungulate grazing since we're talking about elk and livestock.

But does any of the panel know how many permits were -- and this is livestock grazing permits -- how many livestock grazing permits were issued upon the transfer to the United States of this property?

MS. LEAVITT: Commissioner Hutchinson, we don't know. I believe a witness yesterday provided a number that was about 16 grazing permits, but that's a Forest Service issue.

MR. HUTCHINSON: Okay.

And then the other part of that question was, you know, how many -- how many livestock were those permits issued for, or how many -- how many livestock were permitted under those permits?

MR. PROPST: Commissioner Hutchinson, the figure that we received from the Forest Service, I believe, is that there's 300 AUMs on the Valle Vidal at this time.

MR. HUTCHINSON: Okay.

And was that -- has that figure been constant since the lands were transferred to the US?

MR. PROPST: I'm not sure that they've been constant. It's my understanding that that's the -- I'm not sure what the correct terminology is, but the maximum number is -- they're grazing at the agreed upon maximum number at this time.

MR. HUTCHINSON: Okay.

That's all I have. Thank you.

MS. ORTH: Thank you.

Commissioner Glass, do you have any questions?

MR. GLASS: Yeah, a couple, Howard having asked about six of mine.

So thanks, Howard. That's helpful.

We'll make this short, then.

I do have one fairly significant issue to ask about, is that if you read in our reg -- in our standards, at 20.6.4.8A.(3), it says -- states, "No degradation shall be allowed in high quality waters designated by the commission as outstanding national resource waters," period.

Now, Marcy read earlier from the EPA Water Quality Handbook in which it states that no degradation in ONRWs is allowed unless there's a temporary need to degrade the water for long-term benefit.

My concern is that our regulations, our standards don't provide that proviso -- ooh, is that right? Provide a proviso? Oh, well.

So my concern would be that because our standards don't provide for any degradation for any period of time, it's a simple -- the simple meaning of the language is that once it's an ONRW, there is no

degradation, none.

And my concern would be that for situations like the hearing -- we've scheduled a hearing in January for the use of a piscicide in the Valle Vidal, that we may be faced with a situation where we're, by our own language, totally prevented from even allowing that.

I'd just like to know the Department's or maybe the panel's -- I guess it would be Marcy's opinion about how we can get around this very plain language and allow degradation for any period of time in an ONRW.

MS. LEAVITT: Well, Commissioner Glass, I'm going to give you a two-part answer.

The first part is that -- sorry, I can't see you.

MR. GLASS: That's okay.

MS. LEAVITT: The first part is that the standards that have been adopted by the Water Quality Control Commission as proposed generally by the Environment Department are based on the requirements of the Clean Water Act.

The Clean Water Act has a number of documents that provide interpretation, additional information to help agencies in implementing those provisions.

In this case, there is the Water Quality Standards Handbook language which I spoke of yesterday

which does acknowledge that there -- there really necessarily has to be short-term impact in some situations for long-term gain.

So that's the first part of my answer.

The second part is that we recognize that this language is very -- on its face, it's very strict and may need to be adjusted, and we have been talking about in the next standards-making proceeding that we bring before the Commission, which will probably be sometime before the next triennial review, to work with this language, to try to figure out better wording that reflects the actual situation as reflected in the Water Quality Standards Handbook.

ONRW designations are new to our agency and to the Commission. The first one was approved earlier this year. So this language that's been on the books -- we're just now getting to use the language and figure out what the idiosyncrasies are, and we know that there are some places that we need to fix language.

MR. GLASS: So in the long-term, that will help.

In the short-term, a declaration today or sometime very soon of that -- of these waters as ONRWs could have some potential -- could create some potential difficulties for the Game and Fish Department, I think,

potentially.

Because I know there's at least one public member out there that has a strong belief that the use of Fintrol is much more long-lasting even with the addition of permanganate to deactivate it.

We've heard testimony in a number of these piscicide hearings that -- there's at least one verbal person out there that believes this stuff has a much more far-reaching, much longer half-life and does a lot more damage.

So, I mean, it's not something we could do something about, it's not -- I'm not suggesting that we deny the request because of that potential problem. I'm just pointing out that there's going to be a period of difficulty for some activities.

MS. LEAVITT: Commissioner Glass, can I address that?

MR. GLASS: Absolutely.

MS. LEAVITT: I think we need to separate out the piscicide application that is before the Commission. There are going to be pros and cons that are presented in that hearing.

I think the Commission, as it has, in adopting other standards and regulations -- you have an understanding of what that language means when you adopt

it, and so in your Statement of Reasons, you can discuss that the Water Quality Stand- -- Water Quality Standards Handbook interpretation has to necessarily be part of your understanding in adopting this ONRW.

And that may be the best way to address things in the short-term, knowing that we'll come before you again in the long-term.

MR. GLASS: Okay. Thank you for that.

MR. HUTCHINSON: I have one --

MS. ORTH: Wait. I'm going to let Commissioner Glass finish.

MR. HUTCHINSON: Oh.

MR. GLASS: I think Howard wants to expand on that point.

MS. ORTH: Oh, ex- -- okay.

MR. HUTCHINSON: One of the problems he has raised here to an earlier question that I had asked, as well as to what effect it would have on the potential for restoration activities, and that's a pretty broad-brush statement, but the Forest Service is currently in the process of doing its forest planning for that area, and under the Clean Water Act, federal agencies are very specifically commanded, they shall comply with state-developed water quality standards and designations such as ONRW.

So we -- we might have even a more immediate and long-term effect from the ONRW designation simply from the standpoint of the Forest Service developing its -- its forest plan.

If they were including things like prescriptive fire or forest thinning or any number of these other activities for watershed restoration, they would have to take consideration -- take into consideration the potential for degradation under the strict reading of our current regulations.

I just wanted to -- I don't know -- I don't know if that really requires an answer, but if you have a comment on it.

MS. LEAVITT: I do.

MR. HUTCHINSON: Okay.

MS. LEAVITT: Well, first of all, I think the answer that I provided to Commissioner Glass stands in this case, as well.

And I'd also like to point out that we are in -- we frequently communicate with the Forest Service on their plans to restore the watershed, and they generally defer to our agency, and also to the Commission, in interpretation of the standards that they're faced with implementing.

And so I think a clear statement from the

Commission in a Statement of Reasons would help them to understand that the activities that they're proposing that might provide a short-term degradation of water quality for long-term benefit are acceptable and that we would be working with them to make sure that the impacts are managed in the best way possible.

MR. HUTCHINSON: And I -- I would just go to the point that not all restoration is deemed acceptable by everybody, and persons who would have conflict with a proposed restoration activity would be given additional litigation and appeal capacity with this designation vis-a-vis the forest plan.

MS. ORTH: Thank you.

MR. HUTCHINSON: Thank you.

MS. ORTH: Commissioner Glass, other questions?

MR. GLASS: Yeah. Thank you, Madam Hearing Officer.

I -- there was some discussion, in fact, some significant discussion, in both the application and by the witnesses about some of the existing restoration activities ongoing in the Valle Vidal area, and specifically it was mentioned that one of the major impacts to stream quality is illegal off-road vehicle use.

The vehicles are out there on two-track roads, on trails off-road completely, on virgin prairie, whatever, and that Amigos Bravos has been working with a 319 grant, I think, to implement some control strategies for that activity.

And I'd just like to know how successful -- I'd like maybe a little -- a tiny bit more detail about what control strategies Amigos Bravos has implemented, how successful they've been, and what -- who bears the restoration responsibility if those programs aren't successful and water quality degradation results.

Three-part question.

MS. LEAVITT: Commissioner Glass, I'll try to give you an overall answer, which is the panel that's going to come up after ours, the panel, the Coalition for the Valle Vidal, they might be better able to discuss the project specifics with you.

On our panel, we don't have someone who --

MR. GLASS: Right.

MS. LEAVITT: -- is representing the 319 program, so I can't give you specifics, except to tell you that those projects have generally been successful. The projects that we're implementing in the Valle Vidal have generally been successful.

We are spending a large amount of money in

that area to ensure that this, you know, beautiful and clean area is protected for the future.

MR. GLASS: And if -- I guess it would be appropriate to ask this panel. If the off-road activity control strategy is less successful than hoped, and there's detectable water quality degradation as a result, who's responsible for -- who would be responsible for restoring that?

Would it be the Forest Service? Would it be Amigos Bravos who tried to accomplish it and didn't? I mean, what -- who would bear the financial responsibility for totalling preventing impacts to the water?

MS. LEAVITT: Commissioner Glass, I believe it would be the Forest Service's responsibility to manage their lands in a way that mitigates impacts and prevents additional impacts.

MR. GLASS: And as Commissioner Hutchinson stated, they're bound by federal law to do that, which -- okay. That's -- the other area that was mentioned is -- and maybe I should wait again, but I would like to at least ask you folks for your view about cattle grazing.

Cattle grazing, apparently, is a traditional use up there in the Valle Vidal, and has continued even

as recreational opportunities have burgeoned. My understanding is that the cattle permittees are working cooperatively, all of -- all of them or most of them are working cooperatively, using -- in fact, in the application, it was described that they're -- that they have -- I guess you would call them cowboys, that herd the --

MR. HUTCHINSON: Riders.

MR. GLASS: Riders, there we go -- that herd the cattle away from riparian areas so that they do less damage to, say, wetlands and so on, and are kept in the upper meadows where they're there -- their impact is more mitigated.

My question would be, has there been any concern expressed by these cattlemen about maybe added expense for managing their cattle in that way or maybe decreased rate of growth or quality of beef or whatever like that -- any concerns about -- that you've heard -- that any of you might have heard about from the cattlemen about negative impacts?

MS. LEAVITT: Commissioner Glass, again, I'm going to give you a two-part answer.

The cattle grazing that's going on in the Valle Vidal I would characterize as using improving management practices. I think things are getting

better. That's my understanding from talking to our staff that are working in that area. Things are moving in a positive direction in terms of protection for water quality.

In terms of concerns raised by the cattle grazers in this area, they aren't here at this hearing, I guess at this point, to talk about that.

The grazing permittees are part of the Cimarron watershed group, which is a very, very active watershed group in this area, and I know that that watershed group has had a number of discussions about ONRW designation. Our Department has briefed them, and I know that they have posted the documents on their web site.

It's my understanding that they have taken a neutral position on ONRW designation. It's a very diverse group, and so representing all those interests in one statement, I think, has been difficult for them.

But that's the extent of my knowledge of what's going on. They are aware of what's going on, and they have taken a neutral position.

MR. GLASS: Well, okay.

I guess I only have one last question for -- for Mr. Fesmire. Actually, it was Mr. Lackey that said that the mineral rights under the Valle Vidal belong to

the people of the United States.

And so it's -- just for clarification, how is it -- what is the legal procedure for El Paso Company to gain access to those -- to that gas, if it belongs to the people of the United States?

And would there be a royalty that would have to be paid to the people of the United States or the citizens of Catron County, or whatever, in addition to the severance taxes that would have to be paid?

MR. FESMIRE: Yes. Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, you're absolutely correct. The mineral rights under the Valle Vidal belong to the federal government.

The process -- and this is a real abbreviated version, but basically, El Paso, or any other interested company, would nominate this area to -- to the federal government and tell them, basically, "We have an interest in leasing it."

Then they would go through a leasing process. The extent of that process depends on how many people are interested and things like that.

But basically, once that lease is acquired, they would pay some sort of a bonus to the -- to the federal treasury. Then the royalties that are produced would be paid to the federal government, but half of

which would come back to the State of New Mexico as a royalty to the State on federal government -- on federal government lands in the state.

MR. GLASS: And that would be in addition to the severance taxes that the State collects?

MR. FESMIRE: That's absolutely correct.

MR. GLASS: And, you know, I again read Mr. -- Dr. Power's analysis and did not see any mention of those royalties.

MR. FESMIRE: Right.

MR. GLASS: Was it considered?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, it's my understanding, after rereading Power's report last night, that he lumped all cash flow out of that in the $18,000,000 figure per year, and that the royalty wasn't separated out from that.

MR. GLASS: Okay. So it was accounted, then, and --

MR. FESMIRE: That's my understanding in Dr. Power's report.

MR. GLASS: Okay.

And just it struck me -- I don't -- I don't need an answer to this, but in rereading Power's report here, it struck me that for the period of time during

which the coal bed methane extraction would be occurring, it would be an influx to the local economy of approximately double what the estimated recreation influx is, and we heard estimates of something like $2,000,000 a year coming in from recreation, hunting, fishing, bird watching, et cetera, and for 20 years or so, the local economy would enjoy a $5.1 million income in addition to some addition -- possible additional support to schools and so on through severance taxes and royalties and so on.

So while I recognize the temporary nature of that economic benefit and the possibility of long-term impact on the sustainability of the recreation resources, I still think it's maybe something that should be acknowledged.

So go ahead.

MR. FESMIRE: Would you like me to respond, Mr. --

MR. GLASS: Sure.

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, yes. I think in the short-term that's what Dr. Power's study says.

I think we -- we, in this designation, have an obligation to consider that very fact. It's not, I think, a point of decision for the Commission. I think

it just has to be considered in the ONRW designation.

MR. GLASS: It does indeed. Since we're setting a standard, we're required to consider about nine different things in the -- in the act, so -- and economic impact on the area is one of those, so --

Thank you very much, Madam Hearing Officer.

MS. ORTH: Thank you, Commissioner Glass.

Commissioner Price.

MR. PRICE: Yes. I have -- want to reiterate a question, I think, maybe I had asked yesterday.

I'm a little bit confused on the ONRW nontraditional uses of the area. And we -- I think we all recognize the traditional uses of hunting, fishing, hiking, cattle grazing, so forth.

But if somehow or another a nontraditional user gets a permit or gets permission from the land owner, which is the Forest Service, within this geographic area -- I guess I -- two questions.

Number one, is it totally prohibited through the Clean Water Act? And if it's not totally prohibited, what permit mechanism or what mechanism would either allow it or monitor it?

MS. LEAVITT: Commissioner Price, could you be more specific about what you mean by nontraditional use? Are you talking about oil and gas drilling?

MR. PRICE: It -- that could be, or, say, mining, for example, some sort of silver or gold mine, or just some other nontraditional use that we've been talking about here, which would be -- certainly, oil and gas would be one of them, or a mining activity, or maybe a power line, or just some other nontraditional use.

MS. LEAVITT: Commissioner Price, I'll try to answer your question.

The first question was would those activities be prohibited, and I believe the answer to that is no. They would not be prohibited as long as they were conducted in a way that did not degrade water quality and in accordance with whatever management plans and permits are required by the state and the federal government.

In the case of a mine, there are state mining rules that would govern that process. In addition, I believe that the Forest Service would have to include that activity in their management plan, and they would also provide some sort of rules for managing the activity.

Same would be true for other activities. There might be state regulations that would govern, and there would likely also be federal regulations that would govern.

And in addition, we would be looking at water quality to make sure that water quality was not degraded in the area.

MR. PRICE: Speaking of water quality, how would you go about doing that? Would that be through a permit process?

MS. LEAVITT: Commissioner Price, no. There wouldn't be a -- well, I guess it would depend.

If it was a point source activity, there could be an NPDES permit involved in the activity. Right now, that permit would be issued by the federal government. We hope that in the near future those permits will be issued by the state government.

And in terms of nonpoint source pollution, we would be using the tools that we use now, 319 funds to restore impacts that have already occurred and monitoring assessment activities to make sure that additional degradation doesn't occur.

MR. PRICE: Okay. Thank you.

MS. ORTH: Thank you.

I'll skip you for the moment.

Commissioner Bada, do you have questions?

MS. BADA: I have a couple questions for Mr. Fesmire.

Does the Oil Conservation Division regulate

road construction associated with oil and gas activities?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, not directly, no, ma'am.

MS. BADA: Do you have any authority to require reclamation?

MR. FESMIRE: On the roads themselves?

MS. BADA: Right, the roads themselves.

MR. FESMIRE: That is a question in my mind, Madam Commissioner.

MS. BADA: I'll pass for now.

MS. ORTH: All right. Thank you.

Commissioner Darden.

MR. DARDEN: I guess to follow up on that, with designation, would you have any authority to -- to provide for reclamation of roads or pad sites or --

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Mr. Commissioner, I believe that if we were to promulgate rules under this designation, we would have -- we would probably have that authority, but I have not -- I'm not sure of that.

MR. DARDEN: Okay.

I'd just like to state, I guess, that in the -- this document, it says it's a Public Discussion Draft, so there will be a final draft sometime, or is

there a draft, or what becomes of this document?

MR. PROPST: I think at some point, we will finalize this, and some of the comments that are received as they're appropriate will be modified appropriately to handle some of the comments, and if there's a specific, say, misstatement, and someone points out the correct information, certainly, they'll be included.

But yes, we do want to finalize this as a final document.

MR. DARDEN: I would just like to see, then, a little broader discussion of economic impacts. I don't -- the Farm Bureau yesterday pointed out a publication by New Mexico State that discusses agricultural impacts and such. Just a little more discussion of the economic impacts in the area.

MS. LEAVITT: Commissioner Darden, it's my understanding that the Commission is going to make a decision based on the record as a whole. The petition is one part of the record.

The comments that you receive from Ms. Abeyta and the Farm and Livestock Bureau are also part of the record --

MR. DARDEN: Right.

MS. LEAVITT: -- and we believe that you

should be considering those, as well, and that's really where that information is provided. And it's something that the Farm and Livestock Bureau has expertise on that we don't necessarily have expertise on.

But we want to make sure the Commission is clear that that document is part of the record and needs to be part of your deliberations.

MR. DARDEN: But I guess we've heard already that we don't have expertise in the tourism impacts, either. These are all numbers out of -- out of the 2001 national Fish and Wildlife Service publication.

So all I'm asking for is a discussion of that, as well, in this document.

MS. LEAVITT: We can definitely make changes to the document to reference the information provided by the Farm and Livestock Bureau. But you have that availability to consider that right now, I guess is my point.

MR. DARDEN: All right.

Thank you.

MS. ORTH: All right. Thank you.

Commissioner Goad.

MS. GOAD: Earlier today, you referred to an EPA handbook that interprets how states would administer ONRWs, and then you went on to say that we should be

referencing that handbook in our statements of reasons.

And I notice that our -- our counsel is not here right now, so what is the exact name of that handbook?

MR. SLOAN: Exhibit 2.

MS. LEAVITT: Commissioner Goad, the handbook is Exhibit 2 in the exhibits that were provided.

MS. GOAD: Oh.

MS. LEAVITT: And actually, it's an excerpt of the handbook, but the title page is included, and it's Water Quality Standards Handbook: Second Edition.

And we provided an excerpt from section 4, because that was the section that dealt with ONRWs. The handbook deals with many other issues, as well. But it is an exhibit that's provided for this hearing.

MS. GOAD: Okay. Thank you. Obviously, I haven't memorized all the exhibits.

In setting aside areas as outstanding national -- ONRW -- Outstanding National Resource Waters, is one of the ideas to protect it for the good of all the people, so that it will have public access and -- well, what I'm thinking about is that this past summer, I went with various family members to a number of national parks and monuments, and I have absolutely no connection with people who set those aside, but I

feel as if it was a great benefit to me to have them set aside.

And is -- is that one of the things that the petitioners have in mind to -- to -- that we all benefit, and it's not just the people who live up there right now, that work on it right now? We all benefit into the future?

MS. LEAVITT: Commissioner Goad, one of the bases for presenting this proposed ONRW designation is to acknowledge and protect the ecological and recreational attributes of the area, and that's been part of the discussion, that was part of our direct testimony yesterday, discussing ecological and recreational significance.

So those attributes would be protected by ONRW designation, and it's my belief that those attributes are a benefit to the state as a whole and probably other people coming from other places to visit New Mexico, as well.

MS. GOAD: Thank you.

MS. ORTH: Thank you --

MS. GOAD: That's all.

MS. ORTH: -- Commissioner Goad.

Commissioner Vigil.

MR. VIGIL: Yes. I have a few questions.

Ms. Leavitt, you said that the -- that there's being money -- substantial amount of money being spent at this time on restoration projects.

Maybe this isn't the correct panel, maybe I should wait for the other panel, but is this 319 money that's being spent in this area at this time?

MS. LEAVITT: Commissioner Vigil, when I spoke of significant money, I was speaking about 319 money that's being spent in the area. Yes.

MR. VIGIL: And, Mr. Fesmire, on your direct testimony, you said there's approximately 1,400 active cases of contamination caused by oil and gas operations and associated fluid releases.

Of these 1,400 active cases, how many are currently in the Valle Vidal?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, Valle Vidal has not been developed yet, so there is no oil and gas activity out there, and so I would say none of these sites are on Valle Vidal.

MR. VIGIL: In the area, is there any --

MR. FESMIRE: Are you speaking of Vermejo Ranch?

MR. VIGIL: Vermejo Ranch.

MR. FESMIRE: I don't have that figure before

me, Mr. Commissioner. I'm sorry. It would be relatively small.

MR. VIGIL: It would be relatively small for that area?

MR. FESMIRE: Yes. There is a small -- like I said, they've only got about 300 wells up there right now.

MR. VIGIL: In that -- to follow up on that, is El Paso Natural Gas -- have they applied to the Forest Service to do any drilling on the Valle Vidal?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, as of right now, I think the only thing that they have done is stated their intent to nominate Valle Vidal for -- for leasing.

MR. VIGIL: For leasing.

So at this point, if we designate it as an ONRW, what would that do to this application, I guess, or intent to apply?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, I don't believe that it would have any effect. I've -- I've heard just by way of scuttlebutt that El Paso may no longer be interested in this. I don't know where they stand.

But this designation would affect, as of right now, nothing in process that I know of.

And I need to point out that designation as an ONRW does not preclude gas development up there. It just sets a standard by which we would have to comply in our -- in our permitting.

MR. VIGIL: I think, like I say -- Howard took a lot of my questions, also, but it's very welcome. Like I say, I think I'll wait for the other panel to come on board to ask any future questions.

Thank you.

MS. ORTH: Thank you.

Commissioner Sloan.

MR. SLOAN: I'll ask a few questions.

I guess this question I should ask Dr. Propst.

Yesterday you were asked about comparable areas in the state and is this Valle Vidal just another beautiful spot, and you listed out several places of which were wilderness.

Is there another place that has comparable access and provides the same recreational value in terms of elk hunting, catching Rio Grande cutthroat trout, wildlife watching, that sort of stuff?

MR. PROPST: Commissioner Sloan, no, there is not, as far as I'm aware.

MR. SLOAN: This next question is probably for Ms. Leavitt.

Does designation preclude any activity or only limit the ability to degrade or pollute?

That's as straightforward as I can ask that question.

MS. LEAVITT: Commissioner Sloan, ONRW designation does not preclude uses or activities. What it does is it sets a standard for protection of water quality.

MR. SLOAN: Thank you.

And, Mr. Fesmire, you may or may not know the answer to this question.

Does Vermejo Park Ranch have permanent employees dedicated to monitoring the wells?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, yes, they have a significant staff whose job is just to monitor the oil and gas activities on the ranch.

MR. SLOAN: And can you make a comparison on either the federal or state's ability to monitor a similar development project on the Valle Vidal relative to what's happening on Vermejo Park Ranch?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, I can answer that by the statement that both us and the feds are understaffed. The Oil Conservation Division is significantly

understaffed and would not be able to provide the level of supervision that Mr. Turner provides on his ranch.

MR. SLOAN: Does Mr. Turner provide daily review in the state, or maybe weekly or monthly, at best?

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Mr. Commissioner, weekly or monthly would be nice. It's nowhere near what we would be able to provide.

MR. SLOAN: Thank you.

One last question probably again for Ms. Leavitt.

What happens or is the purpose of the petition after this body makes a decision? Does it have any purpose, the document itself?

MS. LEAVITT: Commissioner Sloan, yes. Once -- if the Commission approves the petition and designates this water body as an ONRW, then it becomes part of the standards, and the ONRW provisions, the no degradation beyond the existing water quality provisions, would kick in at that point.

MR. SLOAN: Maybe I'm not asking the question right.

I mean the actual document petition, requesting to make it an ONRW -- does this document do

anything after we've made a decision and it's placed in the standards as an ONRW?

MS. LEAVITT: Commissioner Sloan, the document is part of the record for this hearing. Beyond that, it doesn't have any long-term purpose except to give people an idea of what was discussed at the hearing.

MR. SLOAN: So it initiates the process, but the final act is getting it into the standard as an ONRW?

MS. LEAVITT: That's correct, and developing a Statement of Reasons to support the Commission's decision.

MR. SLOAN: Thank you.

MS. ORTH: All right. Thank you.

We turn to the two commissioners who are joining us today.

Commissioner Murray, do you have any questions?

MR. MURRAY: Yes, Madam Hearing Officer.

Not to be repetitious, were there any questions asked regarding Comanche Creek from the Commission?

Ms. Leavitt, does Comanche Creek currently meet 20.6.4.9 B.(3)?

MS. LEAVITT: Commissioner Murray, I'm going

to defer that question to Ms. Guevara. She provided the testimony on water quality.

MS. GUEVARA: Just give me one second, please.

Yesterday I provided testimony specifically on Comanche Creek, and I'm just going to look to it.

And you have a copy of it. Mr. Moore provided that this morning.

MR. MOORE: Just as a note, that's Exhibit 50, for the Commission to follow along.

MS. GUEVARA: Comanche -- oh, sorry. It's page 4 of my testimony, at the top, first paragraph.

Comanche Creek met the B.(3) criterion for everything but temperature.

MR. MURRAY: And that's -- excuse me -- Exhibit --

MR. MOORE: Exhibit 50.

MR. MURRAY: -- 50? Okay.

MR. MOORE: Page 4.

MR. MURRAY: Okay. Thank you very much.

MS. GUEVARA: You're welcome.

MS. ORTH: Other questions?

MR. MURRAY: No.

MS. ORTH: All right.

Madam Chair, Chairwoman Moore has been -- excuse me. Oh.

MS. JOHNSON: I'm sorry, Madam Hearing Officer. I relinquished my right to questions yesterday because I was going to have an opportunity for a few this morning.

MS. ORTH: Certainly, Commissioner Johnson.

MS. JOHNSON: My first question is for Mr. Fesmire.

You've given some testimony both in writing and orally yesterday regarding the possible effects and impacts from development of coal bed methane and releasing pollutants to the surface and the subsurface, but there's been very little discussion and information provided on the geologic environment and what actually happens during coal bed methane development.

And I was wondering if you could provide a little bit more information, kind of describing the geologic environment, where the coal bed methane resource occurs in the environment, and what happens to the geologic environment during the process of developing the resource.

MR. FESMIRE: Madam Hearing Examiner, Madam Chairman, Madam Commissioner, coal bed methane is, as the name infers, methane gas that is physically adsorbed to the coal. It only occurs in a narrow pressure band that occurs from about a thousand feet deep to about

20 -- 2,500 feet deep. Sometimes it will go lower, sometimes it will be a little shallower.

But generally, we're looking at Fruitland coal in the Raton Basin up there, or the equivalent of the Fruitland coal in the San Juan Basin. I'm not exactly sure what it's called over there.

What it amounts to is this coal is filled with water, and water maintains the pressure necessary to keep the gas molecules adsorbed to the coal. In order to produce the coal gas, you have to dewater or significantly lower the pressure in that reservoir to the point where the molecules actually separate from the coal.

The water that we have in the Raton Basin is generally not what we would call usable water. It's slightly higher -- although it's high quality water for an oil and gas op -- oil or gas operation, it's probably not usable as is.

On the Vermejo Ranch, they currently inject that water, once they produce it, into a deeper horizon. You can't take it out and put it back in the same horizon because that would -- that would defeat the purpose. You'd just be maintaining that pressure.

The purpose behind dewatering the coal is to lower the pressure to the point that the gas desorbs and

starts being producible in a -- in economic quantities.

The reserves that we have found up there -- I did a -- actually, I had somebody that works for me do a study to find out what kind of reserves we could expect, and our numbers show that there's a significant variance.

Some of those wells up there will produce very little gas, but they're very important because of the dewatering aspects. Some of them will produce significantly more gas. But it looks like we're going to average somewhere around 230,000,000 standard cubic feet per well.

Today, gas is moving out of there at 1,350 a thousand standard cubic feet. We don't expect that price to -- to stay that high. This is a pretty high price. And we think it's going to be short-term.

Dr. Power, in his report, estimated the reserves between 150,000,000 cubic feet per well and 300,000,000 cubic feet per well. So we think we're in the same neighborhood, and we think it's kind of reasonable.

Does that answer your question, Madam Commissioner?

MS. JOHNSON: I have just some follow-up questions.

During the process of dewatering, does -- how does that affect, and is it a permanent effect, on that geologic strata? I mean, the reason that you're dewatering is to also improve the permeability of that unit, so that the gas can be extracted; is that correct?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, not exactly. Actually -- lowering the pressure actually will allow the cleats in the coal to somewhat heal. So there is a -- a negative effect with respect to the -- to the pure permeability of the rock as you lower that pressure.

Is that the question that you're --

MS. JOHNSON: Partly.

And I'd just like to get a better understanding of physically what's happening and its -- the permanence of the condition in the strata.

Once that -- the liquid is pumped out, is this strata changed forever? Is it a permanent condition?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, the -- in New Mexico, we believe -- and the jury is still out on this, but it looks like that the coal bed methane -- that the recharge back to that -- to that coal -- the water recharge back to that coal is relatively slow.

This is not true in other states, in other

places where coal bed methane is -- is produced. In some places in Wyoming, the water that they produce is virtually pure, and it's probably in communication with some of the usable aquifers. We don't think that happens in New Mexico.

The State Engineer's Office has -- may have a slightly different opinion. I know we've had this discussion -- I've had this discussion with some of their hydrologists.

But the major effect is that the water is permanently removed and may or may not recharge.

MS. JOHNSON: And that condition, Mr. Fesmire -- does it affect the hydrologic conditions in the subsurface, such that deeper stratas -- deeper water-bearing strata that may contain low quality water are now allowed to be in communication with the near surface?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, any time you change pressure significantly, you have the opportunity for communication between other aquifers -- I mean, any time you change conditions down-hole, you have the potential to -- to have a change like that.

I haven't -- I am not aware of anyplace where that actually happens in New Mexico, but there is

significant potential for that.

MS. JOHNSON: And that -- so just to recap and clarify, you're saying that there is a -- would you call it a significant potential for a permanent alteration of the hydrologic conditions in the subsurface such that low quality water would come into communication with the near surface and even surface waters over -- in a permanent state of hydrologic change?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, there is that potential. Like I said, in New Mexico, I'm not aware of that happening.

MS. JOHNSON: At some point during the discussion yesterday, and I think it might have been you mentioned the term "cavitating."

Can you define what you mean by that term, and is it applicable to the conditions in the Fruitland coal outcome?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, it's a stimulation process where they get fluids flowing across the face of the well floor at such a velocity that they are actually non-Newtonian type flows, where they -- they're turbulent.

And that -- that's the process that they found

to be most effective in stimulating the coal bed methane wells in New Mexico.

It's a relatively expensive process. You have to provide the fluids, either gas or in some cases a liquid to do that. But it -- it's proven to be highly successful, especially in the Raton Basin.

MS. JOHNSON: On page 19 of the petition, at the top of the page, the first full paragraph, there is a sentence that says, "Along the Fruitland Coal Outcrop, early methane production led to 'uncontrolled seeps of flammable and toxic gases, underground coal fires, large-scale vegetation die-off and contamination of groundwater, domestic wells, and homes.'"

This is a quote from the Denver Post on June 7th of 2000.

And while I wouldn't call the Denver Post exactly a scientific literature, is there any other good science that documents these types of conditions in the Fruitland Coal Outcrop, for example, on Vermejo Ranch or La Plata County?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, this is documentation of some events that occurred in Colorado where the -- where the outcrop -- where the controlled outcrop to the atmosphere -- they start lowering the pressure down

where the pressure is high enough for the coal to be adsorbed, and you start getting mobile gas flowing up to those outcrops, and these events could very likely occur.

MS. JOHNSON: And does that occur by the gas flowing along the well casing or just up through the geologic strata, along the paths of least resistance?

MR. FESMIRE: There have been incidences where the same sort of thing occurred in older well bores, deeper well bores that went through the coal, that were not properly cemented. I'm familiar with a couple of -- I'm familiar with a couple of cases in Colorado.

But I believe this was talking about events that occurred along the outcrops of the coal, when they started degassing -- or dewatering the coal at deeper depths.

MS. JOHNSON: And so that's something that is not -- I mean, it's -- it's caused by dewatering of that geologic strata, but it's something that occurs along natural geologic boundaries and not -- can be like cased off by a different technology in the wells?

It is not something that improved technology can prevent or even predict, it's something that is an inherent risk to the development of the resource?

MR. FESMIRE: Madam Chairman, Madam Hearing

Examiner, Madam Commissioner, it's going to occur where they're dewatering coals where you have a direct up-dip, continuous permeability to the outcrop. Like I said, it can happen along old well bores, things like that.

I think for the most part, we have a good enough handle on the geology up there now that this kind of thing could be predicted, or at least the potential could be predicted.

MS. JOHNSON: And does that potential exist, would you say, given the geologic conditions on the Vidal Unit?

MR. FESMIRE: Madam Commissioner -- Madam Chairman, Madam Hearing Examiner, Madam Commissioner, I know that the coal does outcrop out there. I am not familiar enough with the local geology, the specific geology where these conditions would exist to -- to guess about that right now.

MS. JOHNSON: Okay. Let's see.

I have one more question, and it might be -- you tell me who's the best person to respond. It might be Ms. Leavitt or the entire panel.

There's been some discussion about how the ONRW designation might affect future activities on the Valle Vidal, and I'm curious, also, how it might affect the Department's future involvement in the unit and how

this -- how it would affect the working relationship between the Forest Service and the State.

And part of this question is they're -- better given to a Forest Service person, but since you're one-half of the equation, how do you see it affecting the State's working relationship with the Forest Service on any kind of activities and long-range management plans?

MS. LEAVITT: Commissioner Johnson, I believe that it would strengthen our position in Forest Service planning. I think that -- I think we would just have a stronger position in advocating for water quality in Forest Service decisions.

MS. JOHNSON: That's all for now. Thank you.

MS. ORTH: Thank you, Commissioner Johnson.

Commissioner Hutchinson.

MR. HUTCHINSON: I just have one. I wanted to wait until everybody got done this time.

Marcy, just as a follow-up on several questions that were asked about Exhibit 2, the EPA handbook, has the Commission adopted that into any of our regulations or recognized that as guidance, for any of our purposes?

MS. LEAVITT: Commissioner Hutchinson, I was involved in the last triennial review, and I know that

this document was referenced and was an exhibit in those proceedings, so the Commission has taken notice of this document.

Whether or not it's referenced in the Statement of Reasons for the triennial review, I don't recall.

MR. HUTCHINSON: Okay.

Thank you.

MS. ORTH: All right.

Oh, excuse me. Commissioner Bada.

MS. BADA: I just have a couple of questions for Mr. Fesmire.

You mentioned that, you know, the estimate on the life of a coal bed methane field is 10 to 20 years.

Is that the life for production? And how does that relate to how long it takes to develop the field?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, that refers probably to the life of a single coal bed methane well. How long the field will last depends on how fast you develop those wells, how fast you're going to drill it up.

Coal bed methane is an -- especially when you consider other types of oil and gas drilling, is a very low risk type endeavor, because you know the coal is going to be there. Once you've established production

there, you know conditions are right to establish production.

So once the field's been found, you generally have a lot of opportunities for development. That's why you see these companies announcing these big, you know, hundred- to thousand-well development programs, because they know specifically that the risk is very low.

The coal -- they've got a good handle on where the coal is, and they know once they sink one well into it, that the conditions, at least locally around that well, exist for coal bed methane being developed.

So the 10 to 20 years probably refers to the individual wells. The field depends on how fast you develop it.

MS. BADA: Does the amount of employment that's available differ from the initial development of the field compared to later when they're just producing?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, yes. You know, a drilling rig generally will have a pusher or supervisor and at least three- or four-man crews. They're probably going to run as quick as they could, although coal bed methane is a slightly different deal.

And, you know, there's an awful lot of employment while they drill on the wells. Generally

when they're producing, the well will be visited, you know, once a day, with modern telemetry type techniques, maybe even not that often.

So you go from having, you know, at least 15 people there around the clock, or, you know, 15 people involved there around the clock, to one person who has to show up a day.

So yes. There's a significant change between the employment during development and the employment while that well's being produced over its life.

MS. BADA: Do you happen to know how much of the area of Vermejo has been developed, and any estimate on how much is left to be developed?

MR. FESMIRE: On Vermejo Park?

MS. BADA: Right.

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, I do know that El Paso intends next year to drill approximately a hundred wells. I don't know what their plans are past that. They have, I believe, somewhere around 300 wells on Vermejo Park now.

MS. BADA: Under OCD's current spacing rules, how many wells -- do you know how many wells they could potentially put in there?

MR. FESMIRE: You caught me on something I

should have looked up here before I came up here, Madam Commissioner. I believe it's on 160s. That may not be true. So we're talking four wells per square mile ultimately. Right now, there may be as few as one.

MS. BADA: Thanks.

No further questions.

MS. ORTH: All right.

Commissioner Darden.

MR. DARDEN: One more.

Ms. Leavitt, how will -- if the petition is granted, how will water quality monitoring in the area change?

MS. LEAVITT: Commissioner Darden, I believe Ms. Guevara yesterday testified that we are going to be in that area next year doing our routine water quality monitoring in the Canadian, and what we would do is we would expand that monitoring to include some of the areas that haven't been monitored very recently to make sure we have some baseline data for those areas.

So next year we would have expanded monitoring.

MR. DARDEN: And I guess that will be on an annual basis then?

MS. LEAVITT: Commissioner Darden, no. We don't have the resources to be monitoring on an annual

basis. So the monitoring will take place on a more frequent basis through the watershed restoration activities that are going on in that area.

Watershed restoration activities include a monitoring component. So when a project is implemented, there's water quality monitoring that generally takes place.

And the routine monitoring that we do will still occur on an eight-year cycle. That's what we're projecting, that we'll get to each watershed once every eight years.

Those are the resources that we have for monitoring the state's watersheds.

MR. DARDEN: That's it.

MS. ORTH: All right.

Commissioner Vigil.

MR. VIGIL: I have a follow-up on that.

By designating the Rio Santa Barbara -- I know that you were just saying that you're going to increase.

Do you anticipate -- by designating this as an ONRW, do you anticipate any more FTEs for your Department?

MS. LEAVITT: Commissioner Vigil, there is no money attached to ONRW designation, so there won't be additional FTEs that are available to us.

MR. VIGIL: I realize that, but what I'm asking is, do you anticipate having to ask for more FTEs if these two designations -- we designated the Rio Santa Barbara as an FT- -- or as an ONRW. With the designation of this one, do you anticipate needing more?

Because like you said, you just said that it's on an eight-year cycle. So to me, that would necessitate more people.

MS. LEAVITT: Commissioner Vigil, we need more FTEs, but we will not be asking for more FTEs at this time.

MR. VIGIL: Okay. Thank you.

MS. ORTH: All right.

Chairwoman Moore had a commitment in Farmington today, so our chairwoman today is Cindy Padilla, the Director of the Water and Waste Management Division.

Welcome.

MS. PADILLA: Thank you.

MS. ORTH: She's familiarized herself with the record to today so she can participate in the deliberations later.

But let me ask you, Madam Chair, if you have questions, and if they haven't been asked, of petitioner panel.

MS. PADILLA: Madam Hearing Officer, no, I don't.

Actually, I appreciate all the questions that have been asked because it actually helps me throughout this morning.

But I do have just one question, I guess, for Mr. Fesmire on the economic analysis.

And I understand from the discussion, also, and the questions that perhaps -- I guess, is it your testimony -- and I read your presentation, and I was also listening to the questions -- your testimony, though, that the overall economic impact long-term for a designation of ONRW for this particular area is actually more beneficial than -- to the state than the short-term gain that would be realized by mining or wells? Is that correct?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, I believe that that was the result of Dr. Power's report, the report that was referenced in my testimony yesterday.

MS. PADILLA: Thank you.

MS. ORTH: All right.

Any other questions?

Commissioner Hutchinson.

MR. HUTCHINSON: Yes.

Just as a follow-up on that, on page 4 of Dr. Moore's (sic) paper, last paragraph, and the next to last sentence, it says, "In the early 1980s, these sources represented almost half of the state general fund," referring to oil and gas production.

But what -- what is the present percentage?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Mr. Commissioner, the present percentage -- it's, of course, going to be increasing, because prices are going up, but when you count bonuses paid to the -- to the land office, the royalty paid to the land office and direct taxes on oil and gas, it's somewhere between a third and a quarter now, I believe, sir.

MR. HUTCHINSON: Okay.

It said that it was almost a half here, so it's gone down?

MR. FESMIRE: Yes, sir. Not -- not -- the oil and gas business is cyclical. The early 1980s was another good time, the mid to later 1980s wasn't.

MR. HUTCHINSON: Oh, okay. So we're back -- you know, we had a crash, and now we're on a curve back up. Okay.

MR. FESMIRE: Yes, sir.

MR. HUTCHINSON: All right. That adds a lot to this economic report, by exclamation.

Thank you.

MS. ORTH: Other Commission questions?

All right.

Mr. Schlenker-Goodrich, I understand you have questions of the petitioner panel, and if you'll trade places with Mr. Moore.

MR. SCHLENKER-GOODRICH: Thank you.

CROSS EXAMINATION

BY MR. SCHLENKER-GOODRICH:

MR. SCHLENKER-GOODRICH: Good morning, Madam Chair, good morning, Madam Hearing Officer, Commissioner.

I just have a few questions for you guys.

Ms. Leavitt, I'd like to step back to the 1998 triennial review process and specifically discussions between the EPA and NMED concerning Outstanding National Resource Water designation.

Do you recall?

MS. LEAVITT: I was not part of the Surface Water Quality Bureau at that time, but I do have sort of a general knowledge just from talking to staff about what happened at that time.

MR. SCHLENKER-GOODRICH: And is it your understanding that EPA, in communications with the State, indicated that the State was somewhat

recalcitrant in nominating ONRWs?

MS. LEAVITT: That's correct. It was noted as a deficiency in the state's water quality standards.

MR. SCHLENKER-GOODRICH: Did the EPA indicate that if the State was unwilling to start designating ONRWs and to make progress towards doing so, that EPA would potentially exert jurisdiction over this issue?

MS. LEAVITT: It's my understanding that EPA was concerned that the ONRW nomination process might be too cumbersome, and so if the process wasn't demonstrated to not be cumbersome or made less cumbersome, then EPA might step in.

MR. SCHLENKER-GOODRICH: A more sort of opinion, qualitative question.

When you look at all the waters in the State of New Mexico, and if you consider them sort of on a continuum of most definitely would be ONRW versus the ones that are obviously not qualified for ONRW, would this -- would you consider the waters of the Valle Vidal the low-hanging fruit on that tree?

MS. LEAVITT: I guess I'll answer in a way that makes more sense to me, which is the waters of the Valle Vidal, in my mind, are some of the most obvious waters to, I guess, request ONRW designation for.

MR. SCHLENKER-GOODRICH: Thank you,

Ms. Leavitt.

Turning to another issue, there were some questions raised -- Commissioner Hutchinson raised -- I think raised very good questions dealing with the Wild and Scenic Rivers Act and the fact that these waters were eligible for protection under the Wild and Scenic Rivers Act.

Those designations are not permanent, rather they are simply eligible; is that your understanding?

MS. LEAVITT: That's correct.

MR. SCHLENKER-GOODRICH: Do you know any of the background in how those rivers actually became eligible? That's a Forest Service duty, if I'm not correct, to go through studies to determine whether or not they're eligible?

MS. LEAVITT: I believe that there might have been some threat of litigation or there was litigation between one of the environmental advocacy groups in the State and EPA -- or the Forest Service.

MR. SCHLENKER-GOODRICH: And have they moved forward beyond that initial eligibility determination?

MS. LEAVITT: Not to my knowledge.

MR. SCHLENKER-GOODRICH: So these are merely temporary protections at this time? Is that your understanding?

MS. LEAVITT: That's my understanding.

MR. SCHLENKER-GOODRICH: Now, dealing with the overlap between the Wild and Scenic Rivers Act and water quality standards, do those -- are those -- do they fit exactly over each other?

MS. LEAVITT: I actually did a little looking into this based on questions yesterday, and no. They -- there isn't duplication between the ONRW designation and the Wild and Scenic Rivers Act.

They have potential to look at water quality, but the Wild and Scenic Rivers Act actually looks at other attributes and may not -- and isn't required to look at water quality.

The Wild and Scenic Rivers Act could protect a stream based on its beauty or the fact that it has a certain class of rapids that people use and without any consideration of water quality at all.

MR. SCHLENKER-GOODRICH: So can you clarify that? So if there was for one of the values that the river was designated for, there could potentially be water quality problems and violations that the Wild and Scenic Rivers Act would have absolutely nothing to do with?

MS. LEAVITT: That's correct.

MR. SCHLENKER-GOODRICH: And are you aware of

anywhere in the state where -- well, I'll be more specific.

Are you aware of situations in the Red River watershed?

MS. LEAVITT: Yes. It's my understanding that the Red River watershed has been designated as a wild and scenic river.

MR. SCHLENKER-GOODRICH: And what -- in 1968, if I'm correct?

MS. LEAVITT: That could be.

MR. SCHLENKER-GOODRICH: With the Red River, have the NMED -- have you guys seen water quality problems from the Molycorp Mine, that there has actually been reductions in water quality despite the fact that there is a wild and scenic rivers designation?

MS. LEAVITT: There are water quality problems in the Red River area.

MR. SCHLENKER-GOODRICH: Thank you, Ms. Leavitt.

Another question. There was another question raised about the prevalence of public lands in the state as an issue for private development.

And in Colfax County, what major federal public land units are in the county?

MS. LEAVITT: I believe the Valle Vidal is the

main public land that's available in that county, and the rest of the lands are under private control.

MR. SCHLENKER-GOODRICH: Dealing with the ONRW designation, and taking a look at it in sort of as protecting public lands and protecting the waters of the Valle Vidal, and looking at the antidegradation, and just to clarify -- I think there was some clarification today -- can you just sort of succinctly define -- or talk about the relationship between use of the Valle Vidal and the antidegradation policy and what antidegradation is intended to do?

MS. LEAVITT: The antidegradation provisions are intended to ensure that water quality is not degraded below the quality level that it is at at time of designation. ONRW designation doesn't address specific uses, it doesn't preclude uses, it doesn't encourage uses.

The ONRW designation is focused on water quality protection.

MR. SCHLENKER-GOODRICH: And taking a look at the Valle Vidal, are you aware that the Valle Vidal -- Valle Vidal functions as headwaters of both the Costilla and Cimarron watersheds?

MS. LEAVITT: That's correct.

MR. SCHLENKER-GOODRICH: And what communities

are downstream from the Valle Vidal?

MS. LEAVITT: Oh. That's a geography lesson.

MR. SCHLENKER-GOODRICH: I have a map to provide you.

Would you mind?

MS. LEAVITT: That would be great.

Just looking at the map, it looks like Springer could be downgradient, Costilla, Cimarron, Amalia. There are a number of communities that are downgradient.

MR. SCHLENKER-GOODRICH: And if you're protecting the headwaters -- the water quality in the headwaters of the Valle Vidal, would you see maybe perhaps a direct benefit but even an indirect benefit to these communities in terms of their ability to proceed with private development in those communities, because water quality in the headwaters is protected?

MS. LEAVITT: In any place in the state where water quality in the headwaters is protected, there is a benefit to the downstream communities on that river system.

MR. SCHLENKER-GOODRICH: Would they even have the ability -- because the water is specially protected in this area, they might even have more of a capacity to develop in those communities than would otherwise be

available?

I know there are site-specific -- you know, subject to your site-specific review of any project?

MS. LEAVITT: I think what you're getting at is that if water quality is very high, and that water flows down to a community, then when you look at load allocation for point sources and nonpoint sources, there's more load to allocate, and, therefore, there is the ability to develop projects in those areas.

If water quality is poor, there is less pollutant load to allocate, and so there might be more limited abilities to develop projects.

MR. SCHLENKER-GOODRICH: Thank you, Ms. Leavitt.

One final question for you.

How many letters of support did you receive for the Valle Vidal nomination?

MS. LEAVITT: It was more than 70. I don't know the exact number. I believe it was 74.

MR. SCHLENKER-GOODRICH: And a follow-up question, how many did you receive in opposition again?

MS. LEAVITT: There were three that expressed concerns. Those were form letters. They were all the same letter signed by different individuals. And then there was a Farm and Livestock Bureau letter which I

would characterize as being more neutral.

MR. SCHLENKER-GOODRICH: And for all of those parties, all parties were provided with the opportunity to provide technical testimony today?

MS. LEAVITT: Yes, they were.

MR. SCHLENKER-GOODRICH: And from my understanding, the only party that had submitted a notice of intent to do so was the Coalition for the Valle Vidal?

MS. LEAVITT: And our --

MR. SCHLENKER-GOODRICH: And --

MS. LEAVITT: -- Environment Department, Game and Fish and Energy and Minerals.

MR. SCHLENKER-GOODRICH: Thank you.

Some questions for Mr. Fesmire.

Mr. Fesmire, taking a look at the state, oil and gas is a very important contributor to our economy; is that correct?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, yes, that is correct.

MR. SCHLENKER-GOODRICH: And could you discuss, taking a look at the state as a whole, in your position, what are the most important areas in the state for oil and gas development?

MR. FESMIRE: There would -- that would be the

southeast, down around Lee, Eddy, Roosevelt and Chaves Counties, and the northwest, the San Juan Basin, around Farmington, Aztec, that corner of the state.

MR. SCHLENKER-GOODRICH: And without putting you on the spot in terms of specifics, what kind of gas are we talking about here in terms of oil and gas, in terms of the volume and the benefit to the state, in those areas?

MR. FESMIRE: Well, the value is -- is roughly split 50/50, half the value comes out of the southeast, half the value comes out of the northwest. The northwest is by far more gas weighted. The south -- southeast produces -- produces more of the oil.

The State of New Mexico last year produced 1.61 trillion cubic feet of gas, of which about half a trillion cubic feet was coal bed methane. All of that came out of the San Juan Basin and the small part that can be attributed to the Raton Basin.

MR. SCHLENKER-GOODRICH: And when you take -- when you compare those areas to the Valle Vidal, you know, would the Valle Vidal -- are we talking small potatoes or big potatoes here?

MR. FESMIRE: Dr. Power estimated there would be somewhere between 75 and 500 producing coal bed methane well sites in the -- in the Valle Vidal. He

used an expected value of 191 sites.

Again, that's about half the value that we would be producing out of Vermejo Ranch. Compared to the oil and gas production from the other parts of the state, it would be very small.

MR. SCHLENKER-GOODRICH: Turning a little bit away from sort of oil and gas in terms of the economic benefits and looking a little bit more at impacts to the ecology of the area and the recreation of the area, you indicated that OCD does reclamation work or requires reclamation work --

MR. FESMIRE: That's correct.

MR. SCHLENKER-GOODRICH: -- as part of a permit.

Now, once that reclamation -- is there a distinction between reclamation and restoration? In other words, do your reclamation standards require that the full ecological health and integrity of an area is restored subsequent to oil and gas development?

MR. FESMIRE: I don't think that we could say that. I don't think that we -- I think we can make the statement that we're never going to get back to virgin.

MR. SCHLENKER-GOODRICH: And in terms of bonds, what is your perspective on bonds? Are the bonds that the oil and gas companies provide -- are they

adequate to deal with full reclamation and perhaps restoration in certain instances, though you indicated that's not really feasible?

MR. FESMIRE: The major focus on the bonds is to plug wells should the operator not be financially able to do that. The statewide bond in the state that most operators work under is $50,000.

When the OCD comes in to plug a well, our average cost will be somewhere between $14,000 and $15,000 per well, although since I've been here, we have plugged one well in the City of Bloomfield that cost us $130,000.

A $50,000 bond per operator, if we've got an operator with anywhere more than three wells, who becomes financially unable to plug that, it's going to take everything that the bond has to plug three wells, much less restore or plug any additional wells.

So are the bonds adequate? The answer is no.

MR. SCHLENKER-GOODRICH: So in other words, if reclamation provisions weren't sufficient to, say, restore water quality in the watershed, who would be responsible, then, for restoring water quality?

MR. FESMIRE: Okay. To the extent that we would have the money to do it, the Oil Conservation Division, if the -- if the operator becomes financially

inviable. That would -- that would fall to the Oil Conservation Division.

They would pay for it, to the extent possible, through what's called the Oil and Gas Reclamation Fund, which is based on a severance -- it's actually a severance tax on the product sold -- oil and gas products sold in the state.

MR. SCHLENKER-GOODRICH: And that same question I'd like to ask Marcy.

Would you anticipate increased responsibilities due to degradation caused by oil and gas development? Assuming that an ONRW designation would be put in place, would you have increased responsibilities? So in other words, taxpayer monies would have to be expended?

MS. LEAVITT: Well, I would say our burden would probably increase if ONRW designation was not put in place and oil and gas drilling proceeded through the forest management plan and was approved. Then, I think, yeah, our responsibilities would increase.

MR. SCHLENKER-GOODRICH: Thank you.

Mr. Propst, a few questions for you.

Could you perhaps respond to the distinction between reclamation and restoration and your view of reclamation? Is there a difference between reclamation

and restoration?

MR. PROPST: Are you speaking specifically to our work with fish or -- because --

MR. SCHLENKER-GOODRICH: I'm speaking more generally, but if you could illuminate that in the context of fish, that would be wonderful.

MR. PROPST: That's a good question. I'm not sure how to respond to it.

Restoration -- I guess let me start with restoration, and specifically fish. By restoration, we mean restoring the native fish that occurred in the system prior to any interference, direct or indirect, by humans. So that's restoration.

At least in the fish world, I'm not sure that we make a distinction between reclamation and restoration. And that can be extended through restoration to improve habitats.

If we've got areas where we have, say, elevated sediment loads that are caused by erosion from a road, restoration would be perhaps removal of a road, whereas reclamation would be actually putting in structures, perhaps realigning the road to diminish sediment transport into the system.

So that reclamation, at least in my mind, is more fixing the problem and allowing the -- say in this

example, the road to continue to exist, whereas restoration would be essentially removal of the road to restore a landscape to what it looked like prior to the road being there.

So --

MR. SCHLENKER-GOODRICH: Pivoting off that question and turning back to Mr. Fesmire, a question on that.

Does OCD require, say, an oil -- when an oil and gas operation is going to apply, understanding -- and please correct me if I'm wrong --

(Discussion off the record.)

MR. SCHLENKER-GOODRICH: Mr. Fesmire, my understanding is -- and again, correct me if I'm wrong -- that there are roads, utility lines, pipelines that are required to be put in.

Does OCD require an oil and gas operator to completely remove that road and restore the vegetation to its original state, or as close to it as possible, once the operations are completed?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, the answer to that is generally probably no. There will ofttimes be other uses for the roads and those right-of-ways. Ranchers start using them, things like that.

So generally, no. It depends on what we're negotiating with the operator and what's part of their permit.

MR. SCHLENKER-GOODRICH: Thank you very much.

No further questions.

MS. ORTH: Thank you.

Are there any other questions of the petitioner panel before we excuse them?

No. All right.

MR. HUTCHINSON: Oh, I did have one follow-up.

FURTHER CROSS EXAMINATION

BY THE COMMISSION:

MS. ORTH: Commissioner Hutchinson.

MR. HUTCHINSON: In regards to the question about the EPA stepping in to inter- -- interject itself in our ONRW process, would that stepping in have constituted designating ONRWs or merely prescribing the process and criteria for us to include in our standards?

MS. LEAVITT: Commissioner Hutchinson, that's a good question.

I know that the routine role that they would play would be to promulgate regulations and requirements, but since ONRWs are actually part of the standards themselves, I suppose that they could take a step further and actually work through the designation

process in designating ONRWs.

But I'm not sure about that.

MR. HUTCHINSON: But the controversy and what EPA was suggesting in the letters that were exchanged was that they were encouraging us to make our process a little bit more, let's say, user friendly and accessible to the public?

MS. LEAVITT: Commissioner Hutchinson, that's correct.

MR. HUTCHINSON: Okay. Thank you.

MS. ORTH: Thank you.

Any other questions before we -- Mr. Moore.

MR. MOORE: Madam Hearing Officer, members of the Commission, I may have a little limited redirect, but I need a few minutes to talk with some of my witnesses, if that's all right.

MS. ORTH: All right. Go ahead.

MR. MOORE: Actually, at this time, if I could, I'd go ahead and move the admission of Petitioners' Exhibits 1 through 51.

MS. ORTH: All right.

Are there any comments at all on the Petitioners' Exhibits 1 through 51?

We certainly consider them part of the record that you're deliberating on.

All right. Those are admitted, fully part of the record.

(Exhibits NMED 1 through 51 were marked for identification and admitted into evidence.)

MR. MOORE: If we could just take five minutes.

MS. ORTH: All right.

Let's take a five-minute break.

(Proceedings in recess.)

MS. ORTH: Let's come back from the break, please.

Let's come back from the break, please.

All right. We are back from the break.

Mr. Moore.

MR. MOORE: Madam Hearing Officer, members of the Commission, we actually have no redirect for these witnesses, so I have no more questions for them.

MS. ORTH: All right.

I understand that Commissioner Johnson had a follow-up question before we excuse the panel.

MS. JOHNSON: Thank you, Madam Hearing Officer.

I do have some additional questions that I'd like to direct again to Mr. Fesmire, in kind of continuing our discussion on the alteration to the

geologic environment during coal bed methane production.

When production wells are initially drilled into the producing formation, is there a process involved called fracking, and can you -- and it involves the injection of materials or fluids under pressure into the geologic strata to facilitate the release of the resource?

Can you describe a little bit more what happens during that process and what pollutants may be released to the environment during that process and what -- what you do with those contaminants long-term?

MR. FESMIRE: Okay.

Madam Chairman, Madam Hearing Examiner, Madam Commissioner, yes. There is a process called fracking. It's a process by which high pressure, high viscosity fluids are injected into the formation. The idea is to crack the rock.

These fluids also contain generally properties that are designed -- sands or some sort of high strength geologic material or sometimes synthetic material to keep those fractures open.

As you can imagine, when fluids, either gas or liquids, flow into a well floor, there is a significant pressure drop right around the well bore.

The idea of the fracture is to effectively

expand the size of that well bore and get that pressure drop to be reduced, because the amount of fluids you can produce in an oil and gas reservoir depends on the pressure drop between the reservoir extent, the far extent of the reservoir, and the pressure in the well bore.

So the fracking is intended to stimulate that.

The process that I was talking about a little while ago, cavitation, might be considered sort of an extension or a substitute for that process.

There have been claims that fracking has contaminated water. There was a famous court case in Alabama, and I think it -- at least in New Mexico, we have seen no evidence of that yet. I don't know about other states.

Like I said, there are other states where the coal bed methane reservoir may be in communication with the freshwater, and I can see where it might be a problem there. But so far in New Mexico, we haven't seen any evidence of that.

MS. JOHNSON: The fluids that are used during this process, do they include or incorporate any toxic pollutants?

MR. FESMIRE: They -- Madam Chairman, Madam Hearing Examiner, generally, they're water based with

additives such as surfactants and some other exotic chemicals that could be considered problems. Again, it's not so much a problem in New Mexico.

These fluids are expensive. The frac jobs are very scientifically designed with the intent of maintaining that fracture in the zone that it was intended to stimulate, because, like I said, it doesn't pay anybody to let these fractures -- frac jobs get out of control, although sometimes I can see where they might.

MS. JOHNSON: During -- after that process of fracking, is there any method by which the fractured material and the fluids that were used in the fracturing process are to be released back to the surface?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, yes. Like I said, these fluids are designed to be highly viscous going in. They may do what's called break. They break the viscosity down to where they have essentially the viscosity of water.

But they have fines and materials in them that you have to get out of the formation so that it doesn't plug the pores and so they -- the intention is to get that stuff back as quickly as you can. When it gets to the surface, it has to be stored, it has to go into pits

or tanks.

MS. JOHNSON: And is it retained on-site in those pits or tanks, or is it removed?

MR. FESMIRE: Madam Chairman, Madam Commissioner, it should be removed. There's no provision in our rules to maintain it for a long period of time.

MS. JOHNSON: You say that it should be removed.

What actually happens in -- what happens really?

MR. FESMIRE: Madam Chairman, Madam Commissioner, the operator has -- once they put materials in a pit, under our rules, if it's properly fenced off, and in some cases netted, they have six months to let that stuff dry up, in which case the materials from the frac job could remain on-site.

Generally, we will grant them another six months. The reason being, it's very expensive to haul this stuff around, and if it can evaporate, it saves a significant amount of money.

MS. JOHNSON: And so during the time that it is kept on-site, six months to a year, it's open to surface processes, infiltration and so on, and during that time, is there a potential for pollutants that are

a part of that material to be released into the environment?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, yes. We have rules for governing pits, but yes, there's always that potential that -- you know, that there could be some infiltration of this fluid.

MS. JOHNSON: I appreciate your description of the fracking process during the drilling of the wells. And this is what I was trying to get at during cavitating, and I was actually honing in on the wrong term.

But it's my understanding that part of the objective of the fracking process is to increase the permeability of the geologic strata that the resource is sequestered in around the well bore, to facilitate movement of the methane gas into the well bore, and that that fracking process is a permanent alteration of the geologic strata; is that correct?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, it is intended to be permanent. Unfortunately, through some physical and chemical characteristics, the reactions, these -- these fracs that are created can heal over time, and sometimes there is a need to refrac sometime during the life of

the well.

MS. JOHNSON: So they may or may not be permanent, but that obviously means that they can be, and oftentimes are, a permanent alteration to the geologic strata.

If that -- under natural conditions, that coal-bearing and methane-bearing formation is of very low permeability, and increasing the permeability of that unit, on a permanent basis, does that not allow a pathway for upward movement of lower -- low quality water in underlying strata to then move up to the surface as a permanent condition?

I mean, it's not something that can necessarily be reclaimed to a natural condition just by plugging the bore hole, for example?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, I'm not sure exactly what you're trying to say.

If a frac job is successful, it has the potential to be effective, to increase that permeability over the life of the well. But it's intended to increase the horizontal permeability, not the vertical permeability between -- between zones.

The earth, I'm sure as you're aware, is sort of like a layer cake. Some of these zones have pressure

communication between them, some of them don't.

Generally, the coals that we're producing from here in New Mexico are interbedded, and there are inter- -- kinds of rocks that are less permeable between those coals and the rocks on the surface.

Now, in other states, I'm -- and I'm thinking of specifically the Powder River Basin in Wyoming -- that may not be true. There may be communication, like I said, between the coal bed methane and the aquifers that produce the usable water there.

The fractures, like I said, are intended to extend laterally and not up and down, and a significant amount of science has gone into the design of those fractures, because, like I said, these fluids are expensive, the pumps are very expensive.

We're talking, you know, sometimes thousands of pounds of pressure generated by these pumps, so the company does not want to waste time and create problems by fracking up and down the well bore, but instead intends to frac that one layer of the layer cake out horizontally.

MS. JOHNSON: I understand that there are natural occurrences of methane being released at the surface in the Valle Vidal and Vermejo Park area; is that correct?

MR. FESMIRE: Madam Chairman, Madam Commissioner, I have seen at least one of those seeps. Yes, ma'am.

MS. JOHNSON: And this would be, obviously, a place where there are natural conditions allowing methane to come up from deep within the subsurface along some pathway, whether it be a geologic, a stratigraphic contact or a geologic fault; is that correct?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, yes, ma'am. That could be true.

MS. JOHNSON: So during production of the resource -- and you were describing this process of cavitating, that these natural pathways along geologic or stratigraphic contacts or geologic faults could then become avenues for the cavitating process; is that correct?

If I get your previous testimony, you were saying that cavitation occurs not only along the well bore, but along natural pathways to the surface.

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, I think we're confusing two different processes.

Cavitation is a -- an induced process -- stimulation process roughly akin to fracturing.

What I think you're referring to is that as we decrease the pressure in that zone, those seeps -- they're producing gas now. As we decrease the pressure and dewater the zone, it's liable to have more mobile gas, more free gas, and we're liable to increase those natural seeps that we produce if we dewater in the coal bed methane in that area.

MS. JOHNSON: Could that be the source of the circumstances that were described in the petition, these large-scale vegetation die-offs, spontaneous fires in the subsurface and near surface, circumstances like that? Is that the process that leads to those events?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, yes, ma'am. I hope my previous testimony indicated that that's -- that's my belief of what probably happened.

If these -- if these seeps weren't active prior to production, then somewhere down-dip they start lowering the pressure, the gas desorbs, the gas becomes mobile and migrates up to these outcrops. That could very well be the exact reason that those events occur.

MS. JOHNSON: Thank you for that description, Mr. Fesmire.

And I guess just to recap, is it your testimony, then, that you have observed and there are

documented natural conditions within the Valle Vidal Unit that could allow large-scale what I would call fairly catastrophic and uncontrolled environmental consequences that would accompany coal bed methane development at that location?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, I have been out there. I know that there is at least one natural seep, and I can see that as we lower the pressure in the coal bed out there, if it is in the vicinity of that seep, and if there is no -- no stratigraphic trap to keep that gas from migrating -- once we lower the pressure to the point it becomes mobile, and there's nothing to keep it from migrating to the source of that seep, I can see where we could exacerbate the seep.

Yes, ma'am.

MS. JOHNSON: Thank you, Mr. Fesmire.

MR. FESMIRE: Yes, ma'am.

MS. JOHNSON: I guess just one follow-up question.

Is this -- the coal bed methane resource is trapped in a geologic strata that you said occurred between 1,000 and 2,500 feet or thereabouts; is that correct?

MR. FESMIRE: Madam Chairman, Madam Hearing

Examiner, Madam Commissioner, those are generally the areas where the water contained -- has enough pressure to actually get the coal to adsorb -- I mean get the gas to adsorb to the coal. That's the pressure range.

MS. JOHNSON: And I guess I would just note that that depth interval is -- two things about that depth interval.

One, that it is near enough to the surface, I -- it's actually considered not the deep surface, but really fairly shallow, and, in fact, is within the depth range where waters are controlled by the Office of the State Engineer.

And it's not really far removed from the surface environment in a similar way as to the deep resource production in the San Juan Basin in the southeast part of the state; is that correct?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Madam Commissioner, generally -- I have to be careful, because the one part that you said may or may not be correct.

It's not that the pressure below that -- it's not that coal bed methane can occur below that, but generally the pressure -- while it's sufficient to keep the gas adsorbed to the coal below there, the pressure is so great on the coal that the coal loses its

permeability when you get deeper, higher pressure regimes.

So it's not that it can't occur below that, it's just this is the -- this is the area that it generally occurs.

MS. JOHNSON: In the 1,000 to 2,500 --

MR. FESMIRE: Yeah, maybe 3,500 feet.

MS. JOHNSON: What is the depth range that is the cutoff for regulating waters between the Office of the State Engineer and the OCD?

MR. FESMIRE: Okay. Madam Chairman, Madam Hearing Examiner, Madam Commissioner, that was the part I was trying to get around answering.

Any water that is produced with oil and gas in the State of New Mexico is regulated by the Oil Conservation Division as a waste and is -- and Doug may be grinning at me and gritting his teeth, but our interpretation of the law passed in 2004 is that if it is produced with oil and gas, it would be a waste and governed by our rules.

MS. JOHNSON: What if the development activities affected other hydrologic regimes above 2,500 feet? Is that under the control of OCD or the State Engineer?

MR. FESMIRE: Madam Chairman, Madam Hearing

Examiner, Madam Commissioner, like I said, if it is produced with oil and gas, we believe that that water would be regulated as a waste.

Fortunately, so far in New Mexico -- and I -- again, I have a difference of opinion with some of the hydrologists from the State Engineer's Office. I do not know of any reservoir -- coal bed methane reservoir in New Mexico where there is hydrologic communication and where the water quality is such that we would consider it a useable aquifer.

You know, the jury is still out on that.

MS. JOHNSON: Thank you, Mr. Fesmire.

MS. ORTH: All right.

MS. JOHNSON: That's all.

MS. ORTH: Anything -- all right.

Commissioner Hutchinson.

MR. HUTCHINSON: That just brought up one that I noted a while back, and -- and this is to Mr. Fesmire, going along these same lines.

Are these water-bearing strata hydrologically connected to the -- to the surface flows, to your knowledge?

MR. FESMIRE: Madam Chairman, Madam Hearing Examiner, Mr. Commissioner, to the best of my knowledge, that doesn't happen in New Mexico. Like I said, there

is at least one hydrologist in the State Engineer's Office who gets mad at me when I say that.

I do know that that occurs in other states. I don't believe that it occurs -- that we have found an occurrence like that in New Mexico.

MR. HUTCHINSON: Okay. Thank you.

MS. ORTH: All right.

Anything else at all before we excuse the petitioner panel?

Commissioner Murray.

MR. MURRAY: Madam Hearing Officer, more of a statement.

I don't know if this came up or it's been part of any of the exhibits, but the Office of the State Engineer has responded, on September 15th, 2005, to Martin D. Chavez, Forest Supervisor, regarding comments to Proposed Forest Plan Amendment for the Valle Vidal, which there's a brief discussion regarding the exploratory -- excuse my -- exploration of coal bed methane deposits in Eastern New Mexico and potential of significant impacts in the area to water resources as dewatering is implemented.

So I just want to, you know, mention that the State Engineer has provided a response to the Forest Service.

MS. ORTH: All right. Thank you.

Anything else at all before we excuse the petitioner panel?

Commissioner Goad.

MS. GOAD: Isn't there an opportunity for the public to question this panel, too?

MS. ORTH: Yes.

Are there -- and I have sort of looked at the audience while I've asked.

MS. GOAD: Oh.

MS. ORTH: Are there any other questions of the petitioner panel before we excuse the panel?

Anything else at all?

All right.

Well, thank you very much. You're excused.

Mr. Moore, do I understand that you have a witness from the forestry?

MR. MOORE: Yes, Madam Hearing Officer. We have one rebuttal witness which we can call at this time if you want us to.

MS. ORTH: All right.

Let me mention first that there will be other opportunities for public comment, and again -- I mentioned this before -- if you have a time constraint, please share that constraint with the hearing clerk,

Sally, there in the front.

Mr. Moore.

MR. MOORE: Madam Hearing Officer, members of the Commission, the petitioners call Kimberly Paul as a rebuttal witness.

KIMBERLY PAUL

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MOORE:

Q. Could you please state your name?

A. Kimberly Paul.

Q. Ms. Paul, where are you currently employed?

A. I am a forester and geographic information systems specialist with Forestry Division of Energy, Minerals and Natural Resources Department.

Q. And in that position, what are some of your current job responsibilities?

A. As a GIS specialist, I perform spatial analysis for all program areas of the division. And currently, I'm more or less a support position for all the staff on forestry issues.

Q. Could you briefly describe your educational background for me?

A. I have a bachelor's of science degree from

Northern Arizona University and a master's of engineering in geographic information systems from the University of Colorado Denver.

Q. And are you familiar with the petition that's been filed by the petitioners in this case?

A. Yes, I am.

Q. And have you reviewed that petition?

A. Yes, I have.

Q. Do you have a copy of it with you --

A. Yes, I do.

Q. -- that you can refer to?

If you could please go ahead and turn to page 15 of that petition.

A. Okay.

Q. And if you could look to -- I believe it's one of the lower paragraphs that starts -- has the heading above it, it says Roads and OHV Use. And there's a sentence that talks about 300 miles of roads being closed.

Are you familiar with those 300 roads being closed?

A. I'm aware of them, not personally, but --

Q. And can you tell me why those roads were closed?

A. More or less, to reduce impacts on the aquatic

systems, reduce maintenance fees for the Forest Service. They've been doing -- nationwide, closing roads for reduced maintenance costs. They've --

Q. And that's the US Forest Service?

A. That's right.

Q. So it's a national initiative to do that?

A. Right.

Q. Okay.

And if you could go ahead and turn to page 19 of the petition.

And about the middle of the page, there's a paragraph that has the caption above it Timber Harvest and Forest Management. And in that paragraph, it mentions -- there's some information there about the economical haul distance.

Could you give me your explanation of what was meant by economical haul distance in that paragraph?

A. For any commercial harvest, getting the product from the woods to either the processing plant or the market, there's several factors for that hauling cost, fuel prices, the amount of product being removed, the price of the product you get when you get to the processing plant or market, and the road conditions and the time to reach that market or processing plant.

So for this statement, "no large mills within

an economical haul distance," I believe historically Forest Service sales have been large volumes, a couple million board feet or more, over a short period of time. In the last three years, most of the mills in this state have closed that could handle that volume in that short amount of time.

Q. So for the purposes of this petition, when it says, "no large mills within an economical haul distance," that's a true statement for the Valle Vidal in terms of the amount of timber that would be harvested there?

A. For -- right, for historical timber sales. Who knows what would actually come off the Valle Vidal, but historically, that would be a true -- true statement.

Q. Thank you, Ms. Paul.

I have no more questions for this witness.

MS. ORTH: All right. Thank you, Mr. Moore.

CROSS EXAMINATION

BY THE COMMISSION,

MS. ORTH: Commissioner questions. I'll start on this side this time.

Commissioner Sloan?

MR. SLOAN: Nothing right now. Thank you.

MS. ORTH: Thank you.

Commissioner Vigil.

MR. VIGIL: Ma'am, you just stated that there's no economical haul distance within this area.

The New Mexico Forest and Watershed Health Plan, which was signed by the Governor back in April of this year -- is there any plans or otherwise that you know of that's going to permit -- I mean, like I said, over the State of New Mexico, the forests are overgroomed, well overgroomed.

Is there any plans in the mill to do any forest thinning in this area?

MS. PAUL: The Forestry Division is working with many industry representatives and industries in other states to bring mills back into the state.

Most of the thinning that you're referring to that would occur under the Forest and Watershed Health Plan is small diameter material and in small quantities per land area. There are very -- there are quite a few number of markets for the small diameter material. There's the post and pulp plant in Raton that takes material.

But when you're talking about a large-scale forest harvest, commercial harvest, there aren't any mills that will take that large volume of large material over a short amount of time.

Is that not --

MR. VIGIL: Well, okay.

So this statement here that says they're suitably mature and accessible for timber harvest, on page 19 -- so what are they going to do with that, the material?

MS. PAUL: Well, the rest of that sentence says, "to support an extensive cut of their resource."

Small harvests can be handled by the mills that are currently running in the state. There are several mom-and-pop-type size lumber mills in the state that can handle a small volume over a large period of time.

An extensive cut of resource so that the lumber is actually usable once it gets to the market, there aren't any mills right now that can handle that large volume in a small amount of time.

So small sales could be handled. It's the large, extensive sales that are not being put up right now.

MR. VIGIL: All right. Thank you.

MS. PAUL: Um-hum.

MS. ORTH: All right. Thank you.

Commissioner Goad.

MS. GOAD: No questions.

MS. ORTH: Commissioner Darden.
MR. DARDEN: No.
MS. ORTH: Commissioner Bada.
MS. BADA: No.
MS. ORTH: Madam Chair.
MS. PADILLA: No questions.
MS. ORTH: No.
Commissioner Price.
MR. PRICE: No.
MS. ORTH: Commissioner Glass.
MR. GLASS: No questions.
MS. ORTH: Commissioner Hutchinson.
MR. HUTCHINSON: Yeah. I'd like to continue that line of questioning.
So -- and it was, I guess -- you're up there because of the question I asked yesterday.
So what is considered an economical haul distance for that type of a sale?
MS. PAUL: For an extensive sale, say the Ponderosa pine type, they're getting somewhere in the neighborhood of $400 per thousand board feet.
That could be hauled all the way to Mescalero mill or White Sands mill down in the same area economically if the sale -- if that price holds, if there would be a contractor willing to do such. It's

possible that could be done.

But at the time that this was written, the botanist from our division that provided the information wasn't aware of all the economic abilities of -- but like I said, even for a large, extensive cut, the Mescalero mill could not handle that.

They are staying pretty busy with things coming off the Lincoln National Forest and private land in that area.

MR. HUTCHINSON: So there's no -- there are -- there's no activity taking place to build or reinstate mills in the northern part of the state?

MS. PAUL: No. There is. We are working with a company out of Idaho that is thinking of coming to the state. So things could develop in that realm.

But I do know also for a fact that the planned amendment for the Carson -- for the Valle Vidal does not have any cutting planned for -- you know, full-scale harvest planned for the next 10 years.

MR. HUTCHINSON: Were the people that made -- or developed this statement aware that -- that following the Rodeo-Chediski fire, that the San Carlos Apache road-hauled logs to Globe, Arizona, and then put them on train cars and shipped them to Oregon for milling?

MS. PAUL: I was not involved when this was

being written, sir, so I'm not sure if they're aware of that or not.

MR. HUTCHINSON: Okay.

That's quite a long haul distance, wouldn't you say?

MS. PAUL: Yes, sir.

MR. HUTCHINSON: Okay.

That's all.

MS. ORTH: Thank you.

Commissioner Johnson.

MS. JOHNSON: One short question.

Would an ONR designation affect the Forest Service decisions in its long-term management of the Valle Vidal Unit? And how would you view that designation? How would you work with it?

MS. PAUL: Well, I don't work for the US Forest Service, so I can only surmise that --

MS. JOHNSON: Oh, I'm sorry.

MS. PAUL: That's okay.

MS. JOHNSON: I had that in a wrong note. I apologize. I withdraw the question totally.

MS. PAUL: Okay.

MS. ORTH: Thank you.

Commissioner Lujan.

MR. LUJAN: Yes. I have one general question

not related to water.

But do you know if there are any archeological sites in that area?

MS. PAUL: I have no knowledge of any archaeological --

MR. LUJAN: Or cultural studies done?

MS. PAUL: I have no idea, sir.

MR. LUJAN: Thank you.

MS. ORTH: Commissioner Murray.

MR. MURRAY: No questions.

Mr. Schlenker-Goodrich, do you have any questions?

MR. SCHLENKER-GOODRICH: I do not.

MS. ORTH: All right.

Does anyone have questions -- okay.

Commissioner Sloan.

MR. SLOAN: Just one quick question.

Are there differences between the impacts of small timber sales versus large timber sales?

MS. PAUL: Small in volume or --

MR. SLOAN: Yeah. The 3,000,000 board feet versus the small mom-and-pop kind of sales.

MS. PAUL: 3,000,000 board feet would require extensive road building, landings of a quarter acre or half acre or more for stacking the logs, before they're

removed for the sale.

The small, mom-and-pop operations sometimes are being done with ATVs for skidding logs, and they're the smaller -- small diameter, fewer trees, so there's not as much impact to the soil or neighboring streams.

MR. SLOAN: So ONR designation would probably impact smaller sales much less than the larger sales in terms of their management practices?

MS. PAUL: Correct.

MR. SLOAN: Thank you.

MS. ORTH: All right.

Commissioner Bada.

MS. BADA: I do have a question.

Do you have any knowledge of where the large timber in the Valle Vidal is located and whether, excluding haul costs, would that be economical to harvest?

MS. PAUL: Excluding haul costs -- well, you can ask five different foresters what to do on a piece of land, and you'll get five different answers, but for my opinion of the Valle Vidal, most of the commercial timber is on steep slopes, which would require either helicopter logging or skyline logging, which is cost prohibitive in the Southwest.

MS. ORTH: Anything else?

Anyone have any questions of Ms. Paul before we excuse her?

No?

Thank you very much, Ms. Paul.

Let me ask at this point, before we begin with the coalition's case, which then we'd have to interrupt abruptly, is there anyone who would like to give public comment before we break for lunch?

Any public comment before we break for lunch?

Sir, if you would come up to the table.

BILL SAUBLE

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Would you state and spell your full name, please?

MR. SAUBLE: Okay.

Madam Chair, Commissioners, my name is Bill Sauble, S-A-U-B-L-E. I am president of the New Mexico Cattle Growers' Association.

And I apologize for not being here yesterday, but I was at a funeral, and I appreciate the chance to get some comments in.

New Mexico Cattle Growers' Association understands that preexisting traditional and sustainable

land uses such as grazing can continue under the designation of Outstanding National Resource Waters so long as degradation does not intensify.

Although state designations do not call for curtailment or elimination of grazing, we are concerned that federal entities often rely on state designations to effect a reduction in grazing.

Our comments are intended to point out that the efforts of the grazing lessees have contributed to the improvement of the water quality standards on the Valle Vidal.

Grazing has been a traditional part of the land use continuously since the 1800s. The current grazing permit is held by the Valle Vidal Grazing Association. The association has taken a neutral stance in this designation. I have spoken with Joe Torres, president of the association, and would like to share some of his observations with you.

The Valle Vidal Grazing Association consists of 15 livestock owners from New Mexico and Colorado. They have had the grazing permit for approximately 18 to 20 years. They graze 850 cow-calf pairs for a five-and-a-half month grazing period.

Their progressive management includes the use of range riders to move cattle off of riparian areas and

fencing -- fencing exclosures of sensitive wetlands areas.

Early in the grazing association's tenure and with financial assistance from the Rocky Mountain Elk Foundation, they reseeded the McCrystal Creek area. The association has also assisted in establishing Aspen sands -- Aspen stands in the Valle Vidal.

In 1983, the US Forest Service, Vermejo Park Ranch and the New Mexico Game Commission signed a management directive for the Valle Vidal. At that time, the riparian habitat was considered poor. Lack of stream bank vegetation contributed to increased sediment loads as well as increased water temperatures.

President Torres stated at that time one of the major contributing factors to these conditions was the hundreds of miles of roads throughout the area and the resulting erosion from these roads, hence their reseeding efforts.

Mr. Torres would also like it to be known that their association has been in existence for 18, 20 year -- to 20 years, and with the Forest Service leasing, the way it works, there's a 10-year lease where they would have the option of renewal.

So they anticipate being there far into the future and do wish to continue to work in a progressive

manner with the other users of the Valle Vidal.

The 850 livestock pairs that share the range with, according to Mr. Torres, whoever's numbers you accept, 3,000 to 5,000 head of elk, and with livestock and the wildlife, the improvement in the trends in the water quality from the 1982 designation to this point, now that you are considering this area as an Outstanding National Resource Water, is ample testimony that grazing does not contribute -- or has not in this case contributed to the degradation of the water quality in the Valle Vidal.

It also raises the question of wildlife degradation of water quality. Rarely is the input of elk taken into account. The degradation is simply blamed upon livestock. There needs to be a measurement of wildlife impacts upon water quality.

The New Mexico Cattle Growers' Association believes that the livestock grazing in the Valle Vidal has been demonstrated to be a positive factor in the habitat improvement, in the upward trend of water quality in the Valle Vidal, and we would not support any designation that does not allow for the continued livestock grazing.

Thank you.

MS. ORTH: Thank you, Mr. Sauble.

Are there questions of Mr. Sauble?

No.

All right. Thank you very much.

Is there other public comment to be given this morning?

Mr. O'Donnell, I think we heard from you yesterday; is that correct?

MR. O'DONNELL: Yes, you did. If I may add something related to a question Mr. Lujan had asked.

MS. ORTH: Oh, all right.

And, sir, did I see your hand over here in the vest?

All right.

Go ahead, Mr. O'Donnell.

And again -- I'm sorry. Did I see a hand back there?

All right.

You're already sworn.

JIM O'DONNELL

having been previously duly sworn or affirmed, was examined and testified further as follows:

FURTHER DIRECT TESTIMONY

MR. O'DONNELL: Again, my name is Jim O'Donnell. I'm with the Coalition for the Valle Vidal.

I just wanted to quickly address a question

Commissioner Lujan had asked about archaeological resources.

I am a former archaeologist, and I worked for about seven years for the oil and gas industry.

And I wanted to answer your question by saying there are significant archaeological resources, both historic and prehistoric, within the Valle Vidal.

The Pueblos of Taos and Picuris have expressed concern over those resources and their protection.

The Valle Vidal is considered the homeland of the Jicarilla Apache, and they have also expressed concern over the well-being of their -- their cultural resources in the area.

The State Historical Preservation Officer has also written in a letter to the Forest Service, during the periods for scoping comments, that they are also concerned and -- with the archaeological resource of the Valle Vidal and would like to see the Forest Service develop a comprehensive inventory and management plan for those resources.

MS. ORTH: All right. Thank you, Mr. O'Donnell.

Commissioner Lujan.

MR. LUJAN: My first question, what about sacred areas? In other words, under the Forest Service,

the way they manage, there are a lot of tribes that are allowed to visit the sites in conjunction or in agreement with the Forest Service.

Are there any sacred -- known sacred sites --

MR. O'DONNELL: That I'm not --

MR. LUJAN: -- expressed by Taos and Picuris?

MR. O'DONNELL: That I'm not aware of.

MR. LUJAN: Thank you.

MS. ORTH: Other Commission questions of Mr. O'Donnell?

No other questions.

Thank you.

MR. O'DONNELL: Thank you.

MS. ORTH: Sir in the vest.

COURTNEY WHITE

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Your name, please.

MR. WHITE: My name is Courtney White. I'm an executive director of a nonprofit based here in Santa Fe called the Quivira Coalition.

I do apologize for not having been here for the testimony so far. We've had a death in our family, as well.

We are the sort of ringmasters -- ringmasters of a large restoration project on the Valle Vidal, and I'd like to tell you a little bit about it in the context of some of the talk I heard this morning about what restoration is.

We support the designation of outstanding national waters for this area, and I wanted to explain a little bit what we've done in the sense of what's happened up there and why we think this is an outstanding natural area and deserving protection.

The best way I thought to do it was to read an excerpt of some comments I wrote to the Forest Service as part of their planning process. It's going to take a few minutes. I don't know how pressed for time we are or not. It would give you a -- kind of a look into what restoration type activities are taking place.

This is a large 319 EPA grant that we've administered now for about four years. And so I don't want to consume a large amount of your time. It won't take that long, but I wanted to kind of go through it.

So what do you -- what's the pleasure of the committee?

MS. ORTH: You'll be less than 10 minutes?

MR. WHITE: Yes. Yes, I will.

MS. ORTH: All right. Go ahead.

MR. WHITE: I'll take off my glasses to read them, so --

Taped to my computer is a postcard that I found in a local coffee store. It depicts an ill-looking planet earth with its tongue hanging out, imprinted with the message "The world could be in better shape." Surrounding this image are words, "renew, heal, reaffirm, nurture, rekindle, revitalize, repair, revive, mend, soothe, rebuild, fix, regenerate, reinvigorate."

They are the words of action, positive, progressive, healing action. They are words of advancement, not defense or keeping safe, and as such give people direction and hope. It involves us in a giving rather than a taking, a giving back to nature, an honoring, while we necessarily continue to take nature's bounty.

They are also words of redemption.

We have taken much from the natural world, often with tragic consequences, and we continue to take at an accelerating rate. The proposed oil and gas development in the eastern half of the Valle Vidal is another form of taking.

Restoration, by contrast, is a way to redeem our behavior, kind of moral exercise, if you will.

It's an opinion shared by William Jordan in

his book called Sunflower Forest: Ecological Restoration and the New Communion with Nature.

"Everything we have," he says, "we take from nature, sometimes by persuasion or collaboration, sometimes by outright theft. Either way, the debt we incur is, or at least ought to be, a constant concern. For many, restoration is an attractive idea because it offers a way of repaying this debt."

Jordan considers restoration to be a gift back to nature, both in the restored ecosystem and in the greater understanding and self-awareness that restoration creates among its practitioners. It is a redeeming gift, a gift of reciprocity. We give so that nature may give back, not a one-way gift of charity or commerce.

Restoration is an unending exchange of goods and services with the natural world. It is not, he says, about settling accounts."

We -- quote, "We can take from nature but can never give back," Jordan writes of the old paradigm. "We accept its gifts of food, materials, place, and beauty but never offer back the clinching gift that would establish a basis for solidarity, and because we never risk the offering of a gift, we have no need for sacrifice."

In contrast, restoration is all about giving.

"As for the gift," he says, "the basis for solidarity with nature, the restored ecosystem is perhaps as close as we can come to paying nature back in kind for what we have taken from it."

On the Valle Vidal, we have a tremendous opportunity to rekindle our solidarity with the natural world by giving the gift of restoration. In fact, it has already begun.

Four summers ago, I received a phone call from Dick Neuman, who was then president of New Mexico Trout, based in Albuquerque. For years, his group had been contributing money and labor towards an effort to restore Comanche Creek. Comanche Creek is on the western half of the Valle Vidal, a tributary of the Rio Costilla, located in the Valle Vidal.

The reason for their substantial investment of time and money over the years was very simple. They wanted to restore Comanche Creek to its former status as a prime coldwater stream for native Rio Grande cutthroat trout, one of only two native trout in New Mexico.

As Dick Neuman has explained to me, there were plenty of cuts in Comanche, but the watershed as a whole was still struggling -- the watershed population as a whole was still struggling for survival.

Accepting his invitation for a tour, I found out why. I had never been up there until I took this tour.

The Valle Vidal has been hard used. Much of the West's recent history, in fact, could be read into the condition of the property at the time of its transfer to the Forest Service in 1982. It was overgrazing by cattle and widespread scars from logging and road building and the bleeding effects of a historic gold mining district up on the property.

After the transfer, I learned an innovative effort was made on the part of the Forest Service, the grazing permittees and various wildlife organizations to reverse this Old West legacy. A herder was hired by the grazing association, willows and cottonwoods were planted along the creek, and a mile-long elk exclosure was constructed.

While these efforts were helpful, the creek and its fish population continued to struggle. All the pole planting, for example, had failed. And Dick called me in because he was worried.

Fortunately, the Surface Water Quality Bureau of the New Mexico Environment Department, and by extension the EPA, was also worried about Comanche Creek, as was the New Mexico Game and Fish Department.

Excessive sediment movement, he wrote -- and some of you heard this testimony -- the presence of aluminum and other things in the water system had landed Comanche Creek on the state's 303D list.

So a dialogue began that resulted in an award from the EPA through NMED of a large 319 project grant, a substantial, multi-year grant to restore a portion of Comanche Creek to health.

The partners included the Forest Service, the Environment Department, Game and Fish, Trout Unlimited, New Mexico Trout, the Valle Vidal Grazing Association, Quivira Coalition, Amigos Bravos, Rocky Mountain Youth Corps, Philmont Boy Scouts, Taos Soil and Water Conservation District, and numerous consultants, including Bill Zeedyk, Steve Carson and Kirk Gadzia.

As part of the application process, this group, now called the Comanche Creek Working Group, agreed to the following process: Conduct an assessment in order to identify specific impairments, conduct baseline monitoring and mapping, identify best management practices to implement in the watershed and conduct an educational program.

The grant writers wrote, "The ultimate goal of this project is to improve the condition of the Rio Costilla watershed to meet current water quality

standards and to restore normal hydrologic function to the Rio Costilla and its tributaries."

"Completely achieving this goal will likely take decades. Over the next three years, however, we hope to establish the technical and organizational foundation for achieving this goal and to begin some on-the-ground restoration at Comanche Creek to maximize habitat for Rio Grande Cutthroat Trout."

That was the official goal.

The unofficial goal was to give back to nature. We wanted to be engaged in an act of redemption. If much of the Old West could be read in the Valle Vidal's history, we wanted to write a new and more hopeful chapter.

In the summer of 2002, the members of the working group conducted an assessment of the watershed. Their findings confirmed what long-time observers, including Peter Wilkinson of the Game and Fish Department, George Long of the Forest Service and Bill Zeedyk, who will testify later, had suspected all along, that the Valle Vidal Comanche Creek watershed suffered from three broad ills.

That was the legacy of historical misuse was evident in the raw stream banks and overall poor hydrological function, contributing to high sediment

loads in the creek.

Number two, poorly designed and maintained roads, including the main road, contributed significantly to sediment transport.

And overgrazing by elk were prohibiting the growth of shade-creating woody plants, such as willows and cottonwoods.

After the baseline monitoring and mapping was completed, the working group embarked on a three-pronged strategy to address these impairments.

First, bad roads. Bill Zeedyk and Steve Carson, with assistance from the Forest Service, conducted an inventory of the roads and prioritized what was needed first to be addressed. They paid particular attention to the placement of culverts.

A poorly placed culvert can quickly create a head cut which will travel uphill and have tremendous ecological effects, particularly on white meadows.

Noting that society often treats water as if it were a nuisance rather than a resource, Bill Zeedyk pointed out how much water was being trapped in roadside ditches, thus starving downslope plants. This water also gathers a great deal of sediment as it picks up speed in long runs downhill.

He proposed that many of these roads receive

rolling dips so that water is allowed to flow again in their microwatersheds.

To date, 12 miles of road have been rehabilitated to reduce sediment sources in the upper watershed of Comanche Creek. Some were restored to natural contours, some had rolling dips and water bars installed. Two culverts were removed, and one stream crossing was rehabilitated.

Raw stream banks, the second concern. Under the guidance and tutelage of Bill and Steve, again, a total of 102 erosion control structures had been constructed within the watershed, including two rock divots, one head cut control structure, 53 one-rock dams, one plunge baffle, one plunge pool, nine rock baffles, two worm ditches, 26 Zuni rock bowls -- ask Bill what he means by that when he comes up -- and six vanes.

The purpose of these structures is to speed up natural recovery processes. Scouring by erosion caused by historic overgrazing and logging resulted in the creek cutting down below its tradition floodplain.

Over time, the creek has been -- had begun to heal itself by creating a new floodplain, remeandering itself to dissipate energy and drop sediment, but there were plenty of old wounds that had not healed yet.

The goal of the restoration work was to goose the healing process along gently, to use nature to heal nature, in Bill Zeedyk's words.

Finally, in the mid 1990s, the Forest Service experimented with a novel idea, to create house-sized mini exclosures around existing native willow clumps to protect them from grazing particularly from elk. This was in contrast to the mile-square elk exclosure that was built in the 1980s which proved difficult to maintain.

The mini exclosures were deemed a success, so the working group decided to build more. We have to date built almost a hundred of these structures, principally using the energy of the Rocky Mountain Youth Corps, which employs at-risk youth from the Taos area.

The goal was to protect the willows so they could grow and shade the water, thus reducing overall stream temperatures, a critical requirement for the fish. And despite a stubborn drought, followed by a big flood in the last spring, the exclosures are doing their job.

In other words, the Valle Vidal is healing.

Our work on Comanche Creek is not the only active -- is not the only act of redemption taking place on the Valle Vidal. Numerous projects are underway on

both sides of the Rock Wall.

The Philmont Boy Scout Camp, the Albuquerque Wildlife Federation, the New Mexico Wildlife Federation and others have been doing restoration work in various creeks and meadows for many years. And they intend to continue their work well into the future.

That's because the quantity of restoration work needed is huge. All our combined efforts have barely begun to scratch the surface, so to speak, of the land. In the scale of a human lifetime, the opportunities for gift giving in the Valle Vidal appear to be practically endless.

Or, as an astute observer of land health once said to me, "It took a long time for us to get into this mess, it's going to take us a long time to get out of it."

To speed up the restoration work, as well as offer coordination and training, we've proposed to the Forest Service through our comments that the Valle Vidal as a whole become a demonstration site for the possibilities of hands-on restoration education and action.

And this, I think, is where the ONRW designation comes into play. I think it can help do that, by helping us maintain and preserve and enhance

the work we've done in the future.

My vision for the Valle Vidal is a landscape filled with gift giving and redemption. Restoration is -- as Kenneth Brower, the son of David Brower, the famous Sierra Club leader, wrote recently, restoration is the main task in front of us for our -- the duration of our time on the planet, he said.

Nature needs a hand in healing old wounds, wounds that we have caused. The toolbox for healing -- such healing work is now advanced enough to feel confident in our abilities.

As an ecologist friend of mine, Craig Allen, says, "We don't know everything, but we know enough to get started."

We have gotten started on the Valle Vidal. The time is now to expand our work and to do -- create some new creeks and meadows, with new partners and renewed hope. Connecting people to nature in a meaningful manner is perhaps the greatest challenge we face collectively today, especially among children.

Restoration is an ideal way to accomplish this goal. It teaches us ecology, humility and the value of work, all while healing land and relationships.

When the Forest Service writes the final plan for the Valle Vidal, I hope that the authors will employ

the verbs that I see every day on my postcard, to renew, heal, reaffirm, nurture, rekindle, revitalize, repair, revive, mend, soothe, rebuild, fix, regenerate and reinvigorate.

Thank you.

MS. ORTH: Thank you.

Are there questions of Mr. White?

Questions?

No.

Thank you very much, Mr. White.

Sir.

BRYAN BIRD

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Your name, please.

MR. BIRD: My name is Bryan Bird, spelled with a Y, first name, last name with an I.

Again, Commissioners, my name is Bryan Bird. I am the Forest Service Program Director at Forest Guardians. We're a nongovernmental environmental advocacy group based here in Santa Fe, New Mexico.

I am here today on behalf of our 1,400 members to do what probably goes without stating, support the nomination for the Outstanding National Resource Waters

for the Valle Vidal.

Forest Guardians believes that the naming of this area as Outstanding National Resource Waters will establish a foundation for the long-term ecological integrity of this area and its wildlife and its water quality.

As you know, we're very concerned with these -- this part of our state's natural heritage. The outstanding national resource designation is a wonderful foundation for the ecological restoration of this area, as we've just heard so extensively from Mr. White.

Forest Guardians is also undertaking several restoration projects in the state under the state's 319 grant program, and we are very enthusiastic about the potential of further restoration in Valle Vidal, its water, its wildlife and all of the recreational resources it provides to the people of the state.

And we also just want to point out that we believe the designation per the Commission's antidegradation policy does allow for these activities to proceed as they have been and will hopefully in the future.

Thank you very much.

MS. ORTH: Thank you.

Questions for Mr. Bird?

Questions?

No.

Thank you very much, Mr. Bird.

MR. BIRD: Thanks.

MS. ORTH: All right. We'll break for lunch now.

And we usually need an hour and 15? Is that right? So about 1:15? Is that good?

MR. LUJAN: Madam Hearing Officer, can you kind of give us an idea of whether we're on track or not?

We have this monumental task to accomplish that we only have like this afternoon to hopefully even come to deliberations and also make a decision? Is it feasible that we can do this this afternoon?

MS. ORTH: Yes, sir. I think the Commission is reasonably on track. We will hear from the Coalition for the Valle Vidal.

Mr. Schlenker-Goodrich, we've heard from one of your witnesses.

How long do you anticipate the other witnesses will take?

MR. SCHLENKER-GOODRICH: I need to touch base with my witnesses. My intent is to try to expedite the process and move it along as quickly as possible. So

I'm going to encourage my witnesses to try to shorten their testimony as much as possible, but to ensure that the critical points are made and to ensure that the Commission has an opportunity to cross-examine my witnesses.

MS. ORTH: All right.

And I'm aware that we have at least one other public commenter who would like to comment this afternoon. But we don't have any other parties beyond Mr. Schlenker-Goodrich's client, and I think we've bitten off most of the public comment, as well.

MR. SCHLENKER-GOODRICH: I would guess, also, just for the Commission's purposes, that we would be able to get through our direct testimony in about an hour, hour-and-a-half.

MS. ORTH: All right.

So I think -- I think if your deliberations can proceed later this afternoon, you'll have a good sense of where you are.

MR. LUJAN: Thank you.

MS. ORTH: All right. Thank you.

(Proceedings in recess.)

MS. PADILLA: If I could have your attention, please, we're going to get started in a couple of minutes, if you'd take your seats. If we start on time,

that will put us on a pretty good schedule this afternoon.

That was great. That didn't take long at all.

As a matter of fact, that -- our Hearing Officer did call and said she's going to need about a half an hour, but I think that we can go ahead and just reconvene the hearing, and she can catch up. She should probably be here within the half hour.

So before I ask Erik Schlenker-Goodrich --

MR. SCHLENKER-GOODRICH: Schlenker-Goodrich.

MS. PADILLA: Did I do that right?

Thank you.

MR. SCHLENKER-GOODRICH: Very close.

MS. PADILLA: -- Schlenker-Goodrich to present his panel, I did have a request for one additional public comment. Perhaps in the absence of our Hearing Officer, that might be all right, if the Commissioners are okay with hearing the public comment.

She's Lisa Hummon, Public Defenders of Wildlife (sic).

Lisa.

MR. HUTCHINSON: I -- Madam Chair, I just wanted to ask it -- is that what the Hearing Officer said that we could do? Proceed without the Hearing Officer?

MS. PADILLA: She did. She asked if I would open the meeting and convene. I mean, that was at her request.

MR. HUTCHINSON: Okay.

MS. PADILLA: Is --

MR. SLOAN: We're not doing anything significant other than taking testimony, so it seems perfectly reasonable to me.

MR. HUTCHINSON: Okay.

So you're going to rule on any objections or anything? You're going to act as the Hearing Officer?

MR. SLOAN: Let's cross that bridge when we get to it.

MS. PADILLA: Yes. I will act in terms of running any meeting -- I mean the meeting to bring testimony to the record.

And I believe it will be less than a half an hour for her to come.

MR. HUTCHINSON: Okay.

MS. PADILLA: Is that all right? Are we okay with that?

MR. HUTCHINSON: I don't know.

MS. PADILLA: Thank you.

MR. SCHLENKER-GOODRICH: If I may add, given the direct testimony will last well over a half an hour,

I don't think I will object to my own witness, so --

MS. PADILLA: Okay.

Okay. With that, I would like to ask Lisa, please.

LISA HUMMON

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

THE REPORTER: Would you state and spell your full name, please?

MS. HUMMON: Lisa Hummon, H-U-M-M-O-N, with Defenders of Wildlife.

And thank you for taking the time to hear my comments, and I'll just make them very brief.

I wanted to voice Defenders of Wildlife's support for the designation and to refer you to our more detailed written comments that were submitted previously on the concerns we have for the wildlife in the area.

Thank you.

MS. PADILLA: Thank you.

MS. HUMMON: That's it.

MS. PADILLA: Okay. Thank you.

Mr. Schlenker-Goodrich, if you could please present your panel.

MR. SCHLENKER-GOODRICH: Thank you, Madam

Chair.

May it please the Commission, my name, again, is Erik Schlenker-Goodrich. I'm an attorney with the Western Environmental Law Center, and I represent the Coalition for the Valle Vidal.

As Alan Lackey testified yesterday, the coalition is an entity of over 250 local governments, organizations and businesses throughout the State of New Mexico and, indeed, nationally.

We'd like to present four witnesses today and move right into our direct testimony with our first witness, if it pleases the Commission, Taylor Streit, from Streit Fly Fishing.

TAYLOR STREIT

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. SCHLENKER-GOODRICH:

Q. Could you please state your name and background for the record?

A. My name is Taylor Streit. I have a business called Streit Fly Fishing. We do guided fly fishing trips. And I also have a book where I speak about the -- the Costilla and the Valle Vidal.

And I've spent a lot of time there. I've -- I

was there on the first -- the first day that it opened, and I've been there every year since. So I've spent a lot of time on the ground there.

Q. Mr. Streit, you indicated that you've been there since the very first day that this became public land and that you've been there every year since.

Could you describe your perspective on how these waters have evolved over the years, what the waters were like at the point of acquisition, and then through time to now?

A. I would say that -- I haven't seen a great deal of change in the -- in the riparian area. And the Comanche, of course, when they moved the cows off the Comanche 10, 15 years ago, that made a big difference in that drainage.

When I first started using it as a permittee with the Forest Service, I -- we'd catch really large Rio Grande cutthroats in there, and that was the fish. And then what happened over a period of years is that stocking of rainbow trout downstream hybridized with those cutthroats and so changed the character of the fish into what we call a cutbow, which is a slash rainbow/cutthroat.

And also, fish in high water years come over the dam from the Costilla Reservoir, and those are all

different species, so -- and they tend to hybridize, and those are -- actually, the predominant influence there seems to be Snake River cutthroat, and they interbreed with the other fish, too.

Q. So over time, this has been a fairly good quality fishery?

A. Oh, it's a superb fishery. In my book, I -- we have a rating system, and it gets an 8-and-a-half, which is, I think, only after the San Juan and equal with the Upper Rio Grande as far as the quality of the fishing.

And what makes it really so, hmm, extra special is that you don't have to hike into it. You've seen where the Rio Grande is. You don't have to go there, and you don't -- and the crowds aren't really bad, and it's just a very high quality fishery.

There's very few places where, as far as business, you know, we can guide people that is so accessible. And we can take people of -- handicapped people we've taken there, children. It's a very good place to fish to take beginners, to teach them to fly fish, because it's a -- there's a lot of fish, and it's easy to fish.

Q. Over the last two days, you've heard a lot of testimony about restoration efforts in the Valle Vidal;

is that correct?

A. Uh-huh.

Q. And given these restoration efforts, where do you foresee this fishery going in the future, assuming that protections are put in place to keep that pathway going?

A. Like I say, I spend a lot of time there, and I try -- you know, I'm forced to be a kind of observer of nature, and that entire drainage is certainly, without doubt -- you're going to hear testimony coming up about reintroducing -- not so much reintroducing, but -- I don't know what the word is -- strengthening the Rio Grande cutthroats, that there is quite a bit of blood up in there now, but --

At any rate, it is the -- by far the most logical choice in the whole state, because -- you know, I have the book, and so I have really, you know, a pretty good idea of the different places, and there's really no place else that comes anywheres near having the ability to have this kind of large scope of over a hundred miles of streams that -- where we could have pure strain Rio Grande cutthroats.

There's no -- there is not -- I can't even think of an area where you have 10 miles or 15 miles of streams together to do that, where it would be possible.

Q. Turning from sort of the restoration efforts to the extensive discussion of economics, and in terms of angling, even though, obviously, you're not an economist, but you have a fairly good grounding in terms of what anglers do, what they spend money on, et cetera.

A. Um-hum. My son has a shop, fly shop in Taos, and I have a guiding business, and without this -- and do 200-some-odd guiding jobs, and I would say we probably do 40 or 50 of those jobs on the Costilla, the Comanche and the -- actually, and somewhat on the Costilla below.

So it's a huge factor to us. And there's a number of other guides that work there, too, and have permits, maybe a half a dozen others. So it is a very huge factor.

And it's the kind of place that, like I said a minute ago, we can send anybody to fish. So people come into the shop, and they -- you know, and they want to catch fish, and they can go there and catch fish. I mean, really, anybody can go there and catch fish. It's just the nature of it.

It's just such a -- and it's such a rich fishery, because it's below a dam, that makes it very rich and healthy, and the grazing is quite minimal in the Costilla at this time. So it's a very important

thing to us.

Oh, and another thing I wanted to say was I heard some figures on the money that fishermen spend yesterday, and I thought that they were kind of low, and my -- of course, I might because I get some of the money from guiding, but, I mean, just as out-of-state fishermen which fish there a lot, I think that it was decided that that was -- the primary was nonresident over resident there.

But so many of those people stay in Taos, and it's kind of a package. You know, the husband gets to fish, and then the wife gets the credit card, and, you know, everybody's happy at the end of the day. So it's kind of a bigger picture there that may not be reflected, I think, in some of the figures.

Q. What do you think will be the consequence if -- to both fisherpeople in general and then also to your guiding operations or your son's guiding operations if threats to water quality and to the fishery habitat in the Valle Vidal were compromised by -- there was a lot of discussion about coal bed methane development.

A. Right. My feeling is that -- you know, we got to see this a couple years ago, and there's been different things that -- hantavirus years ago, or the fires of 2002, and, you know, somebody from Connecticut

hears that there's a fire in New Mexico, and they get this picture of the whole state on fire.

And I kind of feel the same way about the -- any development up there, is that from my experience, it scares everybody off. I mean, just a huge -- you know, panic sets in, and "We're not going to do our vacation there because, you know, we're going to get covered with oil."

Q. In situations -- there was a lot of discussion about the importance of the Valle Vidal in terms of the fishery that you're also discussing, and you mentioned the fires, and you also -- what would happen if there were, say, a drought in the state? What is the value of the Valle Vidal, say, as a fishery relative to the broader state in your perspective?

A. Well, it was interesting yesterday, because there was a graph -- I forget when it came in, but there was a graph on the fishing use, and in 2002, the year of the severe drought, the use of the maybe -- of the Valle Vidal went up, went way up, a big spike.

And that was because it is one of the few places -- because the water comes from a dam, and it's a tail water, it should have a stable flow of water through there, so it was one of the very few places that fishing still remained good, because there was -- you

know, there was that steady flow.

MR. SCHLENKER-GOODRICH: Thank you, Mr. Streit.

That concludes my direct testimony of Mr. Streit.

If I could ask the Commission, similar to the State, I would like to present all my witnesses as a panel. I think that's generally more productive.

So with --

MS. PADILLA: I would agree.

MR. SCHLENKER-GOODRICH: Thank you, Madam Hearing Officer -- or Madam Commissioner.

Thank you, Mr. Streit.

MR. STREIT: Um-hum.

MR. SCHLENKER-GOODRICH: Oh, my apologies.

As we're trying to expedite this process, it's become a little bit truncated, but Mr. Streit also has a video that he would like to play concerning his fishing guiding on the Valle Vidal.

MR. STREIT: This was filmed for the TV show that's on -- I'll give it a plug -- Fox, 10 o'clock on Sunday night, which the Game and Fish Department does.

And this is me taking the Director of Game and Fish, Dr. Bruce Thompson, fishing on the Costilla. So not quite the same as actually doing it, but some taste

perhaps.

(Playing video.)

MR. SCHLENKER-GOODRICH: And that concludes Mr. Streit's testimony.

Mr. Streit, thank you very much.

MR. STREIT: Thank you.

MR. SCHLENKER-GOODRICH: The coalition would now like to call Donald Hurst.

And my apologies to the Commission. Don't get too comfortable in your seats. Mr. Hurst is going to have a brief video presentation, as well, and he's going to overlay his testimony -- spoken testimony with that video.

DONALD HURST

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. SCHLENKER-GOODRICH:

Q. Could you please state your name for the record?

A. Don Hurst, H-U-R-S-T.

Q. And what is your background, your position?

A. I guess I come here in two roles.

One is I'm a fly fisherperson. I grew up fly fishing in the Midwest. I started fly fishing in 1953,

abouts. I moved to New Mexico in 1973, been fly fishing here, in the West, and other places, for that matter, since then.

And -- and I also come to you as the Vice-President of New Mexico Trout. New Mexico Trout, as some of you may already know, is a statewide conservation organization. We are a charitable organization, a 501(c)(3), and our mission is to preserve, protect, conserve the coldwater fisheries that we have in the state.

Q. Thank you, Mr. Hurst.

You can proceed with your direct testimony.

A. Okay.

I might go ahead and say, too, that I think all of you have my written testimony, so I'm not going to be redundant, I'm not going to read that or anything else. You're welcome to refer to it at any time.

But I thought what I would do is give you a little description about some of the slides that I'm about to present.

And this -- these slides are rolling, so they're constantly being refreshed. Many of these slides are about our Comanche Creek project, which is our main project in the state. We've provided more resources to this project than any other project.

And this presentation is an educational presentation to everyone who wants to know something about New Mexico Trout and what we're doing in the state to help the conservation effort.

So you'll start to see right here -- and if you don't mind, I'll just kind of give you a little narration.

This is up in the Valle Vidal. This is on Comanche Creek.

Boy, these are really going fast.

Did you control this, Erik?

Anyway, these are actual workdays up there. In the last, oh -- I'm going to say these photographs probably go back five -- five years or so, four years, five years. And you will see the work that's being done.

This is Comanche Creek, right here. And you will see some of the benefits by the added vegetation that is coming up there now.

By building these small elk exclosures, under the supervision and guidance of the Forest Service -- Bill Zeedyk, I know, has been a consultant to this project for quite a while, and others.

These exclosures are primarily elk and cattle exclosures that will allow for the vegetation to

recover. And primarily we're talking about grasses, we're talking about willows, we're talking about alders.

And in the testimony you heard earlier, there was a description about water temperatures. And I'm not a technical person, I'm not a hydrologist or anything, but one of the goals of this project is to deepen the waters, provide more shade for these waters, so we can start to reduce the average temperatures that will, in turn, provide better habitat for the fish and the aquatic insects in the area.

You see some of these willows right here. These are even higher than we are tall. And those have come up probably just within the last five, maybe six years.

Another thing, too, you've heard testimony from another -- a number of organizations, and this project is really a popular project with us because we partner with so many people. We partner with the Forest Service, the Game and Fish, the Quivira Coalition, Amigos Bravos, Rocky Mountain Youth Corps, the Boy Scouts, Truchas Chapter of Trout Unlimited.

And I know there's some that I'm forgetting, too, but this is a big partnership project. And on some of our workdays, we've had as many as 50 people show up.

One of the -- one of the things we're trying

to do, also, is introduce this project in this area as an outdoor classroom.

Sandia Preparatory School, where we host -- have our meetings in Albuquerque, has an outdoor program, outdoor education program. And they are very much interested in what we're doing, and they would like to get their students, both high school and middle school students, involved in this with us.

We have communal lunches. We provide for everybody there.

But you can see the growth now that's happening, and this growth is exactly what we are trying to achieve to improve that habitat.

I think of this area -- and I've described it in my -- my testimony to you -- as sort of the Yellowstone of New Mexico. I also like to think of it as New Mexico's crown jewel. It is really precious, and we would clearly hate to lose or see this area downgraded in any way whatsoever.

Some of these areas you can see -- there's a good description of the road, and then the other side of the -- the stream bed. And what we're trying to do is get that stream to meander more in this -- in this big bed, because that will create better habitat, more habitat. It will improve the whole ecology of this

area.

Some of these pictures, I might add, are also in the Santa Fe National Forest of some other projects we belong to, so they're not all of just the Valle Vidal.

This is the Valle Vidal. This is Comanche Creek. And this is really starting to look good to us now. As you see, those banks start to build back up, the vegetation, the grasses, the alders along the side. That provides that critical habitat for those fish.

I think that's it. There's a little bit more on this CD, but I don't think it's applicable to your hearing here today.

Anyway, this project for New Mexico Trout has really been our -- our focus, our center, for some time, and we certainly hope to continue in -- with this project, because of the success we're seeing. So many projects, you'll do something and not see the immediate results, but we are seeing this vegetation grow now, and it's just precious to see that come back.

Some of those slides, I think you saw how they were just grasses, sort of barren grass all around, and that is starting to change now, and it is providing that critical habitat for our fish.

MR. SCHLENKER-GOODRICH: Thank you very much,

Mr. Hurst.

And that concludes Mr. Hurst's direct testimony.

The coalition would now like to call its third witness, Mr. Bill Schudlich.

And if it pleases the Commission, Mr. Schudlich has a PowerPoint presentation that he will give after he is sworn in and introduced.

And I believe that you were distributed copies of his PowerPoint presentation, so you have it in front of you to refer to directly.

WILLIAM SCHUDLICH

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. SCHLENKER-GOODRICH:

MS. CONN: It may take a moment. I believe that his PowerPoint is on the other computer.

(Discussion off the record.)

MR. SCHUDLICH: We can just move ahead without it. Everybody has the slides here. There are just a few slides which were some pictures of -- that kind of reflect some of the things that we've been doing and some of the recreational opportunities in the Valle Vidal.

MR. SCHLENKER-GOODRICH: Okay. In the interest of moving forward quickly, we'll just proceed directly with his testimony.

Q. Mr. Schudlich, could you please state your name for the record?

A. My name is William Schudlich. That's spelled S-C-H-U-D-L-I-C-H. And I'm Chairman of the New Mexico Council of Trout Unlimited. The council represents 1,200 anglers and conservationists throughout New Mexico who are concerned with the future of our fisheries and our coldwater resources.

A good portion of our work is focused on our two native trout in New Mexico, the Gila trout and the Rio Grande cutthroat trout.

Q. And if you want to simply proceed with your statement, that would be --

A. Sure.

Trout Unlimited has spent and continues to spend considerable time and resources working on the waters of the Valle Vidal. The waters of the Valle Vidal represent some of the best trout fishing waters in the state and are vital to the recovery and sustainability of the Rio Grande cutthroat trout.

As the Chairman of the New Mexico Council, I get calls from people around the country wanting to know

where the best trout fishing is in New Mexico. If their sole purpose is to catch big fish, I send them to the San Juan. If they're looking for a true outdoor experience with a chance to catch a native fish, then I send them to the Valle Vidal.

I've had visitors from as far as Maine make a trip to the Valle Vidal to capture the true New Mexico fishing and camping experience.

The Rio Grande cutthroat trout has been petitioned for listing under the federal Endangered Species Act, and the current petition is still in litigation. Trout Unlimited is not currently party to the current suit to list the cutthroat, preferring to work with the state and federal agencies in accomplishing restoration work on the ground.

With regard to criteria B.(1) and B.(2), Trout Unlimited believes that there are four watersheds and subwatersheds within the Valle Vidal that are of particular importance as both recreational fisheries and as a refuge for the Rio Grande cutthroat trout. They are the Rio Costilla, Comanche Creek, McCrystal Creek and Middle Ponil Creek.

The Rio Costilla is the largest river draining the western side of the Valle Vidal. It enters the Valle Vidal just below Rio Costilla Reservoir and runs

through the Valle Vidal for approximately six miles.

The entire length of the Rio Costilla within the Valle Vidal is easily accessible by automobile. This stream offers some of the best fishing in the state and is one of the best destination fisheries in our state for out-of-state visitors.

Trout Unlimited has also been in extensive discussions with the New Mexico Department of Game and Fish, the United States Forest Service, the United States Fish and Wildlife Service, the Interstate Stream Commission, Turner Enterprises and the Rio Costilla Cooperative Livestock Association and New Mexico Trout to complete an extensive project that would restore the native fish community, including Rio Grande cutthroat trout, the Rio Grande chub and the longnose dace, to this watershed.

I've attached a summary of this project, which was originally presented to Governor Bill Richardson and to the New Mexico State Game Commission, to my written testimony.

The waters of the Valle Vidal are key to making this project happen as they tie all the watersheds together, allowing for the creation of a metapopulation.

A metapopulation, which means that the species

occupy multiple interconnected watersheds, is crucial to the long-term genetic health of a species, protecting it from catastrophic events such as drought and wildfire, and also allowing for genetic drift between the streams, which keeps the gene pool from becoming too closely related.

Given the fractured landscape that makes up most of the West today, including the former range of the Rio Grande cutthroat trout, there are very few places left where one can recreate a metapopulation. The Valle Vidal is one such place.

If this project is to be successful, we feel it is imperative that the riparian habitat be maintained at as high a level as possible. Outstanding National Resource Water designation offers solid protection for the habitat that is so important to the long-term stability of the Rio Grande cutthroat trout.

Comanche Creek drains much of the western side of the Valle Vidal and enters the Rio Costilla at Comanche Point. Over the past several years, Trout Unlimited, in conjunction with all the other people that Don talked about, has worked extensively on repairing habitat in and around Comanche Creek.

This creek had been extensively damaged from past land use activities and the water condition

degraded. Through the use of in-stream structures and cattle and elk exclosures, we've been able to make vast improvements in the quality of this watershed, which I think you saw in the slides that Don presented.

As of the last survey, done in 2001, the upper reaches of Comanche Creek still hold pure Rio Grande cutthroat trout. Our cooperative efforts with the Department of Game and Fish, the Forest Service and the Fish and Wildlife Service to restore the native fish community to the Rio Costilla also extend to the Comanche Creek drainage.

Because the upper reaches of Comanche Creek, including Vidal Creek, are less utilized by fishermen, we feel that this section of the drainage offers a good refuge for the Rio Grande cutthroat trout.

I'd also like to note that the population of Rio Grande cutthroat trout on Powderhouse Creek, which is in the northmost part of the Valle Vidal and drains into the Rio Costilla, has already been secured. Nonnative fish were removed, and a fish migration barrier was installed.

There are certainly some exciting things happening right how in the western half of the Valle Vidal, and we are in the midst of some substantial work that will build a sustainable native fishery, but I'd

also like to discuss the eastern half of the Valle Vidal.

The headwaters of the Canadian drainage, which flows through much of Eastern New Mexico, are located on the Valle Vidal in two creeks of note, Middle Ponil Creek and McCrystal Creek.

These two creeks drain the eastern side of the Valle Vidal from the Colfax County line eastward. Both these creeks hold Rio Grande cutthroat trout and are, in fact, two of the few strains in the Canadian drainage that can still support Rio Grande cutthroat trout.

From the Long Range Plan for the Management of Rio Grande Cutthroat Trout in New Mexico, produced by the New Mexico Department of Game and Fish in 2002 -- and I'll just refer to that as the long-range plan from here on out, McCrystal Creek holds the largest population of Rio Grande cutthroat trout in all of the Canadian drainage.

And I also attached a copy of the long-range plan to my written testimony.

While this stream may not offer the extensive fishing opportunities of the Rio Costilla, it does support angling and acts as a refuge for the core conservation population of Rio Grande cutthroat trout that occupy the Canadian drainage.

Eventually, Trout Unlimited would like to participate and work to secure this population of cutthroat, but that will likely not happen until the Rio Costilla project is at least near completion.

Middle Ponil Creek has seen extensive restoration work in the past to secure the habitat for potential reintroduction of Rio Grande cutthroat trout. A fish barrier has already been constructed to stop the upstream migration of nonnative trout.

At some point in the future, this watershed is a prime candidate for Rio Grande cutthroat trout reintroduction, as has been put forth in the long-range plan.

Even though work hasn't been going on with the fisheries on the eastern half, it is important, though, to maintain the water and riparian habitat quality of both Ponil and McCrystal watersheds until such restoration efforts can be undertaken. Outstanding National Resource Water designation does just that.

Additionally, to the mentioned watersheds, I'd like to briefly talk about Shuree Ponds, referencing criteria B.(1).

The Shuree Ponds, located just west of the Rock Wall, are water catchment ponds on Shuree Creek. These ponds offer a top-notch fishing opportunity for

large trout equal in only a very few places throughout all of New Mexico.

There is developed access, including handicapped access to the ponds, and they represent a significant angling opportunity for those who are not able to or do not desire to fish in the streams of the Valle Vidal.

Trout Unlimited views the waters of the Valle Vidal as very significant in both scope and importance to the future of the Rio Grande cutthroat trout in New Mexico. We see from experience that these waters represent some of the most significant recreational fishing opportunities in all the state.

When the current projects we are working on are completed, the waters of the Valle Vidal will represent a native fishery unmatched in all of the Southwestern United States. It will be a true collaborative effort that will include multiple governmental agencies and multiple private landowners.

It only makes sense that we protect the watersheds that represent the foundation of our investment in this fishery.

Because of the superior watershed conditions that already exist on the ground throughout all of the Valle Vidal, because of the Valle Vidal represents the

last great refuge for our imperiled state fish, because the Valle Vidal represents one of the truly great recreational fisheries in the Western United States.

And because of the continuing great work that is being put forth by both governmental agencies and nongovernmental organizations to further enhance the quality of the watersheds of the Valle Vidal, Trout Unlimited fully supports the designation of the waters of the Valle Vidal as Outstanding National Resource Waters.

Thank you.

MR. SCHLENKER-GOODRICH: Thank you very much, Mr. Schudlich.

With that, that completes Mr. Schudlich's direct testimony.

And the Coalition for the Valle Vidal has one final witness, Mr. William Zeedyk.

WILLIAM ZEEDYK

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. SCHLENKER-GOODRICH:

Q. Mr. Zeedyk, could you please state your name for the record?

A. My name is William D. Zeedyk. I go by Bill

Zeedyk.

Q. And, Bill, have you prepared a statement today for the Commission?

A. I have. That was submitted through your office, I believe.

MR. SCHLENKER-GOODRICH: With the Commission's permission, Mr. Zeedyk will proceed.

MR. ZEEDYK: I would like to say a little bit about my background. I have a degree in forestry from the University of New Hampshire with a wildlife management option, it's a bachelor of science, 1956.

I have 35 years' experience as a wildlife biologist with the US Forest Service across the country, been in different slots, but always with water and wildlife responsibilities associated with my job.

I'm a certified wildlife biologist with the Wildlife Society, which is a professional organization of wildlife biologists. I'm a member -- active member of the Society of Scientists. I'm past president of the New Mexico Riparian Council and a member of the board. I'm a past president of the New Mexico -- of the Albuquerque Wildlife Federation.

And I have for the last 10 years operated my own consulting business, specializing in riparian and wetland restoration.

So I have a long-term professional interest in water and stream and riparian areas and especially wetland protection and restoration.

While I was with the Forest Service, I had a unique opportunity in my career to be a member of the negotiation team at the time that Pennzoil donated the land in the Valle Vidal, 100,000 acres, to the people of the United States in the name of the National Forest System.

And while I was on that team, I had opportunity to review the lands of the Valle Vidal before they were donated and to see the condition and the management practices at that time.

With a team of other people, we developed the plans that would guide the future management of the Valle Vidal in the way it's been managed for the last 23 years, since it was donated in 1982.

And those various treatments and guidelines that were developed are unique to the Valle Vidal because of the fact that it was a donation. It was not National Forest land that had been in use by numerous competing interests for a hundred years, but rather a new place. And so the public had not yet got used to using it.

We didn't have the normal range of user

interests and conflicts, and there was a little bit of time to develop a new way of looking at how lands might be managed, and it was not actually open to the public use for two years after it was acquired.

Now, the importance of that is that provided a new opportunity to manage livestock in a different way, a way to make lands accessible for public use and access in ways that hadn't been done before, and new terms of cooperation between the Forest Service and the New Mexico Department of Game and Fish and previous owners in the name of Vermejo Park Ranch.

I will move the board to this in the future.

Next, I've been a long-time volunteer for restoration activities on the Valle Vidal through my membership in the Albuquerque Wildlife Federation, which is the oldest organized wildlife group in the West, founded in 1914 by Aldo Leopold.

Some of the projects that we've been involved in, we had to work weekends every year, we've done it ever since 1982, two years before the land was opened to the general public use.

We have spent nine years on restoration of wet meadows along the Ring Place -- Ring Ranch meadows, which is a historic ranch on the east side of the wall, that was owned and operated by five sisters back around

1900, and they raised hay for the use of the draft animals at that time.

We installed rock structures through volunteers over a period of nine years to restore that back. We moved hundreds of tons of rocks in cooperation with the Boy Scouts and the Forest Service and helped to turn a gully system back into a lush meadow that's two miles long and a thousand feet wide.

So we have a lot of sweat equity, as is said, in the productivity of that part of the forest.

We spent six years through volunteer efforts working on Middle Ponil Creek to install fisheries, habitat improvements, and we spent four years on Comanche Creek.

So there's been a lot of effort. On the average, we have about 400 volunteer hours per weekend -- or per year dedicated to that over a period of 23 years, whatever that comes out to. What is that -- 8,000-some hours. So we -- we have a long history as volunteers.

Part of the reason that the volunteers are attracted to the Valle Vidal to do these kinds of projects on all parts of the unit is that they can tie recreation opportunity to fish or hunt or hike or whatever it might be into the volunteer work effort.

I've taught my sons -- excuse me. I've taught my granddaughters, and within a few years my great granddaughters. I have two.

So based on my professional and personal interests and knowledge of the Valle Vidal -- I've walked -- I've climbed to the top of Little Costilla, I've hiked to the edge of the creeks. There's one main road system, you can hike four hours -- I mean four miles and see any of the Valle Vidal from that central access road that crosses it.

We have -- based on standard nomenclature for wetlands, in addition to the streams -- we've seen many photos of the streams now. We have basically five different types of wetlands that are important on the Valle Vidal.

The most abundant is the wet meadow. You've seen lots of photographs now from those who testified before me that show the extent of the wet meadows, subirrigated pasture land, some people call them, because you don't need a surface irrigation system. The water gets to the vegetation through the soil.

And we -- and that's the most extensive and the most important, but I want to mention the others.

The other types are what's known as the cienega. The cienega is a spring-fed wetland as opposed

to one that's directly tied to the river system. We have cienegas, or spring-fed wetlands, throughout the Valle Vidal, mostly in the upper elevations.

We have a very unique wetlands on the slopes of Little Costilla Peak. Those are glacial kettle holds, or wetland catchments, that are left over from the last glacial history on the mountain. Those were bogs, and they're occupied by different kinds of plants and wetlands -- animal life than the other wetlands.

We have the playa wetlands, or the crescent base land wetlands, that are found in the lower elevations on the east side of the Valle Vidal, when Sealy Lake and -- well, my memory escapes me. But these are closed basins, they're not connected to the river, so they have their own unique characteristics.

And then we have various kinds of stock ponds and livestock ponds in various stages of evolution that they're well stocked with different kinds of wetland vegetation.

Why am I spending so much time on these wetlands? It's because they're the most -- in my opinion, the most significant ecological resource of the Valle Vidal, especially the wet meadows. And the wet meadows are extremely important because of their productivity for both livestock and wildlife.

The Forest Service did a terrestrial ecosystem survey of lands that qualify under the standard definitions for wetlands. This was a soil survey of the whole unit. But they identified four different wetland soil types that totaled about 2,576 acres.

Those have been distinctly mapped, and they have different characteristics depending on their elevation and soil types in connection with the river.

And then there's another 1,900 acres that are small -- or too small to map but intermingled with other mapping units, giving a total acreage of about 4,489 acres, or roughly 4,500 acres, or 4.5 percent of the Valle Vidal as a whole.

The statewide percentage of wetland and riparian habitats, based on an inventory by the Fish and Wildlife Service in the late 1970s and early 1980s, is that we have .6 percent of 1 percent -- .6 of 1 percent of New Mexico is mapped as wetlands.

So the ratio in New Mexico, Valle Vidal is five times roughly the state -- 10 times the state average. Is that right? My math is wrong. 4.5 percent versus .6, so that would be almost 10 times the distribution on a statewide average.

These areas serve many ecological functions, as well as add various types of values, natural values,

human values. And of those ecological functions, the most important is that the wet meadow is directly linked with a stream, and the water goes under the soil based on the deposition and strata of soil particles in the valley bottom.

The water from the stream has easy access to the meadow subterraneanly, and then water is wicked up by the fine soils, to nurture and nourish the wet soil vegetation.

By the same token, that water that gets stored in the bank during high flows then can go back out into the stream as outer bank flow to sustain the flow of the stream between precipitation events.

So while the water is in the bank, the vegetation cleanses it, and so -- and cools it, because of the -- it being in the bank from a foot to five or six feet deep, if it's not subjected to the sunlight, and so when it eases -- oozes back out into the stream, or seeps back out into the stream, it's cooler than it would have been if it had just sat in the stream a long distance.

So that's one of the ways that the water quality of the Valle Vidal streams is maintained, is by their access to the wet meadows.

So we have 4,500 acres of wet meadows,

paralleling most of the streams. You saw lots of pictures by previous testimony -- witnesses that I think you can maybe recall at least one, I hope, and picture that while I'm speaking.

And these 4,500 acres of wet meadow, in addition to cleansing the stream, may buffer the stream from sediments coming from the overgrazing or from parallel roads or from fires. And the three most common threats on a unitwide basis to the streams and wetlands, water resources of the Valle Vidal, are the potential of overgrazing, roads, both closed and open roads, and fire.

We had a forest fire a few years ago that burned 30,000 acres of the 100,000 acres in the Valle Vidal. The wet meadows served as buffer areas to keep the sediment and ash from the forest -- burned areas from flushing directly into the stream and creating pollution hazards and turbidity hazards for the fish and other wildlife.

The -- when the Valle Vidal was donated to the National Forest System, a special grazing system was set up with the Valle Vidal Grazing Association. After various negotiations, that Valle Vidal Grazing Association was selected to be the permittee, and they -- and there was a very complex grazing system that

was established at that time.

And we've heard testimony about that already today.

And the essentials of that system are that it's an eight-pasture system.

And for those of you not familiar with the geology and the topography of the Valle Vidal, the Valle Vidal is divided by a geologic feature that's called the Rock Wall, that runs north and south across the unit and splits it from about 40,000 acres to the east, from 60,000 acres to the west.

And there's four pastures for grazing of livestock on the east side of the wall and four pastures on the west.

And since each set is managed under a different grazing rotation system, that means one pasture out of the four is rested each year, and each of the other three are grazed for a short time.

Now, that time frame amounts to about 15 days per pasture per year. Okay. So -- if I get my math right again. 90-day season. Yes. Okay.

So that allows for low intense -- or high intensity grazing for a short duration, which means that when the animals are moved, there's a high stubble height that the grasses and the wet meadows and cows are

gone for another year, and that stubble height of -- it's like a mat, it's like the filter in your air -- your swamp cooler.

It lets -- when the spring snow melt of snow runs off, the water runs off the hillside, it oozes out across the meadows, and its flow is slowed by the -- by the filter effect of the grasses, and there's times where the waters seep into the ground.

And in the process, all the dissolved nutrients are captured in the soils, and they're taken up, and then they can be taken out by the grasses to stand even, to make the stand even stronger and more biomass next year.

Why am I telling you all this? It's because that is a slow process. It's a cumulative process, and it's correlated with the presence of the animals on that pasture, so that the soil has gradually come back, and the wet meadows have expanded in the last 23 years, and the stocking density of grasses has increased, and the meadows can store more water, and they can cleanse more water to protect the stream.

So one of the reasons why these waters are worthy of nomination for Outstanding National Resource Waters is because of the grazing system that's being practiced and attention to protecting the wet meadows to

reestablish the filtering of live water to sink into the soil. Okay.

And the same system is followed on the west side of the wall, so that when the animals come off -- they go onto the -- to graze about the first of June, and they graze for 45 days east of the wall, and then they're moved to higher elevation on the west side of the wall, and they have another 45 or some days to graze there.

So that distributes the pressure all around the whole area. Okay.

Now, there's 40 -- there's 100,000 acres of land in the Valle Vidal. There's 5,000 -- 4,500 acres of wet meadow. That wet meadow is distributed between about 40 percent on the east side of the wall and 60 percent on the west. And the distribution of mountain meadows, it's greater on the west.

The -- the wet meadows have the potential to produce from 3,000 to 5,000 pounds of forage per acre per year, because they have the most water, they catch the nutrients, and they get the same amount of sunlight as everywhere else, so they have the ability to grow more forage.

So that 4,500 acres of wet meadow produces about 13,000,000 pounds of grass per year. The upland

meadows, which are about 25,000 acres, produce about 600 pounds of grass per acre, but there's more of it.

The total production of both sides of -- of both types is about the same, 15 -- 13,000,000 acres each, of which about 20 percent is grazed in the grazing rotation. So about 3,000,000 pounds of forage is available for livestock from each of the two types each year. Okay.

Now, that has to -- that's the significance to the livestock industry.

That is also highly significant to the elk population, which has been already expanded on -- expounded on, and it's one of the highest if not the highest elk population in New Mexico. It's managed specially to -- for the quality of hunt and the numbers of animals.

But there's about 4,000 animals, and they consume a lot of forage, also, and more of that forage comes out of the wet meadows. And the animals are attracted to the wet meadows because it's not only abundant, it's the most nutritious source of food around.

The dominant vegetation in the wet meadows is sedges and wet soil grasses, dandelions and plants like that. And the sedge tips are 22 percent protein, value

dry weight, and that's the best source of protein around.

And the cow and elk need that to nurture their calves, and livestock need that to nurture their calves. And so those animals are naturally attracted to the most productive and most nutritious soils.

And finally, because those areas are subirrigated, or irrigated from the stream, and that's the last place to go dry in a drought year, there's forage there when there's not forage available anywhere else.

So I'm trying to build a case to why this resource is so ecologically significant, is both in terms of the quality and the quantity of the forage produced and the reliability of that forage.

Now, finally, those wet meadow systems, as I mentioned before, are totally integrated with the stream system, so the wet -- the water resource of the wet meadows is part of the water resource of the stream. And the two can't be separated.

The water interchanges, flows back and forth between the wet meadow and the creek, so it's all the same water resource. And the meadows play a role in cleansing and sustaining the streams.

Now, water threats.

I mentioned the grazing. The grazing can be managed properly to restore the wetlands, and that's been the process for the last 23 years, and those animals are not only moved between the pastures, but they're -- the association hires a rider to chase the cows out of the stream side areas and to minimize the impact on the stream bank.

Okay. The next thing is the roads. It's been mentioned already when the Valle Vidal was acquired, there was many hundreds of miles of logging roads and ranch roads on that property. The number was about 700 miles of roads -- logging roads and ranching roads.

Over 300 miles of those roads were closed in the initial two years of acquisition, another 200-and-some roads were allowed to revegetate on their own, and about 54 miles, I think it is, of a permanent road system was -- was improved for general access.

So the roads can impact a wetland in many ways. The most direct and obvious way is sediment production off the surface of the road. During a rainstorm, that water moves down, sloping into the creek. If that can be buffered with a vegetated zone that separates the road from the wetland, then those sediments can be captured and turned back into soil.

And the water that flows off the road, instead

of flowing straight into the creek, make the creek dirty, seeps into the soil, promote more vegetation. So a big part of restoration has been the proper treatment of the roads to capture the water and treat it as a resource rather than to have it flow directly into the creek, as well, to degrade the creek.

Some of the other ways that roads affect wet meadows are where they cross the meadow, they end up being incised into the meadow surface, so they capture both surface and subsurface flow, and it runs down the road, or down the road ditch, instead of seeping through the meadow, as -- in total. So that water is quickly lost to the system.

Another way is that roads going across the hill slope, right at the base of the hill slope and the edge of the meadow -- the outslope ditch captures the water and redirects it, and some portions of the meadow that used to be wetted from the hill slope are now living in a rain shadow, so to speak, and those soils dehydrate, and they lose the characteristic as wet meadow soils, and they turn into upland soils, and they're not nearly as productive, 600 pounds per acre or less versus 5,000 pounds per acre.

So that's very important. So dehydration of wetlands is a major effect of roads.

Next, the roads can cause -- where they cross the stream or a wetland, they're usually incised, and they cause erosion of the adjacent land upslope of the road.

So a gully develops and begins to move up -- uphill in the landscape and makes a gully, which captures the water in, and it drains the wetland from below, so to speak, and -- and again, it dehydrates and is converted to upland soils.

So there's a series -- there's many different treatments you can use to offset those, but the most important one is to recognize that as a fact.

Now, there are various kinds of impacts that I've mentioned are all visible along forest road 1950, which is the road that runs east/west across the Valle Vidal.

Even though those are specially -- that road was built with a sensitivity for the value of wetlands and the value of the creek, and measures were taken to mitigate the adverse effects, when we have roads that are built for single purpose, without regard to off-site effects, then the impacts would be far more severe than when those -- there's an active effort to mitigate the effects.

So roading or reroading of the Valle Vidal on

either side of the wall could pose a significant threat to the integrity of the wetlands and, therefore, to the quality of the water.

The -- the final thing that I would like to say is that there's other unique wildlife populations that are dependent on the wetlands and the water quality of the Valle Vidal, in addition to the fisheries which have been very well described in the last two days.

But we also have migratory waterfowl in the spring of the year that rely on picking up invertebrates that feed on insects in the water, in the shallow waters of the flooded meadows, because the water is clean, and it's visible and has high populations of invertebrates.

And the female waterfowl take the protein resource north with them to the wintering -- to the summering grounds, because when they get there, it's still frozen. There's still snow cover. They have to take the protein with them in order to lay across the eggs.

So where the last place they feed before they head north is extremely important to our continental waterfowl populations. The Valle Vidal makes its contribution. We don't even see that, because we're not in the Valle Vidal during snow melt in the spring of the year.

You can't get through there on the roads, but the waterfowl is there, and they gather food they need, and they go north.

So there are many different values -- ecological values that are associated with the water quality of the Valle Vidal and that are obvious to almost everyone and a little bit more obscure to others unless you have the scientific training or knowledge of how the wet meadows interact with the ecosystem in total.

And I -- so I feel that it's -- the Valle Vidal, because of the extent of the wetlands and the quality of the wetlands and the remoteness that allows wildlife to use it, and with some sense of security and solitude, that makes it extremely unique to New Mexico, and is a contributing contribution to the resources of New Mexico, as well as the West in total.

And that concludes my remarks. Thank you.

MR. SCHLENKER-GOODRICH: Thank you very much, Mr. Zeedyk.

With the Commission's permission, I would like to bring up all my witnesses for cross-examination. That concludes the coalition's direct testimony.

MS. PADILLA: Thank you.

And if it please the Commission, I'd also like

to acknowledge the presence of Felicia Orth, who actually returned prior to the testimony of your fourth witness. So our Hearing Officer is here.

Thank you.

MS. ORTH: Thank you.

MR. SCHLENKER-GOODRICH: Before we get to cross-examination, in order to speed things up, I asked my witnesses to provide as -- move through their testimony as quickly as possible. With our notice of intent, we provided elaborate statements, and I would refer the Commission to those statements, which are part of the record, I believe.

MS. ORTH: Yes, and which were sent to the Commissioners about three weeks before this hearing. Right.

MR. SCHLENKER-GOODRICH: Thank you, Ms. Hearing Officer.

MS. ORTH: As part of your NOI and the exhibits.

MR. SCHLENKER-GOODRICH: Yes. And they should be -- they were attached, they should be available.

MS. ORTH: They are.

Let's start -- let's see. This side this time.

TAYLOR STREIT, DONALD HURST,
WILLIAM SCHUDLICH and WILLIAM ZEEDYK
having been previously duly sworn or affirmed, were examined and testified further as follows:

CROSS EXAMINATION

BY THE COMMISSION:

MS. ORTH: Commissioner Murray, do you have questions?

MR. MURRAY: On the elk exclusionaries in Comanche Creek, have those been maintained this year?

MR. ZEEDYK: I assume that was directed towards me.

MR. MURRAY: I was going to say Bill, but I all of a sudden realized there's a lot of Bills.

MR. ZEEDYK: Yes, Mr. Commissioner. My -- I've been involved with the restoration effort all summer of the -- many of the small mini exclosures, we call them there -- they range in size from a tenth acre to a quarter acre or so -- that have been built over the last four years. A couple preceded that. They were all maintained and additional ones added last summer.

MR. MURRAY: Are you collecting data --

MR. ZEEDYK: Pardon?

MR. MURRAY: Are you collecting vegetation and aquatic data from those, and is that available?

MR. ZEEDYK: We have photographed each and every site and have that available through the Quivira Coalition. That could be provided. I don't have it with me.

MR. MURRAY: Okay. Thank you.

MS. ORTH: Thank you.

Commissioner Lujan.

MR. LUJAN: Thank you.

Are there any wells that are dug for livestock other than drink tanks?

MR. ZEEDYK: Mr. Commissioner, the -- there was an extensive network of wells, you know, under the previous ownership. There's no recent wells.

Those wells are now -- the windmills and so forth are no longer maintained. There's no need for them at this point.

MR. LUJAN: Thank you. That's all I have.

MS. ORTH: Thank you.

Commissioner Johnson.

MS. JOHNSON: I pass at this point.

MS. ORTH: All righty.

Commissioner Hutchinson.

MR. HUTCHINSON: I think I'll allow the other commissioners to ask questions first this time, rather than stealing all their questions, maybe.

MS. ORTH: Commissioner Glass.

MR. GLASS: For Mr. Zeedyk, you mentioned that -- something you said doesn't exactly jive for me with something else that was said earlier.

In the petition, it describes how the riders move the cattle away from the wetlands and wet meadow areas, but you described their being allowed to graze for 15 days on these wet meadow areas until there's a stubble left and can regrow.

So that doesn't jive for me.

What exactly is the grazing practice up there?

MR. ZEEDYK: Mr. Commissioner, I get a little nervous in these situations. I might have left something out.

But the -- the animals are moved between the pastures at regular intervals. They have access to the whole pasture. The pastures are several thousand acres in size. Comanche Creek flows through a couple of those pastures, and the riders are used to move the livestock out of those pastures up into the up -- out of the riparian zone up to the upland portion within those same pastures.

So it's not totally exclusive.

Does that answer your question or --

MR. GLASS: Well, I got the impression that

there was a very active effort to prevent grazing in wet meadows and wetland areas.

I guess you can't completely exclude them, right? I mean, they, for some reason -- and at 5,000 pounds of forage per acre, I can imagine why they like to be down there, rather than where it's 600 pounds per acre.

MR. ZEEDYK: Right.

MR. GLASS: It's like a cafeteria down there, I guess.

So I guess I shouldn't make the assumption that there is no grazing in the wet meadow areas --

MR. ZEEDYK: That's correct.

MR. GLASS: -- that wet meadows are, in fact, grazed by the cattle, but that there's an effort to prevent excessive grazing in the wet meadows area.

MR. ZEEDYK: I'm still confusing the issue. There's extensive effort to keep the cattle off of the stream banks where the fisheries restoration effort is ongoing.

MR. GLASS: Okay.

MR. ZEEDYK: The rest of the wet meadows that are not directly associated with Comanche Creek are freely available to the livestock while they're in that pasture.

MR. GLASS: It's -- actually, I -- that's confusing the stream bank exclusion that the riders take care of with the wet meadow grazing. Wet meadow grazing is no problem, stream bank grazing is a problem, because it destabilizes the stream bank.

MR. ZEEDYK: Correct.

MR. GLASS: Okay. Thanks for that clarification.

MS. ORTH: Thank you.

Commissioner Price.

MR. PRICE: I have a question for the gentleman on the end, the fisherman.

MR. STREIT: Ah.

MR. PRICE: Bill --

MR. GLASS: Taylor Streit.

MR. STREIT: No. This one is not a Bill. Taylor Streit.

MR. PRICE: Oh, Taylor Streit.

MR. STREIT: Uh-huh.

MR. PRICE: Yeah.

I'm an avid fisherman.

MR. STREIT: I saw the smile on your face when we hooked the fish.

MR. PRICE: One of the reasons that I understand from hearing this the last two days that the

ONRW is so important is the ability for us to save the Rio Grande cutthroat pure strain --

MR. STREIT: Um-hum.

MR. PRICE: -- and have a place for them to live and basically reproduce on their own and so forth.

My question to you is, how successful will that program be if we cannot get the rainbow trout out of those lower portions of that creek?

MR. STREIT: Mr. Commissioner, I would say that if you can't get the rainbows out, then the project is doomed, but they can -- with -- with the piscicides, it is certainly possible to get the rainbows out.

It is -- although I personally think it's a -- you know, the idea of the project is fabulous, it does have some -- you know, that's a problem, that a couple of rainbows in there could be, you know, tragic, because they could inbreed with the other -- as has happened in the Gila.

But as far as the -- it is a really perfect situation for it. So in other words, maybe those problems were precarious anywhere that it would happen.

MR. PRICE: Right.

And I think I just heard you say we have to use the state-of-the-art fish removal piscicide, or whatever you use, which is supposedly a very short-term

effect on the stream and so forth.

MR. STREIT: Right. I've been involved with the Game and Fish in different shocking adventures, and it's -- that's -- there's no chance that that would -- there's really no -- no way, from my observation, which is pretty considerable, I think, that that could -- and from reading about it for years, that it could work without use of the piscicides.

It would not happen, it couldn't -- wouldn't be successful.

MR. PRICE: Okay. Thank you.

MS. ORTH: Thank you.

Madam Chair.

MS. PADILLA: Thank you, Madam Hearing Officer.

I have a question for -- let's see, it was -- Mr. Hurst, on the education and the benefit to New Mexicans on the outdoor classrooms, the educational opportunities.

How many students are -- or from what areas do students actually go up and participate in some of the classes that you were describing? And if you could maybe elaborate a little bit more about some of the benefits of that outdoor classroom and your partnership?

MR. HURST: Yes. Madam Chair, thank you very

much for that question.

We're working with Sandia Preparatory School, and they have a total enrollment in the high school and mid school combined of about 600, 650 students. Within the school, they have a program that's called the Outdoor Leadership Program, and that involves outdoor education.

And I have been working for many years with some of those faculty in that program to introduce various outdoor leadership opportunities. This is one opportunity that we're just now starting to tap for those students.

And hopefully, we can take that to other schools, too.

I have taken faculty up there. They have actually participated in the project with us. But as of yet -- and it's more of a timing issue because of the summer months when we're doing the work. A lot of students are off somewhere else. So we've not actually had those students there yet. So it's more of a programming scheduling issue.

And then, as I said before, we don't want to stop there. We want to go with other schools, too.

And last summer, just this last summer, when we had several workdays up there, we had a bunch of Boy

Scouts that were up there, and they worked with us in a very similar kind of outdoor education program, environmental program.

So we're sort of really just tapping the very top end of that at this point.

MS. PADILLA: Thank you.

MS. ORTH: Thank you.

Commissioner Bada.

MS. BADA: I don't have any questions.

MS. ORTH: Commissioner Darden.

MR. DARDEN: I think I have more of a comment than anything.

I appreciate Mr. Zeedyk's statements about how the properly managed -- or intensively managed grazing systems can be -- actually be a tool for -- for maintaining water quality as well as the fishery itself.

Thank you.

MS. ORTH: Thank you.

Commissioner Goad.

MS. GOAD: No questions.

MS. ORTH: Commissioner Vigil.

MR. VIGIL: I believe this is for Mr. Streit.

You said that there's approximately 200 guiding jobs that are in the Taos area or --

MR. STREIT: Mr. Commissioner, I believe what

I said is my company does about 250 jobs a season, 40 or 50 of those we do on the Costilla, but there are several other outfits.

So yeah. I'd say a couple hundred anyway would be -- somewheres in there.

MR. VIGIL: And like I said --

MR. STREIT: At least I would say, actually.

MR. VIGIL: -- if this ONRW is not granted, you actually see this as declining, or it will definitely decline, or --

MR. STREIT: Well, I would say that -- of course, our customers are tourists, and I wouldn't -- and maybe going a step further than that, and we'll -- and if we had the -- this gas development, I think that -- as I stated earlier, that it would perhaps scare tourists away just in general.

And that's been my experience, so -- that's all I have on that.

MR. VIGIL: This is more or less a comment to all the different groups.

I note that, you know, there's a -- conservation groups is, I guess, a buzz word, you know, at this time, but the Soil and Water Conservation District, like I made a comment yesterday, you know, I don't know that they're being fully utilized, or, you

know, the Natural Resource Conservation Service, you know, that their services are being totally utilized by your coalition, or even that they're involved with your coalition.

But I would definitely encourage you to, you know, because they are working on all stretches of the -- you know, the Canadian River, the upper headwaters of the Canadian River, they're trying to -- you know, eradication of the nonnative phreatophytes, the Russian olive.

I'm not sure, you know, on the Valle Vidal, you know, what noxious weeds are actually up there on that -- on those stretches.

But do you all have any comments about this or -- in particular? Any of you?

MR. ZEEDYK: Mr. Commissioner, with the Quivira Coalition, Mr. White spoke this morning as the director.

With the grant that they have for restoration along Comanche Creek, the Taos Soil and Water Conservation District acts as a financial agent for administering that grant, and we have put on workshops actually for staff and members of the Taos Soil and Water Conservation District on the techniques of erosion control and riparian restoration that we've been using.

So they can apply them on other lands outside of the Valle Vidal.

So yes, we do interact with the soil and water conservation district.

MR. VIGIL: I'm glad to know that, because, like I said, you know, there are 47 soil and water districts throughout the state, and, you know, we're really involved in the restoration work of these -- of the watersheds.

Like I said, I would encourage you to elicit these different groups to help you to get involved with your coalitions, and they could be active members, because, you know, we do work with -- I mean, we are a subdivision of state government, and we do get money from the legislature every year for some of these types of projects.

Thank you very much.

MS. ORTH: Thank you.

Commissioner Sloan.

MR. SLOAN: No questions. Thanks.

MS. ORTH: All right.

Mr. Shandler.

MR. SHANDLER: No questions.

MS. ORTH: Thank you.

Mr. Moore, do you have questions of the

coalition panel?

MR. HUTCHINSON: Oh.

MR. MOORE: We have no questions.

MR. HUTCHINSON: We never asked --

MS. ORTH: I've forgotten Commissioner Johnson and Commissioner Hutchinson, and then I'll come back to you.

Commissioner Johnson.

MS. JOHNSON: I guess just a brief one.

If the panel could help recap your testimony in just a couple of sentences, if each of you could comment on what you see as the benefit of the Valle Vidal to the state and how an ONRW designation could enhance that benefit.

MR. HURST: Commissioner Johnson, I'll go first.

You know, it was very interesting, the discussion earlier about the economic benefits and the economic costs of this whole area.

And I think from our perspective, it is very, very difficult, almost impossible, to put economic costs and benefits -- to quantify them so that we can really get a handle on them, because for New Mexico Trout, for our members, for, I think, the -- the citizens of the state that like to enjoy the outdoors -- and we clearly

are an outdoor state -- the benefits of this pristine area just clearly, clearly, in my opinion, sway the effort to prevent any further degradation of not just the waters there in the Valle Vidal, but, from our perspective, all the waters in New Mexico.

And it seems like this is the prime -- the prime place for us really to make our stand and to say, yes, we are going to do something, we're going to protect these waters for future generations.

And I think that's what we're all about.

MS. JOHNSON: Mr. Zeekyk?

MR. ZEEDYK: Madam Commissioner, the one overall most important threat that I see to water quality in the Valle Vidal would be a network or proliferation of a heavy duty road system across the wet meadows, because those impacts would be irreversible, because of the change to the subterranean flow of the water through the wetlands.

So I would say that the designation would help to be sure that those potential impacts were noted up front and necessary mitigation measures implemented and to avoid adverse effects up front, because if they were not avoided, they can't be mitigated. You can't get full restoration later.

When I testified before, I forgot to mention a

book that I've written called Managing Roads for Wet Meadow Ecosystem Recovery. That was circulated to you with my testimony, I believe.

And I would especially like to call your attention to three chapters in that book. And this book was peer reviewed, by the way.

And that is, one, how wet meadows function and the various hydrologic and biological processes that are ongoing in there. I hope -- if you could read that, you could better summarize what those effects are.

Secondly, there's a chapter, beginning on page 15, that addresses directly what the various types of impacts on roads actually are and how to offset them.

And finally, there's a chapter on how meadows heal, and so that you can get a feel for what processes have to go on and how long that might take.

MS. JOHNSON: Thank you, Mr. Zeekyk.

MR. SCHUDLICH: Madam Commissioner, as I mentioned in my testimony, Trout Unlimited is primarily concerned with stabilizing and restoring the Rio Grande cutthroat trout.

And there's a reason why there's so much activity going on in the Valle Vidal with regard to the Rio Grande cutthroat trout, and that's because this represents the best habitat left in our state for the

Rio Grande cutthroat trout, and, in fact, some of the best habitat left in all of its range.

So for that reason, ONRW designation protects at least the status of the watersheds as they exist right now and prevents any further degradation.

So I think that that would help us. It helps us in our restoration efforts knowing that the watershed is not going to go downhill. We know we don't have to at least worry about that.

MS. JOHNSON: Thank you.

MR. STREIT: Madam Commissioner, I originally was going to read this speech that I did for the Forest Service meeting in Taos, but we didn't seem to have the time, and it didn't seem necessarily appropriate, because it was a little bit of an emotional thing that I wrote, and -- but this might -- and I say in there that -- that if -- you know, I'm -- I've tried to describe the economic and business and what it -- what that means to me.

But what I said in the little speech was if economics were my strong suit, I wouldn't be in the fishing business.

And the place is just -- it's just a very special place to a lot of people, and certainly me, and I think that -- and all facts and statistics aside, I

think that that's the bottom line for me personally, is it just is a very important place for me.

Thank you.

MR. SCHLENKER-GOODRICH: Commissioner, as a point of information, Mr. Streit's speech is attached as Exhibit I to the coalition's notice of intent.

MS. ORTH: Thank you.

MS. JOHNSON: Thank you, Madam Hearing Officer. That's all I have.

MS. ORTH: Thank you.

Commissioner Hutchinson.

MR. HUTCHINSON: Well, I'll just go down through as the testimony was presented.

So, Mr. Streit, you talked about the exclusion of livestock grazing on -- I believe it was the Costilla and the subsequent improvement of the riparian area due to exclusive -- was the improvement of the riparian area due exclusively to the exclusion of cattle?

MR. STREIT: I don't -- Mr. Commissioner, I don't believe that I went into that territory, but I'm happy to. It may not be my field, but -- we fish along the Comanche Creek where the elk exclosures are, and they're very small, and fishing is quite good inside of them, because there's a big fence around them and you can't cast in there.

But they are very, very small, just to protect the banks themselves. So the -- and I don't know if this is your question. So that the amount of grazing that's lost due to this is -- it's minuscule to count.

I don't know.

MR. HUTCHINSON: I guess I was just noticing that the exclosures were built as elk exclosures and not necessarily exclusively cattle exclosures. So that --

MR. STREIT: I spent a good deal of time there this summer, and I didn't see any cattle on the -- on the drainage or in the bottom at all. I did see a lot of cows up -- going towards Shuree, up on top, and -- but I didn't see any in the bottom.

And we don't see the elk because we're there in the middle of the day and they're lounging there at night.

MR. HUTCHINSON: Okay.

Do you happen to know who operates the dam on the Costilla?

MR. STREIT: The irrigators below, and the fellow that turns it off and on, his name is Mickey Pacheco, I believe.

MR. HUTCHINSON: Okay.

And do you know if it's a permitted dam?

MR. STREIT: I'm sorry. Permitted?

MR. HUTCHINSON: Yes.

MR. STREIT: It's a pretty big dam. I'm sure there's got to be some paperwork for it somewhere. I don't know.

MR. HUTCHINSON: Do you know?

MR. MURRAY: Madam Hearing Officer, members of the Commission, the dam is operated by the Rio Costilla Cattle and Livestock Association, and I'm not sure what you mean, Howard, by permitted, but it is inspected annually by the Office of the State Engineer's Dam Safety Bureau.

MR. HUTCHINSON: So -- but there's no federal permit associated with it?

MR. MURRAY: Not at this time. It originally was constructed by Bureau of Reclamation, but it was turned over to the RCCLA, and they're the sole owner and operator.

MR. SLOAN: That's part of the interstate stream compact.

MR. MURRAY: Yes.

And then the dam is part of the Rio Costilla compact between New Mexico and Colorado.

MR. STREIT: And -- excuse me. It was rebuilt just a few years ago.

MR. HUTCHINSON: Do you know if that is

located on Forest Service land, or is that dam located on private land?

MR. STREIT: Vermejo Ranch.

MR. HUTCHINSON: It's on Vermejo Ranch. Okay. So it's on private lands.

MR. STREIT: Uh-huh.

MR. HUTCHINSON: Okay.

Now, to Mr. Hurst. Maybe Mr. Zeedyk is part of this present -- or question, as well.

Are beaver present in any of the waters?

MR. HURST: Mr. Commissioner, I have not personally observed evidence, at least on the Comanche Creek, of beaver presence. I believe there may be some on Rio Costilla.

MR. HUTCHINSON: Mr. Zeedyk?

MR. ZEEDYK: Yes, sir. Mr. Commissioner, the beavers have long been present in Shuree Ponds. They became a hazard to the dam a year ago, and they were translocated to another site on the Valle Vidal.

There are beaver -- there is a beaver population on the lower end of Middle Ponil Creek, just above the boundary. I have personally seen beaver -- a small number on Comanche Creek this early summer.

There's been a dam on the Rio Costilla that's not presently active. I know of no beavers on North

Ponil or McCrystal Creek, but I haven't walked all over that recently, so --

MR. HUTCHINSON: Do you know if there's any intention of repopulating any of the rest of the stream, or were they historically present on those streams?

MR. ZEEDYK: I think there's no doubt that they were historically present. The Forest Service and Game and Fish Department tried unsuccessfully to relocate the population to the head of Comanche Creek about, oh, 1989 or something like that. I was there for that.

But I don't know of any ongoing efforts right now.

MR. HUTCHINSON: This is for -- I'm not maybe pronouncing this name -- Schudlich? I -- I'm sorry if I --

MR. SCHUDLICH: That's close enough.

MR. HUTCHINSON: Okay.

Would you consider that the species makeup of the stream is a consideration in determining degradation or maintenance of an ONRW?

MR. SCHUDLICH: Mr. Commissioner, I don't know that I'm really clear on that, what you mean if there are -- is there an absence of like maybe one of the native species or -- well, it is my understanding the

ONRW is just a snapshot of the conditions as they exist now.

So if -- if that fishery is a mixed fishery now, I would expect that no further degradation of that fishery would be allowed, but I don't know what that says about if it's restored. I really don't -- I'm not an expert on ONRWs. I don't know whether that means that the fishery cannot be degraded from a point that it's restored to.

MR. HUTCHINSON: Okay.

That's really just a clarification question for the Commission here, so it's --

How would ONRW designation benefit Rio Grande cutthroat and subsequently be classified as a benefit to New Mexico that the Commission can use to make that determination?

And that kind of goes to the question that Peggy had here a little while ago. I -- you know, because we have to state in our Statement of Reasons what that benefit is. And I did -- you know, you kind of made a shot at that. I'd like to hear it again.

MR. SCHUDLICH: Mr. Commissioner, we -- we believe that the Rio Grande cutthroat trout is important. It has been reduced to a very small portion of its former range, and as I mentioned, it has been

petitioned, I think, a couple of times now for listing as an endangered species.

We don't want to see that happen. We think if that does happen, that will reduce fishing opportunities in the state.

And on the other end of that, because it's our state fish, and it is a pretty beautiful species, I think everybody -- well, at least from our perspective -- wants to fish for that fish, and that that draws people to the state from out of state.

I believe that the partners in the Costilla project that we're working on feel the same thing, that not only is there a biological benefit, but there's an economic benefit to having a native fishery that's unique to the State of New Mexico and you can't really find any other place.

Does that answer your question?

MR. HUTCHINSON: Yeah. In fact, you gave a good reason for consideration. Thank you.

And the rest of these are going to be for Mr. Zeedyk. And I had the pleasure and honor of sharing some presentation time here recently at the Soil and Water Conservation Commission meeting.

We -- also, Mr. Zeedyk is one of the primary consultants on one of the district -- or on the district

that I serve one of our restoration areas. So I was really glad to see Mr. Zeedyk was coming here to present his testimony.

I'm also one of his -- an advocate of his restoration techniques.

Mr. Zeedyk, were cattle and elk forage allocations made during the initial development of management for the Valle Vidal?

MR. ZEEDYK: Mr. Commissioner, thanks for the support of my efforts in behalf of the conservation districts and elsewhere on stream riparian and wetland restoration across the state. I appreciate that.

Yes. Allowances were made for forage needs of the elk population at the same time that the livestock initial stocking was done.

If I could digress, with your permission, at the time of the donation, or just prior to the donation, the Vermejo Park Ranch was grazing in the summertime about 2,000 to 2,500 head of cows on what is now the Valle Vidal. Those were summer use. They went off that area for the wintertime.

When the area was acquired by the National Forest System, there was a two-year period of gearing up when there was no livestock on the area.

At the time of acquisition, the range was in

very poor condition based on that, a long history of use that went back for tens of -- you know, decades, and including sheep use. So the range was in degrading condition.

So the initial stocking rate was conservative when that was first stocked, and I believe the numbers then were about 700 cow/calf units per livestock, and making allowances for about 3,000 to 4,000 head of elk.

And their use is sporadic depending on snow depths from year to year and whether they concentrate on the east side of the wall at the lower elevation, which is about 1,500 feet lower on the average than the west side.

So -- and then after 10 years, I believe, there was a slight increase in the numbers based -- permitted numbers of grazing based on the improved range condition, the restoration and recovery of some of the wet meadows and so forth.

So there was a -- there has been some slight increase in the livestock grazing pressure and about the consistent use on the elk.

And it's judged based on the percentage use of the forage each year, so that we're shooting for about 20 to 40 percent depending on soil site conditions and the veg conditions.

I'm no longer directly associated, but that -- and I've been retired for 15 years from the Forest Service, but I have maintained very close association with the management of the unit.

MR. HUTCHINSON: Mr. Zeedyk, can we expect proper functioning condition of the riparian zones to be maintained or improve if the uplands are not restored and maintained, especially concerning reducing the threat of catastrophic wildfire?

MR. ZEEDYK: Sir, would you please restate that?

MR. HUTCHINSON: Okay.

Can we maintain the riparian function or proper functioning condition without maintenance of the upland, especially concerning prevention of catastrophic wildfire?

MR. ZEEDYK: Mr. Commissioner, I believe that that's pretty much a given in riparian management. You have to manage the whole system, not just the stream zones.

MR. HUTCHINSON: Concerning that upland management, would temporary roads to be used for upland forest restoration projects -- if they were designed and constructed so as to not create long-term impacts on the riparian and function of water quality, would those be

useful on -- or would you see them as being potential -- or having potential for long-term impacts on the riparian area?

MR. ZEEDYK: Mr. Commissioner, the -- the area is already laced with a network of closed roads of many hundred miles.

So my answer would be that, yes, temporary roads could be installed to harvest forest products or for whatever use.

And so long as they were properly drained to spill the water back on buffered zones before the water entered the creek and they were reseeded and revegetated and closed to random use afterward, then yes, they would be a useful tool and not a threat to the watershed.

MR. HUTCHINSON: Okay.

Just as a comment, as usual, I've heard several of your presentations and read a number of your papers and publications. I learned a lot again today, so thank you for your presentation.

MR. ZEEDYK: Thank you, sir.

MR. HUTCHINSON: That's all.

MS. ORTH: That's all?

Thank you.

Are there other Commissioner questions of -- Commissioner Sloan.

MR. SLOAN: I'd just like to ask Mr. Schudlich one question in response to Commissioner Hutchinson's question.

You mentioned the potential listing of the Rio Grande cutthroat trout.

If the cutthroat trout were listed, how do you think it would affect the land use and use of the Valle Vidal?

MR. SCHUDLICH: I imagine it's different for either endangered or threatened listing, but not only in the Valle Vidal, but all throughout anywhere there would be determined to be critical habitat. The Fish and Wildlife Service would make the determination as to what would happen with land uses.

I imagine it would impact -- it could impact any number of land uses, grazing, forestry, agriculture, other water uses.

MR. SLOAN: Would you say that the ONRW designation is a first step towards restoration of Rio Grande cutthroat trout and a potential step towards nonlisting?

MR. SCHUDLICH: Mr. Commissioner, yeah. I think that by setting this baseline for the Valle Vidal with ONRW designation, we know what the water quality is in there right now, and we know that it's good enough to

hold Rio Grande cutthroat trout right now, and we know that it's good enough for us to go forward with this project.

So if there's this baseline set and the water won't get further degraded, I think we can be fairly certain that a strong population of Rio Grande cutthroat trout would survive the Valle Vidal and be sustainable.

MR. SLOAN: And not listing and having that strong population would be a benefit to the entire state?

MR. SCHUDLICH: Absolutely, as the recreational fishery would stay open and it wouldn't impact other land uses.

MR. SLOAN: Thank you.

MS. ORTH: Thank you.

Other Commissioner questions?

No?

All right.

Mr. Moore, do you have questions?

MR. MOORE: The petitioners don't have questions of the panel.

MS. ORTH: All right.

Does anyone have questions of the coalition panel before we excuse them?

All right. Thank you, gentlemen.

We'll turn now to public comment, if there's any left to be given.

I see Ms. Pearson back there.

Raise your hand if you'd like to give public -- oh, I'm sorry, Mr. --

MR. SCHLENKER-GOODRICH: Madam Hearing Officer, if I may -- and we have no redirect --

MS. ORTH: Right.

MR. SCHLENKER-GOODRICH: -- of the panel.

Also, I did not know as a procedural matter whether -- similar to the State, whether I had to ask the Commission to move for introduction of all of our materials formally into the record.

MS. ORTH: We can go through that as Mr. Moore did.

MR. SCHLENKER-GOODRICH: Okay.

MS. ORTH: I think, you know, as far as I'm concerned, it's part of the record, but why don't you offer it, and I'll ask if there are objections.

MR. SCHLENKER-GOODRICH: If it may please the Commission, I would ask the Commission to move for the introduction of all the Coalition for the Valle Vidal's statements, notice of intent and testimony presented here today.

MS. ORTH: All right.

Commission comments? Objections?

Any objections or comments from anyone on the admission of those things?

No.

Okay. Thank you. They're all admitted.

(Exhibits Coalition for the Valle Vidal A through I were marked for identification and admitted into evidence.)

MR. SCHLENKER-GOODRICH: Thank you, Commission.

Thank you, Madam Hearing Officer.

MS. ORTH: Thank you.

Public comment. Raise your hand, please, if you'd like to make public comment. This will be the last opportunity.

Ms. Pearson and then the lady in the back.

Anyone else?

THE REPORTER: We've been going for two hours.

MS. ORTH: Oh, we've been going two hours.

10-minute break?

All right. Sorry.

(Proceedings in recess.)

MS. ORTH: Come back from the break, please.

All right. We are back from the break, and we are turning to public comment.

This is Julie Pearson.

JULIE PEARSON

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

MS. PEARSON: Madam Chair, Madam Hearing Officer and Commissioners, my name is Julie Pearson, P-E-A-R-S-O-N, and I'm here on behalf of the Pajarito Group of the Sierra Club in Los Alamos. I'm the environmental education chair.

And on behalf of our executive committee, we'd like to thank the Governor, the State of New Mexico through the stewardship demonstrated by the petitioners and the hard work of the organizations and businesses that form the Coalition for the Valle Vidal for their extensive restoration efforts in support of this nomination.

On a personal note, I also moved back to New Mexico four years ago because of the environment. After 12 years in Dallas, I simply couldn't handle it anymore. Where the best part of Dallas are the airports, I know I'm not in a place I want to be.

Having visited the Valle Vidal, which is a wonderful resource -- and I've been several times each year throughout different seasons -- it's been very easy

for me to understand the special qualities, the clean waters, the scenic beauty, abundance of wildlife.

I'm a nonconsumptive user. I strictly come into the Valle Vidal to hike. As well as what is impressive to me is the sheer variety of low impact recreational uses, the fact that Boy Scouts can use it, that we can send our students from Los Alamos public schools for bird banding demonstrations to the Valle Vidal, which several fifth and sixth grade classes did actually last fall.

I -- it's very easy for me to understand why the Valle Vidal has enriched so many lives.

But while we can try to define the quantitative factors of economic impact and water quality, what has been demonstrated repeatedly with so many impassioned voices is the importance of the Valle Vidal's qualitative aspects and the personal sense of ownership so many people have for the gem in the Carson National Forest.

For those of you who have visited the Valle Vidal, this decision may be fairly simple today.

For those who haven't, by protecting the water quality of the Valle Vidal from what is potentially an imminent threat -- and we conservationists have really felt this looming, and have, to a certain extent,

mobilized the cause of the potential of oil and gas development within the Valle Vidal, in this case coal bed methane -- by protecting the resource, you are prioritizing the long-term viability for the people of New Mexico over the short-term gain of, in this case, a Texas oil corporation, and the very unfortunate realities of environmental degradation resulting from extensive road networks that aren't truly monitored and the long-term impacts of extraction operations.

The 1.7 million acres that form the Raton Basin -- and this is a very small component of -- of the acreage -- the resources that form the San Juan Basin, Powder River Basin in Wyoming -- and I may be mispronouncing this -- the Uinta Basin in Utah, which have millions of acres available for coal bed methane extraction.

If we as New Mexicans cannot protect the 40,000-acre component of the greater Valle Vidal that's currently at risk by recognizing the rare attributes of the entire Valle Vidal Unit, including the surface waters which nourish far more than the elk herd and the enthusiasm of fly fishermen, it simply does not speak highly of us as stewards for our children and grandchildren.

For myself and the Pajarito Group, we

wholeheartedly endorse and encourage you to support this designation of the Valle Vidal waters as ONRW.

And I simply have enjoyed being here for the two days of hearings, two days at this hearing, and actually learning quite a bit more about the Valle Vidal than I knew coming into it yesterday morning, and appreciate all of your time.

Thanks.

MS. ORTH: Thank you, Ms. Pearson.

Are there questions?

No.

All right. Thank you.

Ma'am.

DENISE MARTINEZ

having been first duly sworn or affirmed, was examined and testified as follows:

DIRECT TESTIMONY

MS. MARTINEZ: My name is Denise Martinez, and I was born and raised in Taos, New Mexico, and I still reside there.

And I'm here on behalf of myself and my family who also use the Valle Vidal for many years for hunting and grazing and cattle grazing and for fishing, and not only have they used it as a recreation, but as a way of sustaining our family.

So I speak for myself and my family who do not want to see this area destroyed or the rivers that we depend on for clean water destroyed and speak in support of ONRW protection for the waters of Valle Vidal.

Thank you.

MS. ORTH: Thank you, Ms. Martinez.

Let me ask if there's any other public comment to be given. This is the last chance. I would plan to close the evidentiary part of the hearing if I see no hands.

Hands from anyone.

No. All right.

That being the case, I need to ask the Commission for input.

The prehearing order certainly contemplates that we would close the hearing record at this time and the possibility that you would want to reconvene your meeting to go into deliberations on that record, or you can choose to supplement the record with posthearing submittals, a Hearing Officer report, exceptions to the Hearing Officer's report, transcripts and what have you.

It seems to me that you have enough evidence to make a decision and that you don't need my help, but give me your input.

Otherwise, I have to leave the record open for

all of those other things.

MR. SLOAN: I would suggest we're ready to deliberate and make a decision.

MS. ORTH: Yes?

MR. HUTCHINSON: I think that there were a couple of questions raised by several Commission members concerning the economic impact statements, and, you know, it -- again, you know, I leave it up to those Commissioners that really raised that issue if they would have -- like to have that additional -- or have additional information supplied before deliberations.

MS. ORTH: Is there any support for pursuing that?

And I will remind the Commission that in the triennial review that was completed this year, the word "analysis" was changed to "discussion."

Is -- does anyone want to pursue additional economic information?

I forgot to mention one other thing.

Before I would completely close the record, we would have closing arguments verbally, if you choose to forego the -- all the written posthearing submittals. I forgot to mention that, that that would be available to you today, would be verbal closing arguments where each -- the petitioners and the other party presenting

technical evidence would have minutes, not long, minutes, to sort of capsulize their -- their presentation before you.

MS. PADILLA: Madam Hearing Officer, do you need a vote on whether we want to close the record or just --

MR. GLASS: No.

MS. ORTH: I don't think we need a vote.

I'm just asking, is there any support at all for pursuing additional evidence?

No. All right. I'm seeing shaking heads, not nodding heads.

All right, then. That being the case, let me ask first the petitioners, Mr. Moore on behalf of the petitioners, and then Mr. Schlenker-Goodrich on behalf of the coalition, just take a few minutes in closing arguments.

MR. MOORE: Thank you.

Madam Hearing Officer, members of the Commission, what I'm going to do is very briefly go through the statutory and the regulatory requirements for the Commission to make a determination that the waters of the Valle Vidal deserve designation as Outstanding National Resource Waters.

I'm going to try to go through that very

quickly, because I know we have limited time. I'm going to highlight these for you, and you can think about all the evidence that's been submitted, and I'll try to highlight that for you, but we're basically just going to walk through that.

The first thing that I'm going to go over is the relevant section of the Water Quality Act, and that is 74-6-4.C. And the reason why that's the relevant section is that is the section that gives the WQCC the authority to develop standards.

And as you know, this section -- or ONRW designations occur -- are tucked into 6.4, which are part of the standards. So this is the section that we're dealing with.

And the relevant section for you guys in doing this designation is the consideration of the use and value of the water for these various factors, and I'll briefly go through those.

The first one is you need to consider the use and value of the water for water supply.

And I think that's been done today. You heard Marcy Leavitt testify that protection of these waters will protect waters for downstream cities like Costilla, Amalia, Cimarron, Springer. So that has been considered. That evidence has been put forward, and you

can consider that during your deliberations.

The next is the use and value of the water for the propagation of fish and wildlife.

You've heard lots of testimony today about the propagation of the Rio Grande cutthroat trout. You've heard a lot of information about the propagation of the elk species and a lot more evidence about the different wildlife species that occur within the Valle Vidal.

The next thing you need to consider is the use and value of the water for recreation.

You've heard lots of testimony from the petitioners, as well as members of the public, about their use of the Valle Vidal and the fact that the waters are an integral part of the appeal of the area and that the water supports the wildlife there and that's why people go there to recreate.

The next thing you need -- that you'd need to consider is the use and value of the water for agricultural purposes.

Once again, you've heard testimony today about grazing. I would consider that part of agricultural purposes. And there was lots of information presented that grazing will continue. That has to make sure that there's no degradation, but it's not preventing, the ONRW designation will not prevent grazing, and that the

use and value of the water is relevant to the grazers themselves.

They need high quality water and good riparian zones to produce all of the grasses that support the grazing.

The last thing that you have to consider under this section of the Water Quality Act is the use and value of the water for industry.

And this one's a little more -- in my mind, a little less identified, but in general, the protection of the waters in the Valle Vidal, much in the same way that they -- that the protection would benefit downstream users for water supply, would definitely benefit industrial users downstream.

There is no industry within the Valle Vidal, but they would be downstream. And in the same way that the cities downstream would benefit from it, so would industrial users.

The next thing that the Commission has to consider are its own regulations and whether or not the petitioners have submitted information that you think justifies the designation.

And those are listed in 20.6.4.9. They're in two different subsections, A and B. And I'm just going to briefly go through each one of those and point out

where we presented that information.

The first thing that's required in Subsection A is a map that shows the area, shows the waters that deserve that protection.

And that is in the information that's in front of you, and it's at Exhibit 3. So, you know, we can check this one off, because we provided that information.

The next thing under A.(2) that we had to provide was evidence supporting the nomination under the Subsection B criteria. And so really for the purposes of this list, I'm going to address that under Subsection B.

The next thing that we needed to provide was available water quality data.

And we have done that as petitioners. We put those together in Exhibits 30 through 38. And so that is part of the information that is available for your deliberations. That's the data that the Environment Department has, and so you've got that information.

The next thing that we have -- that you have to consider under your regulations is -- and I want to highlight this -- in this section and in this section. It's a discussion of the activities that might reduce water quality.

Your regulations are very specific. In taking you back to your last triennial review, there was a question or a general debate as to the level of information that petitioners would have to put forward in order to make a case for ONRW designation.

And what the Commission decided there was that a discussion was good enough. And so what we've done today -- or through this whole hearing is we've provided a discussion of the activities that might affect water quality.

And under those, you heard Lynette Guevara testify about increased road development is a potential source -- or it's an activity that could reduce water quality.

You heard Mark Fesmire talk about oil and gas development and that that activity could reduce water quality in the Valle Vidal.

You've also heard other testimony from other members of the public that oil and gas, timber harvest, anything that relates to building a large network of roads, could reduce the quality of the water in the Valle Vidal.

So I think the petitioners have addressed that requirement.

The next one, again, A.(5), is the

discussion -- it's a discussion of the economic impact of the designation.

Neither the petitioners nor the coalition have economic experts, but what we do have is people who discussed the economic impact to the designation. We provided as much information as we possibly could.

And included in that information, Dr. Propst talked about the economic benefit that came from fishing and hunting, the wildlife viewing, hiking, camping, horseback riding, snowshoeing and cross-country skiing. All of that information was discussed.

And as a side note, just so you know for your -- for the purposes of your deliberations, we've included in your binders at Exhibit 18 -- it's a copy of your decision from the triennial review which lays out your discussion in the statement -- the Statement of Reasons really from the last triennial review on ONRW designation.

So you can flip back to that and refer to it for that discussion of analysis versus a discussion.

We also presented information from Lynette Guevara on the A.(5) criteria, and she testified that the designation is not expected to negatively impact rangeland grazing. So there was a discussion there of grazing within the Valle Vidal and its economic impact,

the economic impact of the designation.

You also heard from Mark Fesmire, and he testified regarding the Power report. That's in your materials at Exhibit 47. And just very briefly, I'm going go back over what Mr. Power said in his report.

Mr. Power said that coal bed methane development in the Valle Vidal will result in an insignificant amount of local employment and personal income. He also said that coal bed methane development requires specialized jobs that are not available to local residents.

The report said that coal bed methane will provide no continuing benefit to the local economy. The report said that coal bed methane development provides limited tax revenues for local government. The development will provide minimal tax benefits to municipalities.

And the coal bed methane development will -- I'm sorry -- that local and regional economies rely on nearby recreational lands, and that development will fundamentally degrade those natural -- the natural -- the natural landscape, the wildlife habitat and the recreational potential of those lands.

All of that information was provided. That is part of our discussion that we've presented to you to

meet the requirements of A.(5).

And finally, what you require in your regulations under A.(6) is an affidavit of publication of notification. That affidavit is contained in your materials at Exhibit 4.

Now, the real meat of the designation, which is the Subsection B criteria, did we as petitioners give you information that demonstrated that we met one of these criteria.

And as an initial point, I want to point out to you, if you look at your regulations very carefully, between each of these different sections there is an "or." As petitioners, we only need to meet one criteria.

Now, it is a combination criteria, which was somewhat pointed out by Commissioner Hutchinson, but I'll explain that. But we only need to meet one of these under all of those regulations.

And the combination really is this. The first part of it is that it has to be beneficial to the state. So first it's beneficial, and then it's either 1, 2 or 3. So if you find that it's beneficial to the state and meets any one of these three, then we have met our burden under Subsection B.

So the first part of it is is it beneficial to

the state.

And I think it's pretty clear, based on the testimony that we've presented and that you've heard from the public and that you heard from the coalition, that protection of all of these uses, protection of the ecology, protection of the wildlife is a benefit to the state.

Whether or not that equals out to what the oil and gas rights are or any other future use really isn't the question. The question is this. Is there a benefit that will flow from the designation?

And as petitioners, we believe that the protection of the recreational uses and the ecology meets that requirement.

Next, we move into the first one, which is the criteria under B.(1). There are lots of things listed under B.(1).

You heard some discussion of whether or not the waters were eligible to be -- for wild and scenic status. We're not putting forward a case saying that we deserve designation under that criteria. Under B.(1), we're only focused on one part of that, and that is a gold medal trout fishery.

The case we put forward, mostly by Dr. Propst, was this. In the State of New Mexico, there's no such

thing as a gold medal trout fishery. Game and Fish doesn't have it. You adopted that language in the triennial review last -- your last triennial review. So it doesn't exist.

But this is your language. You can interpret that language to mean what you think it needs to mean. In the State of New Mexico, we have waters that are special trout waters. That's our designation. That's what we use in the State of New Mexico to say these are important trout waters.

So our case is this. The State of New Mexico doesn't have a gold medal trout fishery, but we do have special trout waters, and we think that's equivalent and that you can interpret this language to mean what you think it means -- it's your language -- and that we meet the B.(1) criteria because these waters are special trout waters.

The next one is that the waters have to have exceptional recreational or ecological significance.

You heard a lot of information about the recreational and ecological significance. I don't think you need to hear it from me again. Lots of people talked about how they like to recreate there. You heard witnesses talk about all the different wildlife species, including the Rio Grande cutthroats, the elk. I'm not

going to go into it. Just we think it meets that criterion.

The last one is this, B.(3), that the existing water quality is equal to or better than the numeric criteria for aquatic life uses.

And you heard Lynette Guevara talk about this criteria. And under this criteria, the existing chemical data indicate that the B.(3) criterion is met for the vast majority of the numeric water quality criteria associated with aquatic life uses.

So we think based on the information that Lynette provided, we meet that criteria.

So I guess in closing, what we would say is this. We believe we put forward enough information and evidence for you to make a decision in this case.

Your decision is based on the full record, which includes all the testimony, it includes the petition that was filed to initiate this -- this proceeding, it includes all the information that was submitted by the coalition and all the testimony today.

When you put all that together, we think that we meet our burden and that you should designate the waters of the Valle Vidal as an ONRW.

The specific regulatory language that you should refer to in making that decision is listed in the

petition, and it's a specific amendment to 20.6.4.9D.

And that's all I have.

MS. ORTH: Thank you, Mr. Moore. Very nice.

Mr. Schlenker-Goodrich.

MR. SCHLENKER-GOODRICH: May it please the Commission, I will try not to go over any ground that the State's already gone over. I think the state has done an excellent job of presenting a case for why the waters deserve protection as Outstanding National Resource Waters.

In terms of the coalition's testimony, I'll let it speak for itself. I think it has demonstrated why these waters are so important for New Mexicans and, in particular, why it's so important for the Coalition for the Valle Vidal.

I'll simply reiterate the fact that the coalition consists of over 250 local governments, organizations and conservation groups and businesses in Northern New Mexico, the broader state, indeed nationally.

I think that the success of the coalition to date is reflective of how important the Valle Vidal is. And as I say, the witnesses speak for themselves, and I think the Valle Vidal speaks for itself in terms of its importance to this state in a protected state.

And I commend Governor Richardson for functioning as a catalyst for these proceedings here today by pushing the State to bring this nomination before the Water Quality Control Commission, and I commend the Water Quality Control Commission for having a very vigorous discussion about many issues.

As an advocate for my clients, I will say that it is sometimes frustrating to seem like we're going down rabbit holes on various tangents, but at the end of the day, I think this builds a solid record for the Water Quality Control Commission to act.

And at the end of the day, it also demonstrates the Water Quality Control Commission's dedication and commitment to providing for sound water quality protection in the State of New Mexico.

Thank you very much.

MS. ORTH: Thank you, Mr. Schlenker-Goodrich.

At this time, then, we will close the evidentiary record entirely, and we'll turn the proceedings over to Madam Chair. I believe she's going to reconvene the meeting.

MS. PADILLA: Thank you, Madam Hearing Officer.

(Proceedings adjourned at 3:55 p.m.)

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

I, CHERYL ARREGUIN, the officer before whom the foregoing proceeding was taken, do hereby certify that the witnesses whose testimony appears in the foregoing transcript were duly sworn or affirmed; that I personally recorded the testimony by machine shorthand; that said transcript is a true record of the testimony given by said witnesses; that I am neither attorney nor counsel for, nor related to or employed by any of the parties to the action in which this proceeding is taken, and that I am not a relative or employee of any attorney or counsel employed by the parties hereto or financially interested in the action.

NOTARY PUBLIC
CCR License Number: 21
Expires: 12/31/05

My Commission Expires: 12/12/07

PETITIONERS' EXHIBIT

31

STATE OF NEW MEXICO

WATER QUALITY CONTROL COMMISSION

No. WQCC 05-04(R)

IN THE MATTER OF THE PETITION FOR PROPOSED AMENDMENTS TO 20.6.4.9 NMAC, DESIGNATION OF WATERS WITHIN THE VALLE VIDAL AS OUTSTANDING NATIONAL RESOURCE WATERS

TRANSCRIPT OF PROCEEDINGS

BE IT REMEMBERED that on the 14th day of December, 2005, the above-entitled matter came on before the New Mexico Water Quality Control Commission, taken at the PERA Building, Apodaca Hall, Santa Fe, New Mexico, at the hour of 3:55 p.m.

A P P E A R A N C E S

For the Water Quality Control Commission:

CINDY PADILLA
MIKE SLOAN
MAXINE GOAD
FRED LUJAN
PEGGY JOHNSON
STEVE GLASS
HOWARD HUTCHINSON
TIM DARDEN
CHERYL BADA
EDWARD VIGIL
WAYNE PRICE
DOUG MURRAY

ZACH SHANDLER
Assistant Attorney General
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Post Office Box 1508
Bataan Memorial Building
Santa Fe, New Mexico 87504

MS. PADILLA: And I would like to at this time, then, reconvene the December 13th-14th meeting of the Water Quality Control Commission.

We are reconvening now to begin deliberations and a possible vote. I believe there's actually consensus among the Commission that we'd like to have that vote today, a vote on the petition -- or the proposed amendments to 20.6.4 NMAC, Standards for the Interstate and Intrastate Surface Waters, Nomination of the Waters of the Valle Vidal as Outstanding National Resource Waters.

With that, I would just like to point out in terms of time, not to limit discussions or deliberations, please -- every member of the Commission please feel free to discuss, deliberate, you know, at length. However, it is ten until 4:00, and I just wanted to point out the time for that reason, just it is late in the day.

And I believe we do have a consensus that we'd like to have a vote at the end of the meeting, or at the end of the day.

I would like to give everybody an opportunity to speak to the matter. I think we've heard -- you all have heard two days, I've heard one full day, and read testimony, also, on the petition itself. I think we

have a lot of information to kind of digest and discuss.

But I would like to give everyone an opportunity to, you know, present their thoughts, any feelings, any discussions or questions they might have that we could discuss amongst ourselves.

So what I think I'll do is just kind of follow the format of the Hearing Officer, maybe just start to my right with Commissioner Sloan, if you'd like to make any comments or start anything, and then we can just go around the table, and then we can kind of open it up for more dialogue.

Commissioner Hutchinson.

MR. HUTCHINSON: I was just wondering if we could turn to our counsel for any direction at this point that he would -- or suggestions that he would like to toss out that might make it easier for him.

MS. PADILLA: Thank you. That's a good point.

MR. SHANDLER: Madam Chair.

MS. PADILLA: Mr. Shandler.

MR. SHANDLER: Commissioner Hutchinson, I have a list similar to what the petitioner has, and I'm going to be listening to see if you have been persuaded, and if so, in what areas and what exhibits.

MS. PADILLA: Thank you.

Commissioner Sloan.

MR. SLOAN: I guess what I have is a list of what I believe are the benefits to the state that I took from the testimony and also where I think the petitioners met their burden on the criteria for listing. So I'll just go through those.

MS. PADILLA: Thank you.

MR. SLOAN: I guess the first benefit I see is that there's a long-term, low-impact sustainable economy that's compatible with an ONR designation.

I think there was a lot of discussion about recreation, fishing, those sorts of things that are sustainable on the landscape of the Valle Vidal as compared to some other uses and that those current uses and future uses are compatible with an ONR designation, ONRW.

I also felt that there was -- a part of the uniqueness of the Valle Vidal is the ability for all citizens of the state to recreate there and that that is a benefit to the state in that, you know, anyone, whether they're mobility impaired or a small child, can get to the streams of the Valle Vidal and fish for the state fish, Rio Grande cutthroat trout.

Also, based on Ms. Leavitt's testimony, the idea of maintaining a pure and clean water system, allowing for downstream development is a -- is clearly a

benefit to the state.

Also, in Mr. -- my questioning of Mr. Schudlich, there was a discussion about the potential to list the Rio Grande cutthroat trout, and by designating the ONRW and maintaining a place where Rio Grande cutthroat trout can be sustained, we may be able to prevent listing and thereby allow statewide continued land use, instead of having critical habitat limitations placed on lands throughout the state.

In terms of meeting the burden for the criteria, I do feel that the petitioners made their case about the fact that a special trout water in the State of New Mexico is equivalent to a gold medal or blue ribbon trout fishery in other places, that the designation of the State of New Mexico is a special trout water, and all of the waters on the Valle Vidal are designated as special trout waters.

I also felt that they met their burden in B.(2) in that it's clearly recreationally significant for multiple uses, including fishing, hunting, bird watching, wildlife watching in general. I think they made that case very strongly, showed a great deal of use for angling in particular.

I also felt that there was significant evidence given by its ecological significance from the

various shrimp that are only found in a couple -- I think five or six places in the Southwest, to the fact that there are 4.5 percent of the wetlands -- 4.5 percent of the land is wetland as compared to .6 percent statewide.

That means it's a very unique area.

And, also, that -- again, the Rio Grande cutthroat trout and other species that are found there.

So that's -- I think they met their burden in the criteria and that there's clearly several benefits to the state.

MS. PADILLA: Thank you.

MR. SHANDLER: I'm going to interrupt periodically, and I apologize.

Where did the 4.5 versus the .6 -- do you remember who said that?

MR. SLOAN: Bill Zeedyk.

MR. SHANDLER: Okay.

MS. PADILLA: Thank you.

Commissioner Vigil.

MR. VIGIL: I mean, there was quite a bit of testimony that was given in the past two days, and it's kind of hard to -- you know, to digest all that in such a short amount and then for you to come back and ask you to explain why, you know. It's rather hard for me

personally to do that.

But I do feel that the Department has met their burden of proof.

Like I said, the existing water quality is equal to at this point. There are some reaches that are, I guess, degraded at this point.

I'm not real sure, you know -- I guess the benefit -- I mean, I shouldn't say the benefit, but -- the fact that the Department only monitors on a rotational basis, you know -- I'm unconvinced, you know, on an eight-year cycle, you know, how it's going -- how they're going to -- to monitor this.

I know they said there will be more monitoring, yet when I asked the question if there would be more FTEs requested, you know -- everybody needs more people to monitor, you know, so -- in that regard, I'm unconvinced that, you know, they will be able to -- by designating, I guess, as an ONRW, how they're going to meet this, you know, on a rotation eight-year basis.

And that's my biggest concern.

Like I said, you know, the grazing, as far as, you know -- as long as agriculture and grazing is kept at the current standards, what they are now, you know -- they say there's 16 permittees, I believe -- 16 permittees that are allowed 850 livestock pairs at this

point.

You know, that would be my big concern, you know, that the -- the grazing permittees, you know -- you know, keep their allocations and not lower them from what they were.

I know that in other areas of the state, you know, grazing has been decreased because of the trout, and I would definitely want to see it stay where it is at this point.

I would like to see the continued cooperation between the federal and the state agencies, you know, as far as Forest Service, you know, the Natural Resource Conservation Service, you know. I would like to see that expanded at this point, you know, cooperation.

Like I said, you know, the last two years, you know, I've been thoroughly involved with the New Mexico Forest and Watershed Health Plan, the New Mexico Nonnative Phreatophyte Plan, and I would like to see the different state agencies', you know, continued cooperation with these, as we go forward in trying to implement these two plans that were designated by the legislature in the past two to three years.

I think at that point I'll stop and pass.

MS. PADILLA: Thank you.

Commissioner Goad.

MS. GOAD: Well, I -- I share Mr. Vigil's feeling that it's -- it's very hard to just spring out at the end of the day and list everything very well. I'm impressed that Mr. Sloan was able to do that.

I think it is clear that -- that the petitioners have, among all themselves, met their burden of proof and then greatly backed up by all the public comment, and the testimony of the coalition, so that -- I was also struck by the -- by the fact that I think this is a unique hearing in that nobody has stepped forward to say this should not be an ONRW.

At least I didn't hear anybody say that.

The Cattle Growers said that they wanted to make sure that the grazing could be allowed to continue, but otherwise, they were neutral on this.

And everybody else stepped forward and said that they greatly value the Valle Vidal as -- as a really valuable fishery and really valuable place for recreation.

And so I'm thoroughly convinced that it is such by the weight of the evidence that we've heard, and I'm -- I'm sorry, Counselor, I can't point to particular points in the record where -- where these -- it's just the overwhelming cumulative effect of -- all this evidence is extremely convincing, and I think they've

clearly met their burden of showing that this should be an ONRW, and I -- because of the lack of opposition, I don't see any reason why we couldn't go ahead and act today.

MS. PADILLA: Thank you.

Commissioner Darden.

MR. DARDEN: I'd also like to apologize. I don't have a nice list laid out.

I think the petitioners have done a very good job presenting their case. I think one of the -- one thing that stood out to me -- and I think Mike asked the question of -- Mr. Schudlich? Is that right, I think?

I think it is important to prevent listing if we can -- anything we can do to prevent listing of the species, I think, helps us all out. So I would make that point as being a strong point that the petitioners made.

I also would call on the petitioners to use other resources when putting together this type of information. I think they did a good job, but I -- some of the economic information could have been more well rounded, and I would offer my assistance in the future.

And that's about all I have. Thank you.

MS. PADILLA: Thank you.

Commissioner Bada.

MS. BADA: I have to share the sentiments of my fellow Commissioners. I feel put on the spot, but I'll do my best.

And I have to admit that growing up in Raton, I have a very personal attachment, so I'm having to get past the emotional thing and explain rationally why I feel the way I do.

But I have to say that I was really impressed by the testimony for the coalition, Mr. Zeedyk, and I'm not going to even attempt to pronounce his name, from New Mexico Trout. I -- those two -- that testimony really drove home for me the ecological importance of the Valle Vidal, in a way that I probably never thought about before.

This, for me, is more spiritual and esthetic, but -- so it's nice to hear that there was something besides that I really like to go there and I don't want to see it degraded.

And I'll also point to the public testimony, because Doug Shaw from the New Mexico Riparian Council also, in addition to Mr. Zeedyk, pointed out the real importance of the wet meadows and the wetlands in the Valle Vidal for filtering water and improving that water quality, but also in having those meadows available for livestock and for wildlife.

And so I appreciated their testimony.

I also -- there was a lot of testimony on the recreational importance, and I appreciate in particular Mr. Streit's testimony about the impact to fly fishing and guiding, as well as a lot about -- the public's testimony about their own use of the area, I think, really points out the importance of recreational experiences in the Valle Vidal.

I also think that Lynn Guevara's testimony established that the water quality in the Valle Vidal is equal to -- I don't have the exact language, but to pristine standards, and so I think that she -- that it does meet B.(3) as far as that criterion.

And I agree with Commissioner Sloan that the special trout waters designation is equivalent to our use of the term "gold medal trout fishery" and may have been a -- maybe in future standards we can make our terms match, but --

So I think that the criteria were met, and I also think that it would benefit the state as far as it's a very important place for recreation, a very important place for hunting, and also for Rio Grande trout, and an establishment of a pure fishery would be really great.

I also wanted to point out that we had a lot

of discussion about the economic benefits, and I want to state that while I certainly hope an ONRW designation would influence the Forest Service in their land management planning, there is nothing in an ONRW designation itself that would prevent oil and gas activity.

So I really hate to have the discussion of economic benefits be an either/or, because we can't really say that, that it's -- that it's one or the other.

So I just want to point that out to the fellow Commissioners, that it's not necessarily an either/or, and/or while, certainly, if they chose to go ahead and lease, and if they put lease restrictions in the leasing, it could certainly make it more expensive to extract coal bed methane, it wouldn't necessarily prevent it.

And so I would say that it's no jobs or -- you know, in that industry, or it's all -- I certainly think it would impact the recreation, and that would concern me. I can't say I want to go hiking and fishing next to a compressor station. That's -- when you drive into the Valle Vidal, you already see the Vermejo, and it's not my idea of a good time for recreation.

So it would concern me on the impact more

actually on recreation than economics, whether it would actually prohibit the development of coal bed methane.

MS. PADILLA: Okay. Thank you.

Commissioner Price.

MR. PRICE: Fully anticipating that the Commission counsel was going to ask us for a list, I see my list over there on this easel, and I have to -- I'm going to go through it.

Gold medal trout fishery, special waters, we have that here in the state, and we particularly have that in the Valle Vidal. I think there was a lot of testimony to that.

I have one little concern about the restoration of the pure strain Rio Grande cutthroat, is -- there was some discussion that's still in the language about temporary degradation of the water, or something like that, but I think the Environment Department assured us that we can work around that.

And so what I'm saying is that it, from testimony, appears that these waters will have to be treated with some sort of material in order to eradicate some of the nonnative fishes, and I fully support that approach. I believe that's the only way we're going to truly get the pure strained Rio Grande cutthroat back.

I also support the fact that the -- that we

should do -- by having the ONRW in these waters, it will most likely prevent the Fish and Wildlife Service from having the Rio Grande cutthroat to be listed as threatened or endangered.

And if that happens -- I know what happened in the Gila trout, that lots -- miles and miles of streams of water were basically shut down to anglers and to a lot of activity on there, and that was a -- that was an economic issue.

And so I think that's -- I think that was proven here today, that it's very beneficial that we list this as an ONRW in order so we can restore the Rio Grande cutthroat trout, which would indeed let the State of New Mexico have a, quote, gold medal trout fishery.

And since we only have to prove one of those, I think that's my biggest point.

MS. PADILLA: Thank you.

Commissioner Glass.

MR. GLASS: Well, it's pretty much all been said. You know, the petitioners have most certainly met the burden of proof, in my view.

There have been repeated testimonial -- or testimonials, I guess, regarding the fact that we have an excellent trout fishery, that we have exceptional recreation and ecological significance, and that the

existing water quality is in many -- most cases better than needed to support aquatic life. Most of that came from the original petitioners.

The benefits that occur to me, of course, include the support of a sustainable recreational economy in the region that was described in detail by Mr. Lackey.

Another benefit is the improved ability of the Oil Conservation Division to prevent degradation if coal bed methane mining is admitted.

I mean, we've already -- we've established thoroughly here that designating an ONRW status for these streams will not prevent coal bed methane mining from moving in, but it will give the OCD an opportunity and, we hope, a tool to protect the watershed and maybe even advance the science of watershed protection with regard to this kind of mining.

There's no question that this is a very, very rich ecological area and should be protected for that reason alone. Now, that comes out of Mr. Zeedyk's testimony.

And finally, as far as benefits, the public comments went heavily toward maintenance of the beauty of the state in which we reside, and that, to me, is maybe -- that's not an economic, it's not a measurable

benefit, but it's a huge benefit to the citizens of New Mexico and those that visit our state.

So I have no question that they have established enough testimony that this is a beneficial move.

I will reiterate my concern about the proscriptive language in the antidegradation policy that states there will be no, under any circumstance, degradation of an ONRW under any circumstance, and that gives me pause.

Marcy addressed it, saying that the Environment Department wishes to modify that language to better correlate with the -- the water quality handbook that EPA has published, and that's an excellent objective, but between -- between now and when that gets done, I do have some concerns about our ability to do things to improve the Valle Vidal because of potential short-term, temporary degradations that might have to occur.

And that's going to include restoration of the rainbow -- or cutthroat. I guess we're trying to -- it's going to include possible watershed projects that might disturb sediment and degrade the stream temporarily.

And so it was Marcy's suggestion that

somewhere in our Statement of Reasons there might be a -- or an allusion to the fact that we recognize temporary degradations being necessary to improve from the -- to continue the work to improve the water quality and protect the watershed.

So that is the only caveat I have with regard to this vote. In other words -- otherwise, I think it's an excellent decision to declare it an ONRW.

MR. SHANDLER: To interrupt on that, wasn't there a page she referred to about temporary --

MR. GLASS: There was. It was Exhibit 2.

MR. HUTCHINSON: 2.

MR. SLOAN: Exhibit 2, page 4-10, where it says, "The only exception to this prohibition, as discussed in the preamble to the Water Quality Standards Regulation (48 FR 51402), permits States to allow some limited activities that result in temporary and short-term changes in the water quality of ONRW."

It goes on from there.

MS. PADILLA: Thank you, Commissioner Glass.

Commissioner Hutchinson.

MR. HUTCHINSON: You know, in hearings like this, it's hard to try to divorce one's self from emotional responses and weigh these things in a -- I guess a coldhearted examination. And I'm kind of

echoing Commissioner Bada's sentiments.

But I think that -- I think that we're in the position of being required to do that somewhat and give careful reflection on -- on the evidence that's been presented.

I'm going to address procedurally first, because this is the first designation that we are conducting under our new regulation.

The closing argument citing our authority under -- I'll go to that -- that's 74 -- yeah, flip that -- or go back the other way. Yeah. 74-6-4.C.

MR. SLOAN: Thank you, Vanna.

MR. HUTCHINSON: And then the language in our -- in our regulations where we have the terms discussion.

And I don't believe that discussion -- or that discussion does not mean that the Commission could rely on less than credible scientific data whenever it is making decisions about the standards, because that is what the statute says regardless of what our regulations say, and the statute is the commanding authority, not the regulation.

And so as a comment on the evidence that was submitted, by and large, most of the evidence submitted would meet that criteria of credible scientific data.

And where it was deficient in its discussion was in the arena of the economic analysis. And that, I would find that it did not meet that threshold of credible scientific data.

And the reason that I think that it did not meet that is that the evidence presented was not peer reviewed. It did not have to withstand any debate. The information seemed to be interpreted to benefit the argument being presented by the petitioners and made to fit their petition request, but I don't think it met the threshold of credible scientific data.

Having said that, I do not think that that causes the information to fail the requirement of having discussion.

And that leads me into the next part of the procedural aspect of this, and that is the petitioners' interpretation of Section B for the criteria for ONRWs.

And -- no.

MR. SLOAN: I was close.

MR. HUTCHINSON: Yeah.

The construction -- the construction of B starts off by saying 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.

Now, we did not -- we had fairly extensive discussion on this during the creation of this and the adoption of San Juan water conditions suggestion for this language.

And so benefit to the state is a pretty broad category, and as several Commissioners have already iterated, there's -- there's a number of areas that we can consider as being beneficial, beneficial to public health, beneficial to water delivery, beneficial to water quality, beneficial to our esthetic enjoyment.

Testimony was given not only by the petitioners, but by the public that there's benefit to spiritual renewal. So there's a whole host of benefits. And I think that both the petitioners and their supporters have met that statement.

But I would note that Section B ends with a comma and an "and." So the first criteria that must be met by the -- by the petitioner is that the designation be demonstrated to be beneficial to the state and then -- and one of these three things.

So the first thing is it's beneficial to the state and then one of these three things. So there's actually a minimum of two criteria that must be met in order to cross the bar.

Now, that concludes my statements about the process.

I believe that one of the things that we learned out of the testimony -- and this is primarily that had -- that came from Mr. Zeedyk -- is that management of the riparian and upland areas is a benefit to the state and can be a benefit to the local economy and the people of the region.

I don't believe that ONRW designation diminishes the potential for that benefit. In fact, ONRW designation could benefit that, and testimony was given to us from the coalition and several public members that indicated that ONRW designation would create a greater incentive for these types of activities to take place on the watershed and the riparian areas.

I also concur with the observation that was one of those magic bell moments whenever someone recites a reason that is beneficial, and that is to possibly prevent the listing as a threatened or endangered species.

And one of the criteria that is considered by the Fish and Wildlife Service in listing is whether or not the state has adequate protective measures in place to protect the species.

ONRW designation would certainly go a long way

to answering that criteria for listing by the Fish and Wildlife Service and may indeed cause them to not list.

I don't know that any of the other discussions about the Rio Grande cutthroat trout, and was one of the reasons I asked the question about a species makeup being -- makeup of the stream be a consideration in designation of ONRW. That would not be one of our considerations.

And maybe in the future for presentation of petitions or testimony that we recognize that there's certain criteria that we consider for designation, certainly making a statement that the Rio Grande cutthroat trout is a -- is a species that is desirable for fishing and is attractive for tourism and economy -- you know, I guess it goes to some of the economic consideration, but there was a lot of time spent on the trout that I don't think actually contributed to the -- to the arguments for ONRW designation.

In Mr. Fesmire's testimony of -- and not necessarily testimony, but in response to questioning, he rang another one of those bells, and that is that the ONRW designation, in his opinion, would better -- or would give the OCD more tools in their toolbox to regulate the development of coal bed methane exploration and extraction, and without that added tool, that the --

that their powers to regulate are -- are limited to the extent that there may be further degradation of -- of the water quality in the Valle Vidal.

And I think -- I think I'll stop there.

MS. PADILLA: Thank you.

MR. SLOAN: Madam Chair, if I could just throw in two comments on Mr. -- Commissioner Hutchinson's statement.

MS. PADILLA: Commission Sloan, could you hold those comments until we're done?

MR. SLOAN: Sure.

MS. PADILLA: Thank you.

Commissioner Johnson, please.

MS. JOHNSON: Thank you, Madam Chair.

I probably am not going to say anything new that you haven't heard from the other Commissioners, but I feel it's important for me to iterate.

First, what an excellent petition I think that was put together by the petitioners, both through their exhibits and their technical testimony. I learned a lot about the Valle Vidal, and I thought it was very thorough, and that it meets all of the requirements for a petition for nomination for ONWR (sic).

In terms of the meeting the criteria for designation, I think that based on the petition and all

of the technical and public testimony, I am completely persuaded that the criteria have been met. It is incontrovertible that this designation would be beneficial to the Valle Vidal Unit and to the -- to the State of New Mexico.

I think, for me, the overwhelming way in which that is met is through the protection of the water supply and the quality of those waters. That's the fundamental point on which everything else is based.

Having a continuous high quality water supply in the headwaters of two of the major drainage basins in the State of New Mexico -- that's the Rio Grande basin via the Rio Costilla and the Canadian River Basin -- is imperative to maintaining all of our compact deliveries under those -- in those basins and maintaining economic benefits to the downstream communities and downstream users.

The -- as far as the exhibits -- goodness -- the exhibits that point to that, the water quality issues were dealt with. I think the overwhelming one was Exhibit 43 and the whole suite of exhibits of 30 through 38.

And for me, also, the technical testimony of William Zeedyk was very powerful in explaining the importance of the Valle Vidal and wetlands ecosystem to

maintaining that water quality. And explaining that link, there was nowhere else in the petition, in the exhibits and the testimony that explained that as well as Mr. Zeedyk's -- Zeedyk's. Excuse me.

The testimony by the Valle Vidal Coalition as to the significance of the waters as special trout waters was really important in supporting designation under B.(1).

MR. SHANDLER: I'm sorry. Could you say that sentence again from the beginning?

MS. JOHNSON: No.

For me, the technical testimony of the Valle Vidal Coalition and all of their witnesses was specifically significant for providing evidence as to the special trout waters designation and supporting designation under Section B.(1).

And also, Exhibits 19 and 20.

And as far as designation under B.(2) -- and I do think all of these have been met. I think all of the criteria have been met, not just that the designation would be beneficial to the State of New Mexico, but that all of the three, not just a single one of them, but all of the three, B.(1), B.(2) and B.(3), have been met for me under the technical testimony and the petition.

As far as B.(2), that the waters in the Valle

Vidal have special and exceptional recreation and ecological significance, the public input here was enormous in convincing me of that, and -- and, also, of the unquantifiable noneconomic benefits to the people of the State of New Mexico and -- and nonresidents, as well.

The public input was overwhelming in that, and it was also the absence of protests from any commercial or industrial entities in terms of any negative economical impact of an ONRW designation. It wasn't just what was presented, it was what was not presented that was important to me in terms of supporting the designation.

And that's all that I have.

MS. PADILLA: Thank you.

Commissioner Lujan.

MR. LUJAN: I believe all the testimony that was given, the presentations that were given by the Department and the coalition and the general public were -- were very informative to the point where I think it gave everybody enough information to make a determination that I, for one, feel that I am convinced that it has met the criteria under 20.6.4.9B.(1), where the water is a significant attribute to -- of a gold medal trout fishery.

And I'd like to thank everybody for all of your presentations.

That's all I have. Thank you.

MS. PADILLA: Thank you.

Commissioner Shandler (sic).

MR. SHANDLER: I'll have a couple points, but I will wait until all the Commissioners are done.

MS. PADILLA: Okay. Thank you.

Commissioner Murray.

MR. MURRAY: Madam Chair.

MR. HUTCHINSON: He's been promoted.

MR. SLOAN: Or demoted, depending on how you look at it.

MR. MURRAY: I agree with the comments that I'm hearing from my fellow Commissioners, especially Commissioner Glass.

I appreciate the coalition's presentation, especially A.(1), the map. It passed the Commissioner Murray standard that was informally established two years ago with the Bar Ranch hearing. It's good to get a map that we can all interpret easily.

I think the A.(5) -- as Commissioner Hutchinson said, it passes the discussion test, if you will. But I think in the future, we need to take a further look at the economic impact of the designation,

although I agree with Commissioner Bada's interpretation that it isn't an either/or at times.

I'm trying to summarize this as briefly as possible without being too repetitious.

Under the items B, the criteria, overall, I think it was met. However, I do not agree that item (3) was met for some of the reaches. And I think some of my questions bear that out, specifically on Comanche Creek, and I'm -- I have to further consider those.

I think my -- my main concern is Costilla Creek not meeting specific water quality -- excuse me -- numeric criteria, i.e. -- I believe it's aluminum, lead and zinc, and I think as we are considering our first ONRW nomination under these criteria, we, the Commission, should have a high bar.

So I need to further consider Costilla Creek in particular, and then the other reaches, i.e., Comanche Creek -- and there was another one in there that did not meet the temperature criteria, although testimony regarding the restoration efforts being undertaken on Comanche Creek are compelling, that the temperature criteria probably, depending on when we go out and measure it, would probably pass at any given time due to the restoration that's occurring.

So with that said, I -- and as the Commission

further debates this, I'd be curious to hear my other Commissioners' input on specifically the Costilla Creek numeric criteria that did not pass.

Thank you very much.

MS. PADILLA: Okay. Thank you.

Commissioner Shandler, we return to you.

MR. SHANDLER: I'm just the lawyer here.

I'm going to play the devil's advocate for just a few points.

First, Ms. Abeyta from the farm and livestock industry --

MS. PADILLA: We're finishing the comments from the board, and then I'll ask Commissioner Sloan to --

MR. HUTCHINSON: Oh, okay.

MS. PADILLA: -- ask his comments of you.

Fair enough?

MR. SHANDLER: Okay.

Her concern -- it was in a previous lawsuit -- that the Commission didn't listen to her.

So can I get some Commissioners to respond to Ms. Abeyta's comments for the record?

MS. PADILLA: Okay.

Do you have those -- does everyone know what those comments were?

You're asking the Commission to respond to her comments as presented yesterday?

MR. SHANDLER: Here are some of my notes, and they may not be perfect, but she wanted New Mexico state and local water districts added to the petition. She thought that the economic discussions in the petition failed to depict the oil and gas production issue. She was curious whether adjacent property owners had been contacted. And she asked whether NEPA applied on this matter.

If I could get someone to volunteer to respond to some of these.

MR. SLOAN: I would reply to the NEPA one in particular.

MS. PADILLA: Commissioner Sloan.

MR. SLOAN: Ms. Leavitt pointed out a section in the Clean Water Act that expressly exempted actions under it from NEPA. And I don't know of the specific reference she made, but it was a specific reference within the Clean Water Act.

MR. GLASS: That specific reference was Section 511.(c)(1).

MR. SLOAN: Thank you, Commissioner Glass.

MS. PADILLA: Okay.

MR. SHANDLER: Okay.

My next question is also related. The only Commissioner that appears to talk about grazing is Commissioner Vigil.

So can I have another Commissioner to talk a little bit about grazing allotments?

There was some discussion. Let's build a record on that a bit.

MR. GLASS: I would be happy to talk about that.

I asked a specific question that I can remember. Oh, in fact, yes, I asked a specific question of the petitioner panel. It was answered by Ms. Leavitt about the specific grazing approaches that are used by the permittees for improving watershed and preventing water quality -- or at least preventing further water quality degradation.

Ms. Leavitt, although not intimately involved with the agreements, was aware of the opinions of the permittees, the grazing permittees, and stated that there had been no grumbling, so to speak, there had been no indication that the permittees were unhappy in any way or had experienced any economic impact, positive or negative, from those -- from the grazing changes that were a part of the ongoing watershed restoration activities.

So that satisfied -- I asked that question specifically because of Ms. Abeyta's concerns with regard to grazing permittees, and I'm -- to me, I was satisfied, having not seen the grazing community show up here except for one -- in fact, he did. Mr. Lackey showed up and said he was a member of the New Mexico Cattle Growers' Association.

MS. PADILLA: Um-hum.

MR. GLASS: And so the fact that the cattle grazers -- the cattle grazers didn't show up en masse to object, we had a member of the Cattle Growers' Association here who did not object, in fact, the fact that Ms. Leavitt's experience was that the Cattle Growers were cooperating fully, and, in fact, I believe -- and am I not correct that they're part of the Valle Vidal -- at least the local cattle owners association, the RACCA, I think it's called, is a member of the --

MR. MURRAY: RCCLA.

MR. GLASS: RCCLA. I almost got all the letters in there.

-- are a member of the Valle Vidal Coalition.

So to me, that was persuasive.

MR. LUJAN: I thought -- excuse me. Fred Lujan.

I thought that Mrs. Abeyta testified that she was also representing the Wool Growers and the Cattlemen's Association.

MR. SLOAN: She did.

MR. HUTCHINSON: She did.

MR. LUJAN: She did.

MR. HUTCHINSON: Well, she was presenting testimony because --

MR. LUJAN: Right.

MR. HUTCHINSON: -- the representative of the Wool Growers and Cattle Growers was ill --

MR. LUJAN: Right.

MR. HUTCHINSON: -- and so she presented -- she was presenting some of her testimony.

MS. PADILLA: Thank you.

MR. HUTCHINSON: But I have some other things to -- to contribute to that discussion, as well.

MS. PADILLA: To that particular discussion?

MR. HUTCHINSON: Yes.

MS. PADILLA: Thank you.

MR. HUTCHINSON: Mr. Bill Sauble from the New Mexico Cattle Growers stated that there were 15 livestock permittees -- I think you heard that -- that they had been on the Valle Vidal area for 18 to 20 years. I think that was also restated in Mr. Zeedyk's

testimony.

One of the things that Mr. Sauble brought up was that there needs to be better monitoring of the wildlife grazing impacts rather than just focusing in on the cattle grazing.

Mr. Zeedyk, in response to a question that I had for Mr. Zeedyk about the cattle and elk forage allocations made during the initial management plans for the area, talked about, fairly extensively, the number of cattle that were allowed in initially, and then made the statement that those numbers have been allowed to increase as a result of restoration activities.

And that was one of the concerns that I -- I did have also in looking at this, was would we be negatively impacting economic activities that are customarily taking place within that community.

And if that's -- if that's an indicator, that as the area improves in its function, it may be that we would even see an increase in cattle allotment in the area.

I think Ms. Abeyta -- let's see. She also requested -- and was one of the reasons I brought up the issue of the economic discussion, was that they -- that there was no mention in that economic discussion of agriculture's contribution to the economy, the

contribution to the local economy and the contribution to the state economy.

And -- and that might be considered in there from the standpoint of the issue that I raised as to the adequacy of discussions and making sure that in the future, that those discussions cover the entire spectrum of economic activity when making presentations to the Commission on the ONRW petitions.

MR. SHANDLER: Thank you.

One final question.

As a layperson --

MS. PADILLA: Could I --

MR. SHANDLER: Oops.

MS. PADILLA: Would you like to respond to the petition and Cattle Growers?

Commissioner Sloan and then Commissioner Goad, please.

MR. SLOAN: I believe Mr. Sauble -- or if that's his name -- is the president of the Cattlemen's Association, and he also indicated that he had a statement from Mr. Torres, who was the president of the Valle Vidal Permittees Association, that reflected no opposition to the ONRW designation.

MR. HUTCHINSON: That they were neutral.

MR. SLOAN: Well, no opposition, that's

neutral.

But we also heard from -- I think it was Ms. Leavitt, but it may have been Mr. Lackey, that the permittees are all members of the Cimarron Watershed Association and that that association took a neutral position relative to the designation.

MS. PADILLA: Thank you.

Commissioner Goad.

MS. GOAD: I thought I heard our very last public comment person, Ms. Martinez of Taos, say that she and her family have used the Valle Vidal for recreation, hunting and grazing for years, and they want it preserved, and they support the ONRW.

Did anybody else hear that?

MS. BADA: Yes.

MR. GLASS: Yes.

MS. GOAD: So there's a cattle grazer who is supporting.

MR. SHANDLER: What was her first name?

MR. SLOAN: Ms.

MS. GOAD: Her last name is Martinez, and I -- did you get the first name?

MR. DARDEN: Denise.

MS. GOAD: Hmm?

MR. DARDEN: Denise.

MS. GOAD: Oh, Denise. I wrote that Bernice, but that's very close.

MS. PADILLA: Commissioner Darden.

MR. DARDEN: I'd also add that in Exhibit 50, which was Lynette Guevara's testimony, she kind of highlighted some of the concerns that Cecilia and the Farm and Livestock Bureau had brought up, acknowledging grazing permittees will be part of the process to improve water quality in Comanche Creek area as well as other areas of the Valle Vidal through coordination, cooperation and consultation on ongoing and future underground projects.

And she goes on to mention that there's -- New Mexico State University's Water Task Force, Range Improvement Task Force and soil and water conservation districts could be asked to assist with these efforts.

MS. PADILLA: Thank you.

MR. SHANDLER: One final question.

As the Commission knows, there are people that are opposed to piscicides, so perhaps this might be the question they would ask, is, okay, the Commission has designated this water because it's a high quality water, and one of the primary reasons is to restore this type of trout, and the way to do that is to put piscicide in the water. Isn't that a circular argument made by the

State?

So can anyone kind of defeat that circular argument for the record?

MR. LUJAN: I was with the understanding that we would address that when the -- when it came up as a separate issue.

MR. SHANDLER: Okay.

MR. LUJAN: That's what I thought I heard said.

MS. PADILLA: Commissioner Sloan --

MR. SLOAN: I would --

MS. PADILLA: -- due to your comment earlier, and then you have a comment on this. That's fine.

MR. SLOAN: I would refer us back to the comment Ms. Leavitt made relative to the Water Quality Standards Handbook where temporary degradations that further the purpose of the Clean Water Act are allowable and that the application of piscicide to restore the biological integrity of the system would, in fact, support the purposes of the Clean Water Act and would be allowable.

MR. SHANDLER: Thank you for your time.

MS. PADILLA: Thank you.

Commissioner Goad, do you have another comment?

MS. GOAD: Oh, I was -- I had the same question.

MR. GLASS: Madam Chair, actually, we did not respond to Zach's concern about the public notice question that was brought up by Ms. Abeyta. She --

MS. PADILLA: Oh, the residential notification to adjacent property owners?

MR. GLASS: She said -- she asked was public notice adequate. She brought up the topic of environmental justice and specifically referred to the adequacy of public notice and whether or not everybody who should have heard about it did hear about it.

And we had subsequent testimony -- of course, we have the exhibits showing that the -- that it was sent to various -- that notice of this hearing was sent to mailing lists and posted here and there.

And Ms. Conn also testified that Amigos Bravos -- I believe that's right -- Amigos Bravos had developed a fact sheet about the ONRW nomination, had worked with the Coalition for the Valle Vidal to develop said fact sheet, had approached the Valle Vidal Grazing Association, the local watershed group, directly for discussions regarding that.

And so I believe that the concerns expressed by Ms. Abeyta about inadequate -- or potentially

inadequate public notice were thoroughly addressed.

MR. SHANDLER: Okay.

MS. PADILLA: Thank you.

Commissioner Sloan, did you want to get back to your Commissioner Hutchinson's comments?

MR. SLOAN: I just have to.

Relative to species composition, I would suggest that it is something we would need to consider, because it is part of the unique ecological significance, and that's where the Rio Grande cutthroat trout would come into play, in that there are several pure populations there that are easily accessible and not found elsewhere.

Relative to credible scientific data and economic analysis, I think that while there can be some argument over the Power report in particular and some of the other numbers, that the data relative to fisheries use and reliance on the 2001 US Fish and Wildlife Service survey is -- it would -- should be considered credible scientific data.

MS. PADILLA: Thank you.

I would --

MR. HUTCHINSON: But since we're deliberating --

MS. PADILLA: Please.

MR. HUTCHINSON: -- you know, the -- I asked several questions about the numbers in there, and, of course, the panel did not have the information to respond, but the number -- the numbers in that survey -- I would say that they probably would not pass muster as credible scientific data.

They -- agencies have a tendency to inflate numbers or ignore criteria or make assumptions that make their agency look good, and that is the case with that -- with those survey numbers and the analysis of those numbers.

Surveys, depending upon how they're designed -- and I looked at the design criteria that -- and they did list that in that survey, and I -- you know, I think you can design a survey to render answers and numbers that you -- that you seek.

So, you know, I don't -- I don't think there was full disclosure in that, and that was one of the questions that I asked about in the numbers themselves.

And this is -- this has come up as a critique of that particular survey, that a lot of the dollar figures that were affixed to that had to do with people buying bird seed and bird feeders for their backyards, and it was a large part of the dollars that were -- that were spent, but it was classified as bird viewing or

wildlife viewing.

MR. SLOAN: And I guess that's why I tried to restrict my comment to the actual angler use data and the --

MR. HUTCHINSON: Oh, okay.

MR. SLOAN: -- and the numbers, the dollar values associated with that use.

MR. HUTCHINSON: Yeah. I don't --

MR. SLOAN: I don't argue with you about 600-and -- whatever the number was.

MR. HUTCHINSON: Yeah.

MR. SLOAN: It was --

MR. HUTCHINSON: I think I made a statement that I was not questioning the actual Department numbers. I think those are probably very accurate, because you do issue permits for the area, and there are hunting guides who supplied that information as to -- you know, so that -- that information, you know, is pretty unquestionable.

MR. SLOAN: I just didn't want to invalidate the entire section.

MR. HUTCHINSON: Right, right. Okay. I know.

I agree with you there, that that was credible -- that could be classified as credible scientific data.

MR. SLOAN: Thank you.

MS. PADILLA: Thank you.

I would just like to add a few of my comments.

You know, I, too -- and won't reiterate all the beneficial reasons that Commissioners have stated for this designation.

But I would like to add a couple that I see also as benefits, and I think that one is the educational opportunities and the fact that we are continuing to reach out to New Mexico youth and bringing them outdoors, giving them outdoor classes.

I think all too often our New Mexico youth don't have a chance to go outside, don't have a chance to enjoy migratory waterfowl, don't have a chance to fish, don't have a chance to get out, you know, and do any kind of wildlife watching.

And I think the opportunity -- and the fact that we have associations and coalitions out there that are really addressing and reach out to the youth is incredibly important and beneficial to New Mexicans.

So I would like to add that as a benefit.

And, also, I heard briefly in the testimony, but I did hear in the testimony, the fact that there was and is continued consideration of tribal brothers and sisters in terms of their uses of that land and the

areas, and I think we need to continue to keep that in -- or take into -- thought into consideration, value, and remember that that's, you know, our culture of New Mexico.

And so I think that's another benefit.

I think we've had a lot of deliberations, discussion -- I almost think I heard a consensus amongst the Commission, and I -- again, I don't want to cut off any deliberations. I don't know if any of you have any questions of each other that you would have.

I can entertain a motion now if you feel prepared for that, or we can, you know, continue if you have any questions.

Are there any questions anyone feels that they need to ask or discuss amongst each other?

That --

MR. GLASS: Madam Chair, I move for adoption of the Environment's -- or the petitioners' proposal.

MS. PADILLA: Is there a second?

MR. SLOAN: Second.

MS. PADILLA: Commissioner Sloan seconded?

Ms. Worthington, can we have a roll call for this vote, please?

MS. WORTHINGTON: Yes.

MS. PADILLA: Thank you.

MS. WORTHINGTON: Commissioner Darden.
MR. DARDEN: Yes.
MS. WORTHINGTON: Commissioner Johnson.
MS. JOHNSON: Yes.
MS. WORTHINGTON: Commissioner Murray.
MR. MURRAY: No.
MS. WORTHINGTON: Commissioner Sloan.
MR. SLOAN: Yes.
MS. WORTHINGTON: Commissioner Goad.
MS. GOAD: Yes.
MS. WORTHINGTON: Commissioner Glass.
MR. GLASS: Yes.
MS. WORTHINGTON: Commissioner Vigil.
MR. VIGIL: Yes.
MS. WORTHINGTON: Commissioner Bada.
MS. BADA: Yes.
MS. WORTHINGTON: Commissioner Hutchinson.
MR. HUTCHINSON: Yes.
MS. WORTHINGTON: Commissioner Lujan.
MR. LUJAN: Yes.
MS. WORTHINGTON: Commissioner Price.
MR. PRICE: Yes.
MS. WORTHINGTON: Chair Padilla.
MS. PADILLA: Yes.
MS. WORTHINGTON: Okay.

MS. PADILLA: Okay. Thank you.

I believe that is -- concludes, then, item number 9 on our agenda, and we can move to item number 10, other business.

(Proceedings adjourned at 5:05 p.m.)

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

I, CHERYL ARREGUIN, the officer before whom the foregoing proceedings was taken, do hereby certify that I personally recorded the proceedings by machine shorthand; that said transcript is a true record of the proceedings; that I am neither attorney nor counsel for, nor related to or employed by any of the parties to the action in which this proceeding is taken, and that I am not a relative or employee of any attorney or counsel employed by the parties hereto or financially interested in the action.

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My Commission Expires: 12/12/07

PETITIONERS' EXHIBIT

32

BEFORE THE NEW MEXICO
WATER QUALITY CONTROL COMMISSION

IN THE MATTER OF THE PETITION FOR PROPOSED AMENDMENTS TO 20.6.4.9 NMAC, DESIGNATION OF WATERS WITHIN THE VALLE VIDAL AS OUTSTANDING NATIONAL RESOURCE WATERS

New Mexico Environment Department
New Mexico Game and Fish Department
New Mexico Energy, Minerals, and Natural Resources Department

WQCC No. 05-04 (R)

Petitioners,

ORDER AND STATEMENT OF REASONS FOR AMENDMENTS TO STANDARDS

THIS MATTER comes before the New Mexico Water Quality Control Commission ("Commission") upon a petition filed by New Mexico Environmental Department, New Mexico Game and Fish Department and New Mexico Energy, Minerals and Natural Resources Department (collectively "Petitioners") proposing amendments to 20.6.4.9(D) NMAC. A public hearing was held in Santa Fe, New Mexico on December 13 & 14, 2005, before a hearing officer, with the Commission present during the hearing. The Commission heard technical testimony from Petitioners and the Coalition for the Valle Vidal and admitted exhibits into the record. No other technical testimony was submitted. The Commission also heard and received substantial non-technical testimony. On December 14, 2005, the Commission deliberated and voted 11-1 to adopt the amendments set forth below in relevant part, for the reasons that follow.

I. AMENDMENTS

20.6.4.9.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, Holman, Gold, Grassy, La Belle 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.

II. Statement of Reasons

1. Petitioners filed their Petition for a public hearing in this matter on October 3, 2005 and it was docketed on October 6, 2005.
2. A hearing on this matter was scheduled for December 13, 2005.
3. Notice of the Hearing for the proposed amendments was duly published in the New Mexico Register on October 31, 2005. See Petitioners' Exhibit 5.
4. Notice of the Hearing for the proposed amendments was duly published in the Albuquerque Journal on October 29, 2005, Raton Range on November 1, 2005, and Taos News on November 10-16, 2005. See Petitioners' Exhibit 4.
5. Notice of the Hearing for the proposed amendments was duly sent to the WQCC Commission mailing list, WQCC electronic notification list, Surface Water Quality Bureau stakeholder electronic notification list, Oil Conservation Division stakeholder list and Game and Fish stakeholder electronic notification list. See Petitioners' Exhibit 5.

6. Petitioners filed a Notice of Intent to Present Technical Testimony on November 22, 2005. The Notice of Intent listed four potential witnesses: (a) Marcy Leavitt; (b) David Propst; (c) Lynette Guevara; and (d) Mark Fesmire.
7. The Coalition for Valle Vidal filed a Notice of Intent to Present Technical Testimony on November 22, 2005. The Notice of Intent listed five potential witnesses: (a) Alan Lackey, Coalition for the Valle Vidal; (b) William Zeedyk, Wildlife Biologist; (c) Donald Hurst, New Mexico Trout; (d) William Schudlich, New Mexico Council of Trout Unlimited; and (e) Taylor Streit, Streit Fly Fishing.
8. Pursuant to NMSA 1978, Section 74-6-4 (C), "the Commission shall adopt water quality standards for surface and ground waters of the state based on credible scientific data ... [and] in making standards, the commission shall give weight it deems appropriate to all facts and circumstances, including the use and value of water for water supplies, propagation of fish and wildlife, recreational purposes and agricultural, industrial and other purposes."
9. *There was evidence presented regarding the use and value of water for water supplies.*
10. Ms. Leavitt testified that protecting the Valle Vidal's water quality would protect the water quality of downstream municipalities, such as Costilla and Springer.
11. Mr. Zeedyk testified that protecting the Valle Vidal's wetlands is an important link in protecting the area's overall water quality.
12. Doug Shaw, non-technical testimony, testified that Riprarian Council considers that wetlands are important to filter water and improve water quality.

13. The Valle Vidal's water quality is important because it resides at the headwaters of two major drainages basins the Rio Grande/Rio Costilla and Canadian River. See Petitioners' Exhibits 30-38, 43.

14. These drainage basins are key waters needed to fulfill New Mexico's interstate water compact requirements.

15. See Infra Statement of Reasons 82-87.

16. There was evidence presented regarding propagation of fish and wildlife.

17. Dr. Propst testified that protecting the Valle Vidal is an important step to protect the habitats of "over fifty mammal species, more than two hundred bird species, and sixteen reptiles and amphibians." See Petitioners Exhibit 49.

18. Dr. Propst testified that three native New Mexico fishes, including the Rio Grande cutthroat trout, the state fish, are found in the water of Valle Vidal." See Petitioners Exhibit 49.

19. Mr. Schudlich testified that protecting the Valle Vidal is an important step to protect the health of the Rio Grande Cutthroat trout.

20. Mr. Oscar Simpson, non-technical testimony, testified about the importance of elk hunting season.

21. There was substantial non-technical testimony regarding the importance of protecting the Valle Vidal because of the abundance of wildlife species that exist there.

22. See Infra Statement of Reasons 52, 60, 69-71, 80.

23. There was evidence presented regarding recreational purposes.

24. Dr. Propst testified that "the waters of the Valle Vidal provide about 15,000 angler use days per year." See Petitioners' Exhibit 49.

25. There was substantial non-technical testimony about the appeal of recreational activities at the Valle Vidal.

26. There was substantial non-technical testimony that the public comes to the area to see and watch the wildlife.

27. See Infra Statement of Reasons 64, 78.

28. There was evidence presented regarding agricultural purposes.

29. Grazing will continue in Valle Vidal and will not be prohibited.

30. Mr. Zeedyk testified that the number of cattle being grazed have increased over the years because of restoration activities at the Valle Vidal.

31. Mr. Lackey testified that there were sixteen current grazing permittees at the Valle Vidal.

32. Ms. Leavitt testified that grazing permittees were aware of the petition but did not object.

33. Mr. Lackey testified in favor of the petition and is a member of New Mexico Cattlegrowers.

34. Mr. Lackey testified that the Valle Vidal Grazing Association was a member of the Coalition for the Valle Vidal.

35. Mr. Bill Sauble, non-technical testimony, testified that the New Mexico Cattlemen Association's was neutral on the petition.

36. Ms. Denise Martinez, non-technical testimony, supported the petition and testified that her family had used the Valle Vidal for grazing.

37. Ms. Cecilia Abeyta, non-technical testimony, raised the New Mexico Farm and Livestock Bureau's concerns regarding sufficient notice to local areas.

38. There was non-technical testimony that Amigos Bravos provided a fact sheet regarding the proposed designation and circulated it in the local area.

39. Ms. Abeyta raised concerns regarding the sufficient discussion of the risk of preclusion of human activities and rangeland grazing activities.

40. Ms. Guevara addressed the issues of preclusion of human activities and rangeland grazing activities. See Exhibit 50.

41. See Infra Statement of Reasons 55.

42. There was evidence presented regarding industrial purposes.

43. Ms. Leavitt testified that the designation would protect the water quality of downstream area users, such as industrial and business organizations.

44. The designation is not an "either or" situation and thus oil and gas exploration has not been prevented.

45. There was an absence of protest from the industry sector regarding the petition.

46. See Infra Statement of Reasons 54, 58-59, 63

47. Petitioners must show that pursuant to 20.6.4.9(A) NMAC that the procedures for nomination have been met.

48. There was evidence presented regarding a map of the area. See Petitioners' Exhibit 3.

49. There was evidence presented regarding information on water quality data, discussion of activities, and economic impact.

50. Ms. Guevara testified regarding the impact of water quality. See Petitioners' Exhibits 30-38.

51. Mr. Zeedyk testified regarding greater land management, which can be a benefit to the state (for instance greater riparian and watershed restoration).

52. Dr. Propst testified regarding the impact to fishing, hunting, and camping.

53. Ms. Guevara testified regarding the impact to road development.

54. Mr. Fesmire testified regarding the impact to oil and gas exploration.

55. Ms. Guevara, Ms. Leavitt, Mr. Lackey, and Mr. Zeedyk testified regarding the impact to grazing.

56. There was non-technical testimony regarding the impact to timber harvesting/roads.

57. *Petitioners must show that pursuant to 20.6.4.9(B)(1), (2) or (3) NMAC that the criterion for the designation has been met.*

58. Mr. Fesmire testified that there would be a benefit to designation because it would allow the state Oil and Gas Commission to set better rules and could advance science in setting coal methane exploration regulations.

59. Ms. Leavitt testified that there would be a benefit to designation because it would allow clean water for downstream development.

60. Mr. Schudlich testified that there will be a benefit to designation because it would allow the Rio Grande Cutthroat trout to not have to be potentially "listed" for protection purposes.

61. If the Rio Grande Cutthroat trout is not listed, then other New Mexico lands and waters will not have to be restricted for protection purposes.

62. Mr. Schudlich and Mr. Zeedyk testified that there would be a benefit to designation because it would create an ecological benefit.

63. Mr. Lackey, Mr. Streit and Mr. Fesmire testified that there would be a benefit to designation because it would allow low impact, long term sustained economic development for recreation and fishing in the area.

64. Commissioner Hutchinson stated a concern that the economic benefit testimony was not "credible scientific evidence" and the only reason it was satisfactory was because there was no contrary testimony.

65. There was substantial non-technical testimony that that there would be a benefit to designation because protecting a recreational area is beneficial to New Mexico.

66. The Valle Vidal is a recreational area where all citizens can recreate, including children and mobility impaired.

67. There was non-technical testimony that that there would be a benefit to designation because it would continue to allow educational opportunities for visiting school children.

68. There was evidence that petitioners considered tribal issues.

69. *Petitioners may show pursuant to 20.6.4.9(B)(1) ("Gold medal trout fishery") NMAC that the criteria for the designation have been met.*

70. Dr. Propst testified that the term "Gold medal trout fishery" is not defined in the standards, but the term "special trout water" is commonly used as the equivalent term. See Petitioners' Exhibit 49.

71. Dr. Propst testified that the water in the area is a special trout water. See Petitioners' Exhibits 19, 20, 49.

72. Mr. Hurst, Mr. Schudlich, and Mr. Streit testified that the water is a special trout water.

73. However, New Mexico Game and Fish Department has requested a hearing to temporarily use piscicide to kill non-native species.

74. Commissioner Glass stated a concern that the State Anti-degration policy prohibits any degradation to ONRW waters. This prohibition may restrict a piscicide treatment.

75. Ms. Leavitt testified that temporary degradation, like piscicide treatment, is recognized as acceptable under the U.S. EPA Water Quality Handbook. See Exhibit 2, 4-10.

76. Ms. Leavitt testified that the State Anti-degration policy might need to be amended.

77. *Petitioners may show pursuant to 20.6.4.9(B)(2) NMAC ("exceptional recreational or ecological significance") that the criteria for the designation have been met.*

78. There was significant non-technical testimony that beauty of the Valle Vidal is why they reside nearby the area and in New Mexico.

79. There was significant non-technical testimony that there are exceptional recreational opportunities with a wide variety of uses (fishing, hunting, fly-fishing, bird watching, and angling).

80. Mr. Zeedyk testified that it is an area that is ecologically significant because it contains 4.5 percent wetlands where it is 0.6 percent statewide.

81. There was evidence that there is exceptional ecological significance because the abundance of wildlife species, Rio Grande cutthroat trout, and elk.

82. *Petitioners may show pursuant to 20.6.4.9(B)(3) NMAC ("existing water quality is equal or better than the numeric criteria") that the criteria for the designation have been met.*

83. There was evidence that the existing water quality is equal or better than the numeric criteria. See Petitioners' Exhibit 30-38, 50.

84. Ms. Guevara testified that "existing water quality in the Valle Vidal is equal to or better than the vast majority of numerical water quality criteria associated with aquatic life uses, and will benefit from the protections afforded by ONRW designation." See Petitioners' Exhibit 50.

85. Ms. Guevara testified that the quality of the surface waters in the Valle Vidal is generally good, based on chemical/physical measurements and chemical laboratory results. See Petitioners' Exhibit 30-38, 50.

86. Ms. Guevara testified that "existing chemical data indicated the Subsection (B)(3) criterion is met for the vast majority of numeric water quality associated with aquatic life uses. This statement is supported by Exhibit 31, which shows the number of times if any a particular numeric water quality criterion was not met." See Petitioners' Exhibit 50.

87. Ms Guevara acknowledged that "the specific Subsection (B)(3) criterion with regards to numeric criteria was not met for a few parameters at a few stations in the Valle Vidal, determining whether or not aquatic life uses are met is a broader

question that requires consideration of non-chemical data." See Petitioners' Exhibit 50.

88. Ms. Guevara also stated: "Incorporation of biological and habitat data indicate that surface waters in the Valle Vidal by and large contain good water quality and healthy aquatic life communities that warrant the additional protection afforded by ONRW designation." See Petitioners' Exhibit 50.

89. The Commission hereby CONCLUDES:

    a. The Commission has the authority to approve these amendments.

    b. The Petitioners have the authority to bring this petition.

    c. The petition satisfied all applicable procedural requirements.

    d. The proposed amendments satisfy NMSA 1978, Section 74-6-4 (C).

    e. The proposed amendments satisfy NMSA 1978, 20.6.4.9(A) NMAC.

    f. The proposed amendments satisfy 20.6.4.9(B), (B)(1), (B)(2) and (B)(3) NMAC.

90. The proposal is adopted for any or all of the reasons stated above.

III. ORDER

By a vote for eleven in the affirmative and one in the negative, the petition was approved on December 14, 2005.

Cin S Padilla
On behalf of the Commission
Dated: Jan. 20, 2006

IV. DISSENT

A. Commissioner Murray expressed concern regarding whether Petitioners satisfied 20.6.4.9(B)(3) NMAC.

B. Commissioner Murray expressed concern that Petitioners failed to prove that the water quality was satisfied on all segments on waters (including, not limited to the Costilla Creek). See Petitioners' Exhibits 30-38, 50.

C. Commissioner Murray stated that if the Commission's motion had been for approval based solely on either (B)(1) or (B)(2), he would have supported the petition.

PETITIONERS' EXHIBIT

33

Testimony of Rebecca Roose

Water Protection Division Director, New Mexico Environment Department

To the United States Senate

Committee on Environment and Public Works

Regarding a hearing on

"Stakeholder Reactions: The Navigable Waters Protection Rule under the Clean Water Act"

September 16, 2020

Mr. Chairman, Ranking Member Carper, members of the Committee, my name is Rebecca Roose and I currently serve the State of New Mexico as Director of the Water Protection Division at the New Mexico Environment Department. The Environment Department certifies federal Clean Water Act (CWA) permits issued in New Mexico and has primary responsibility for implementing the activities of the New Mexico Water Quality Control Commission, which is the state water pollution control agency for purposes of the CWA. I appreciate the opportunity to provide testimony today on the impact of the Navigable Waters Protection Rule (NWPR) in New Mexico. My testimony draws on my nearly 15 years of experience implementing the CWA at the state and federal level.

My testimony focuses on three primary issues related to the new definition of Waters of the United States (WOTUS) that was finalized by the Environmental Protection Agency (EPA) and Army Corps of Engineers (ACE) (collectively the "Agencies") and took effect earlier this year: 1) New Mexico's rivers, streams, lakes and wetlands are at risk like never before; 2) the NWPR and its implementation by the Agencies leave a huge regulatory gap in New Mexico; and 3) the NWPR and its implementation by the Agencies fail to deliver on the promise of regulatory certainty and will hurt state and local economies. The stakes in New Mexico are incredibly high as we look to mitigate the of loss of CWA protections for the majority of surface waters, which are relied upon by New Mexicans for drinking water, cultural uses and economic vitality.

THE NWPR'S HARM TO NEW MEXICO WATERS

New Mexico is home to high mountains, expansive plains and plateaus, river gorges, and broad valleys. Land surface elevations in New Mexico vary from just under 3,000 feet above sea level at the Texas border to just over 13,000 feet in the northern mountains. New Mexico is the fifth largest of the fifty states, with a total area of 121,607 square miles. Of this, approximately 34% is Federal land, 12% is State land, 10% is Native American land, and 44% is privately owned. New Mexico is also one of the driest states, averaging less than twenty inches of annual precipitation. About half of annual precipitation is received during the summer months with brief but intense, localized summer storms, commonly referred to as "monsoons." Much of the winter precipitation falls as snow in the high mountains and as snow or rain at lower elevations in more widely distributed, regional storm fronts.

Nevertheless, the State is rich with iconic rivers, such as the Rio Grande, Pecos and Gila; stream and acequia networks that support multi-generational farms; and wetlands, lakes and reservoirs that are critical for drinking water supplies, crop production, a vibrant outdoor recreation economy and interstate compact agreements. Table 1 below provides a summary of New Mexico's surface water resources.

The impact of the NWPR on CWA jurisdiction in New Mexico could not be more dramatic. In its review of the National Hydrography Dataset, the Environment Department determined that approximately 89% of the State's rivers and streams are ephemeral, 7% are perennial, and 4% are intermittent. Under the NWPR, none of the ephemeral streams are protected by the CWA. Let me be clear on this point: Nearly 90% of New Mexico's rivers and streams are left out of CWA protections even though water quality in these waterbodies is just as important today as it was on June 21, 2020, the day before the NWPR's effective date.

Table 1. Summary of New Mexico's Surface Water Resources

Topic	Value
State population	2,096,829
Population dependent on surface water for drinking water	878,765
State surface area	121,607 mi
Total miles of perennial non-tribal rivers/streams	6,362 miles
Total miles of non-perennial non-tribal rivers/streams	88,810 miles
Number of significant public lakes/reservoirs	196
Acres of significant public lakes/reservoirs	89,042 acres
Acres of freshwater wetlands	845,213 acres

Science clearly demonstrates that ephemeral waters are ecologically and hydrologically significant in the arid southwestern United States. Ephemeral streams are the capillaries of watersheds, recharging aquifers and delivering water downstream for aquatic life, wildlife, and human use. Ephemeral streams may be the headwaters or major tributaries of perennial streams in New Mexico. Over time, pollutant discharges unregulated under CWA Section 402 and development activities unregulated under CWA Section 404 as a result of the NPWR will adversely impact downstream water quality in waters that are jurisdictional. For example, in New Mexico, ephemeral tributaries contribute up to 76% of the stormflow in the Rio Grande after a storm event. Where pollutants can be mobilized, ephemeral stormflows will deliver the pollutants to downstream waters, such as the Rio Grande. The cumulative impacts of these non-jurisdictional ephemeral stormflows will be detrimental to downstream water quality and threaten human health and the environment. This hydrologic and ecologic connection between ephemeral waters and downstream NWPR jurisdictional waters is well-established in EPA's own scientific record, which the Agencies flatly ignored in the final rule that excludes all ephemeral streams from the definition of WOTUS.

Ephemeral flows need CWA protection because when they are functioning properly they provide important hydrologic connections across the landscape and across geopolitical boundaries; they dissipate stream energy during high flow events to reduce erosion, thus improving water quality; they recharge aquifers where water can be stored for current and future drinking water supplies; they transport, store and deposit sediment to help maintain floodplains; they transport, store and cycle nutrients for vegetation, wildlife and aquatic life; and they support and provide migration corridors. Given the distribution of ephemeral streams in New Mexico (89% of streams) and their important hydrological and ecological functions, cumulative impacts of ephemeral streams throughout a watershed must be considered in order to protect and maintain water quality and watershed health. Indiscriminately removing protections from ephemeral streams degrades water quality in the watershed and, most notably, the jurisdictional waters that they feed.

The NWPR also results in the loss of many wetlands in New Mexico. Saint Mary's University of Minnesota's Geospatial Services, with input from the Environment Department, created a model to evaluate the extent of federally protected wetlands and other surface waters in the Cimarron River Watershed located in northeastern New Mexico.[1] The results of this case study show that

[1] For details of the Saint Mary's University of Minnesota model, visit https://www.arcgis.com/apps/Cascade/index.html?appid=f3de6b30c0454c15ac9d3d881f18ae33.

by narrowing the scope of federal jurisdiction, the number of wetlands protected by the CWA is substantially decreased, likely leading to a loss of benefits provided by wetlands such as flood control and attenuation, pollution control, wildlife habitat, and recreation. The Cimarron River Watershed is known for its special trout waters, cross country and downhill skiing, boating, ice fishing, and other recreational opportunities that contribute to an important outdoor recreation economy for the communities in and near the watershed. Depending on how the WOTUS definition in the NWPR is applied, 20-70% of the wetlands in the Cimarron River Watershed lose federal protections, threatening the livelihoods of these small, rural towns.

Because of the ephemeral exemption and new definition of "adjacent wetland," the NWPR creates a significant gap in regulation under CWA Section 402 general permits (i.e., construction and industrial stormwater discharges) and CWA Section 404 dredge and fill permits in ephemeral streams and non-abutting wetlands. The Agencies considered the potential effect of the NWPR on issuance of CWA Section 402 permits for stormwater from construction activities. Overall, the Agencies concluded that the ephemeral exemption would likely change circumstances in arid and semi-arid states where many streams are ephemeral, and CWA protections would be removed from the vast majority of waters in these states.[2] The water quality impacts associated with construction and development activities are well-known and firmly established in the scientific record. Besides excess sediment, which can smother bottom-dwelling organisms, fill deep pools that are critical refugia during summer and drought, and clog or injure gills of fish, stormwater carries other harmful pollutants. Construction, industrial, and urban sites generate pollutants such as phosphorus and nitrogen from the application of fertilizer, bacteria, various metals (arsenic, cadmium, chromium, copper, zinc), acidic wastewaters, pesticides, phenols, paints, solvents, phthalates, petroleum products, and solid wastes that attach to sediment and/or get washed into streams and wetlands during overland stormflows. Sediment loading rates from construction sites are typically 10 to 20 times that of agricultural lands and 1000 to 2000 times that of forest lands. Even a small amount of construction or industrial activity can have a significant negative impact on water quality in localized areas if permits are not required and proper management practices are not implemented to reduce or eliminate pollutants in stormwater. New Mexico has over 1000 facilities covered by CWA stormwater general permits. As a result of the NWPR, we estimate that 25-45% of these facilities are no longer subject to federal stormwater management requirements and, as I explain below, the State does not have an established program to promptly ensure the requisite protections in lieu of EPA and ACE permits.

The NWPR also creates a significant gap in regulation of individual permits issued by EPA under CWA Section 402 in New Mexico. The Agencies did not sufficiently consider the potential effect of the NWPR on issuance of CWA Section 402 individual permits for discharges to ephemeral or other non-jurisdictional waters under the NWPR. New Mexico currently has 115 individual, EPA-issued NPDES permits in the State, including permits issued in Indian Country. Under the NWPR, Environment Department experts estimate that approximately 50% of these current permittees will no longer be required to obtain an NPDES permit because they discharge to receiving streams that are not within the new narrow WOTUS definition. Examples of facilities in New Mexico that discharge to NWPR non-jurisdictional waters include: municipal

[2] *Economic Analysis for the Navigable Waters Protection Rule: Definition of "Waters of the United States."* U.S. Environmental Protection Agency and Department of the Army (January 22, 2020).

and private domestic wastewater treatment plants; tribal and Bureau of Indian Affairs wastewater treatment plants; multiple types of mines, both active and in reclamation (coal, uranium, cement, rock, minerals and metals); national laboratories and other federal facilities; fish hatcheries; and oilfield sanitary waste treatment plants. Eliminating CWA protections and federal regulation of these dischargers degrades water quality of ephemeral receiving streams as well as the downstream Traditional Navigable Waters (TNWs) and other jurisdictional waters that they feed.

Three specific examples of NWPR impacts follow:

> **The Rio Grande.** Tijeras Arroyo presents an example of the devastating effects of the NWPR on water quality. This waterway winds for 26 miles from its headwaters in the Sandia and Manzano Mountains east of Albuquerque, New Mexico through developed and undeveloped areas of Albuquerque in the foothills, including Kirtland Air Force Base, before entering the Rio Grande. The waterway is perennial in the headwaters but is ephemeral for 11 miles as it flows out of the mountains and into the Rio Grande. Tijeras Arroyo is a major tributary of the Rio Grande in the Albuquerque area and carries stormwater, and any pollutants mobilized by stormwater, to the Rio Grande during significant rain events, but maybe not in a "typical year" as defined in the NWPR. It is the subject of (1) a Watershed Restoration Action Strategy under CWA Section 319 to address excess *E. coli* bacteria and sedimentation through stormwater management and erosion controls; (2) a Total Maximum Daily Load (TMDL) under CWA Section 303(d) to reduce watershed nutrient loading during both low-flow and high-flow events; and (3) federal permits including several CWA Section 404 permits, an individual CWA Section 402 NPDES permit for Kirtland Air Force Base, and the Municipal Separate Storm Sewer System (MS4) permit for the Albuquerque-Bernalillo County area under CWA Section 402. These various permits and requirements limit and/or monitor the discharge of the following pollutants into Tijeras Arroyo: nitrate-nitrogen, ammonia-nitrogen, total nitrogen, total phosphorus, *E. coli* bacteria, sediment, ethylene dibromide (EDB), heptachlor, per- and polyfluoroalkyl substances (PFAS), total residual chlorine, total suspended solids, biological oxygen demand, and oil and grease. In addition, the Rio Grande downstream of Tijeras Arroyo is impaired for *E. coli* bacteria, polychlorinated biphenyls (PCBs) in fish tissue, and dissolved oxygen. Tijeras Arroyo was jurisdictional under the 1980s regulations and the 2008 *Rapanos* Guidance but is not jurisdictional under the NWPR. Surface water quality is also a major concern for the two acequia associations in the Tijeras watershed and the Pueblo of Isleta, which is downstream of Tijeras Arroyo and the City of Albuquerque. Under the NWPR, these CWA protections (e.g., *E. coli* strategy, TMDL, NPDES permits) are not enforceable as is. Depending on how the NWPR is implemented, they will either be modified to move the point of discharge to a jurisdictional water and consequently change the limitations and requirements, or they will be terminated.

> **The Pecos River and Rio Ruidoso.** The Rio Hondo Watershed in south-central New Mexico is yet another example of the irreparable harm the NWPR will have on New Mexico. As the perennial headwaters of the Rio Ruidoso and Rio Bonito flow downstream, they become interrupted and eventually go underground along several ephemeral segments. Because the ephemeral segments are substantially long (over 50

miles), it is highly unlikely that the Rio Ruidoso, Rio Bonito or upstream portions of the Rio Hondo have a surface connection to the Pecos River (a jurisdictional water) in a "typical year." Therefore, everything upstream of these ephemeral breaks/segments is considered non-jurisdictional under the NWPR. In this watershed there are several facilities discharging to the river, including the Village of Ruidoso Regional Wastewater Treatment Plant and the Ruidoso Downs Race Track. The Rio Ruidoso already exceeds water quality standards for total nitrogen and total phosphorus, two pollutants that are currently controlled by NPDES permits. Historically, excess nitrogen and phosphorus have negatively impacted downstream irrigation uses, hurting family farms. Further, construction and industrial sites are no longer required to obtain NPDES permit coverage for their stormwater discharges. This means industrial facilities and construction sites could discharge pollutants into the river without consequence under federal law. Loss of federal pollution control for the Rio Ruidoso will result in polluted water conveyed to local farms via the 82 acequias, or community ditches, in this area. Acequias have important historical and cultural value in New Mexico, with many dating to the 17th and 18th Centuries, and provide essential water for agriculture. Public health and the environment are directly impacted by the NWPR and unregulated pollutant discharges in the Rio Hondo Watershed.

The Gila River. Another example of the NWPR's harm and regulatory uncertainty is the Gila River, which originates in the Nation's first designated wilderness area (the Gila National Wilderness) and is the last major wild and free-flowing river in New Mexico. The Gila River supports a remarkable abundance of aquatic life and wildlife, provides significant economic value to the region through plentiful outdoor recreation opportunities, and is culturally important to indigenous peoples whose ancestors have lived in southwestern New Mexico for thousands of years. Under prior definitions of WOTUS, the Gila River was covered by the CWA because it is an interstate water, flowing from New Mexico into Arizona. Some segments of the Gila River in Arizona have been designated as TNWs, while the Gila River in New Mexico is designated through an Approved Jurisdictional Determination through 2023. New Mexico's Gila River was named by American Rivers as the country's most endangered river in 2019 because of threats from water diversions and climate change.[3] The temporary designation of the Gila River in New Mexico creates uncertainty surrounding federal protection under the CWA that did not exist prior to the NWPR and results in a precarious future for this precious resource.

The NWPR will have a profoundly adverse effect on water quality in the State. More frequent droughts and shifting precipitation patterns due to climate change result in lower water levels in rivers, lakes, and streams, leaving less water to dilute pollutants. In addition, more frequent and more powerful storms increase polluted runoff from urban and disturbed areas, which transports pollutants from the landscape to nearby waterways. These changes stress aquatic ecosystems and dramatically impact communities throughout the United States, especially in the Southwest. Community impacts include threats to public health, economic strain, and decreased quality of

[3] See https://www.americanrivers.org/2019/04/americas-most-endangered-rivers-of-2019-spotlights-climate-change-threats/.

life. In short, our precious surface waters are more in need of protection than ever before. The effects of climate change in New Mexico amplify the complexities of western water management and contribute to greater regulatory uncertainty surrounding CWA jurisdiction under the NWPR, as discussed further below.

EXISTING STATE PROGRAMS CAN'T CLOSE THE FEDERAL REGULATORY GAP

A core argument by those in favor of the NWPR is that it "ensures that America's water protections – among the best in the world – remain strong, while giving our states and tribes the certainty to manage their waters in ways that best protect their natural resources and local economies."[4] However, this promise relies on a false premise that the roll-back of federal jurisdiction will not actually weaken water quality protections at the state, tribal and local level. In some parts of the country it may be true that states and tribes will pick-up where the CWA leaves off, utilizing existing authorities to close the regulatory gap and retain the critical water quality accomplishments of the past 50 years. Meanwhile, in New Mexico and a number of other states, as well as across tribal lands, it could take years and millions of unavailable, unappropriated dollars to prevent water quality and watershed degradation as the Agencies rush to implement the NWPR coast to coast.

Furthermore, the same federal agency leaders touting the rule as maintaining strong water protections in the U.S. are simultaneously touting the rule for "accelerat[ing] critical infrastructure projects," and "ensur[ing] that land use decisions are not improperly constrained."[5] These purported benefits are actually premised on an assumption that states and tribes will not close the regulatory gap. In other words, the federal agencies cannot take credit for ensuring ongoing strong protections while simultaneously celebrating the lack of those protections. Decisions by the EPA and the Army Corps of Engineers to begin implementing the narrow definition of WOTUS, regardless of a state's readiness to protect the excluded waters, further undermines the Agencies' assertions that the rule is intended to maintain strong water quality protections. In fact, the NWPR and its early implementation by the Agencies preclude ongoing protection of all surface waters in the State of New Mexico that were jurisdictional under prior WOTUS definitions.

New Mexico cannot, as a practical matter, immediately fill the burdensome federal regulatory gap created by the NWPR. New Mexico is one of only three states without NPDES authority, and the only such state in the arid west. The NPDES program is the primary mechanism under the CWA for regulating and limiting discharges of pollutants into the "waters of the United States." Developing, adopting and implementing such a program requires significant time, funding, and staff. Unlike most states with established NPDES programs, New Mexico does not have the legal and procedural program infrastructure to issue and enforce NPDES-like permits to regulate discharges of pollutants to surface waters of the state that are not WOTUS under the new definition. As laid out above, the Environment Department estimates that 50% of NPDES individual permits and 25-45% of stormwater general permits are no longer required, which could amount to hundreds of unregulated discharges and thousands of pounds of pollutants

[4] EPA Headquarters News Release (January 23, 2020), available at https://www.epa.gov/newsreleases/epa-and-army-deliver-president-trumps-promise-issue-navigable-waters-protection-rule-0.
[5] Id.

entering New Mexico's surface waters every year as a result of the NWPR federal rollback.

The NWPR imposes significant resource burdens on the Environment Department while putting the health of New Mexico waters and citizens at great risk. The premise that all states are capable of addressing water quality issues in their state is false. Not all states can implement a robust and successful water quality program without significant federal assistance. Recurring federal and state funds need to be identified to support a New Mexico surface water discharge permitting program because reasonable permit fees would not cover the costs of the program in New Mexico. To exacerbate this issue, federal financial support for water pollution control programs has been steadily declining over the past decade, making it more and more difficult to establish an effective and viable permitting program, to the detriment of New Mexico's precious surface waters. Many other states face challenges associated with existing laws that limit those states' ability to protect wetlands, streams and other water resources more broadly than federal law.[6]

A preliminary analysis performed this year by an Environment Department contractor indicates that establishing and operating a surface water discharge permitting program may cost New Mexico taxpayers, including working families and small businesses, as much as $15 million in the first year alone. For context, the current budget for all the Environment Department's surface water quality programs is approximately $6.5 million annually. Meanwhile, New Mexico, like many other states, faces a budget shortfall amid the current economic recession.

The NWPR introduces great uncertainty into the Environment Department's regulatory efforts and burdens the Environment Department with the onerous task of interpreting and applying the NWPR. When the NWPR became effective, previous guidance documents, memoranda, and materials were rendered inoperative. In addition, the Environment Department is unaware of a firm commitment by EPA and ACE to provide guidance and training to assist with early implementation of the NWPR. With no new federal or state funding associated with this substantial shift in CWA jurisdiction, any Environment Department involvement in NWPR implementation will strain available resources for other priorities and programs, such as ambient water quality monitoring, assessment and reporting on the status of the State's surface waters, water quality standards revisions, water quality management and watershed-based planning, watershed and wetland restoration, groundwater protection, and program and project effectiveness monitoring. For example, on-the-ground investigations are needed to delineate, for compliance and enforcement purposes, which waters are truly intermittent and which are ephemeral. Considering New Mexico has over 88,000 miles of non-perennial streams, and the vast majority of streams in the State do not have active gages to measure stream flows, these stream-specific investigations will be extremely resource-intensive. The Environment Department already has received inquiries from various stakeholders, including the regulated community, about scope and implementation of the NWPR that cannot be answered due to uncertainties related to jurisdictional interpretation and enforcement.

For decades the Environment Department has relied on close coordination with EPA and ACE on CWA permitting actions in furtherance of our mission to preserve, protect and improve

[6] *State Constraints: State-Imposed Limitations on the Authority of Agencies to Regulate Waters Beyond the Scope of the Federal Clean Water Act* (2013), available at https://www.eli.org/research-report/state-constraints-state-imposed-limitations-authority-agencies-regulate-waters.

surface water quality across our state. Simply put, there is no ready substitute under State laws and budgets to maintain the critical surface water protections achieved through CWA Section 402 and 404 permits. The decision of federal agencies to proceed with NWPR implementation without consideration of state and tribal coverage will allow hydrologically connected ephemeral tributaries to be permanently filled or degraded, to the detriment of the downstream jurisdictional waters the NWPR purports to protect.

POLLUTED WATERS HURT THE NEW MEXICO ECONOMY

The value of healthy surface waters in New Mexico is both cultural and economic. New Mexico's diverse waters recharge aquifers, support an amazing variety of wildlife and aquatic life, maintain drinking water resources for over 40 percent of the population, and sustain critical economic activity. The Environment Department is concerned about the economic costs associated with the regulatory vacuum created by the NWPR for the majority of New Mexico surface waters. Not only are polluted waters costly for drinking water utilities, farmers and the thriving tourism industry, we see implementation of the rule as creating new areas of regulatory uncertainty that will burden New Mexico businesses and communities.

The regulatory gaps created by the ephemeral waters exemption and loss of wetlands protections resulting from the NWPR will result in decreased water quality, as explained above. As a result, the cost to treat drinking water and maintain drinking water infrastructure will increase. The cost to treat surface water to drinking water standards depends on the quality of water coming into the treatment plant, the technologies used, the size of the system, and the energy source. Municipalities will likely need to invest in water treatment infrastructure and other costly technologies, such as desalination and ultrafiltration, to provide clean, safe water for drinking. Degraded water quality coming into the treatment plant, the need for improved and more costly treatment technologies and the less populated, rural nature of New Mexico as a whole will cause water treatment costs to increase substantially for many in the state and may force municipalities to choose lower water quality over necessary investments for clean and safe drinking water. In addition, enhanced treatment to remove pollutants causes increased water loss during treatment, which translates to less potable water in an increasingly arid State.

Outdoor recreation is among New Mexico's largest economic sectors, representing the lifeblood of communities across the state and providing livelihoods for tens of thousands of New Mexicans. More than twice as many jobs in New Mexico depend on outdoor recreation than on the energy and mining sectors combined. The NWPR does not take into account the recreational economy impacts associated with poorer water quality. In addition to tourism dollars spent by New Mexicans in New Mexico, the Tourism Department reports that the State also has a high percentage of out-of-state visitors who come to New Mexico for outdoor recreation activities, such as river rafting, fly fishing, camping, boating and wildlife viewing along the State's scenic waters. Visitors spent $846 million on recreation in the State in 2017, supporting 13,000 direct jobs. In addition, the New Mexico Department of Game and Fish reports there are 160,000 anglers who fish in New Mexico, spending $268 million on their activities annually. The New Mexico Outdoor Recreation Division, created by legislation in 2019, is tasked with increasing outdoor recreation-based economic development, tourism and ecotourism, recruiting new outdoor recreation business to New Mexico, and promoting education about outdoor recreation's benefits to enhance public health. People do not want to recreate on polluted waters that cannot

sustain healthy fish, bird and wildlife populations. The outdoor recreation industry in New Mexico will be adversely impacted by the regulatory gap created by the NWPR, to the detriment of jobs and revenue in New Mexico.

Agriculture is part of New Mexico's cultural and economic identity. We are the top state in the country in chile production, third in pecans and in the top 10 for number of dairy cows. According to the New Mexico Economic Development Department, there are 24,800 farms in the State and agriculture and food products are among the State's top five exports.[7] As a rural state with a poverty rate nearly twice the national average, many family farms grow crops and raise livestock for their own families and neighbors, as well as to contribute to the local economy. The Environment Department's surface water quality programs are designed and implemented to identify waters used for irrigation/irrigation storage and livestock watering and to then take actions to protect and restore those waters to support that use. Based on the scope of the NWPR and New Mexico's inability to close the regulatory gap, waters that farmers rely on to irrigate crops and water livestock to feed New Mexicans and export to other states and nations will be vulnerable to increased pollutant loads from dischargers and detrimental impacts from dredge and fill activities.

To represent benefit-cost analyses of the NWPR, EPA and ACE relied on three case studies in the supporting Economic Analysis, "to explore potential changes and resulting forgone benefits and avoided costs."[8] The case studies focused on three geographical regions – the Ohio River Basin, the Lower Missouri River Basin, and the Rio Grande River [sic] Basin – that intersect 10 states. The Rio Grande River Basin was divided into two major watersheds, the Upper Pecos (HUC 1306) and Lower Pecos (HUC 1307) River Basins, which contain a combined 44,300 square miles in New Mexico and Texas from east of Santa Fe, New Mexico to the confluence of the Pecos River and Rio Grande at the Texas-Mexico border. This case study found 85% of stream miles within the Upper Pecos River Basin in New Mexico are ephemeral, and 34% of all wetland acres to be "non-abutting" wetlands. These ephemeral waters and non-abutting wetlands in the Upper Pecos River Basin are clearly not federally protected under the NWPR, whereas many other waters in the Upper Pecos River Basin *may* no longer be protected under the NWPR because they likely do not contribute surface flow to a downstream jurisdictional water in a "typical year." The cost analysis for the Rio Grande/Pecos River case study shows benefits of the NWPR to be minimal or negligible; however, the Agencies did not quantify or monetize the environmental effects and forgone benefits of the NWPR for this case study, blaming this deficiency on limitations in the data. Again, the Agencies chose to ignore their own research and data by disregarding the 2015 *Economic Analysis of the EPA-Army Clean Water Rule,* which monetized the ecosystem services and benefits from wetlands.[9] In fact, the estimation of nonmarket environmental values is not new – one notable example is compensation for the 1989 Exxon Valdez oil spill in the Gulf of Alaska. It is well known that wetlands provide many ecological and economic benefits to watersheds, such as filtering and improving water quality,

[7] See https://gonm.biz/uploads/documents/publications/AgricultureWEB.pdf.
[8] *Economic Analysis for the Navigable Waters Protection Rule: Definition of "Waters of the United States."* U.S. Environmental Protection Agency and U.S. Department of the Army (January 22, 2020).
[9] *Economic Analysis of the EPA-Army Clean Water Rule.* U.S. Environmental Protection Agency and U.S. Department of the Army (May 20, 2015), available at https://www.epa.gov/sites/production/files/2015-06/documents/508-final_clean_water_rule_economic_analysis_5-20-15.pdf.

flood attenuation, erosion control, carbon sequestration, aquifer recharge, and providing fish and wildlife habitat and nurseries.[10] It is also known that ephemeral waters are ecologically and hydrologically significant in arid and semi-arid watersheds of the southwestern United States, and transport nutrients and sediment to downstream ecosystems, provide habitat for wildlife, and recharge aquifers used for drinking water.[11] The NWPR fails to account for the economic costs of degraded ephemeral streams and unprotected wetlands.

Beyond these intersections between New Mexico's economic engines and clean water, I will provide a few examples of why grandiose claims of an era of regulatory certainty made possible by the NWPR are false. First, the NWPR significantly changes the national regulatory landscape, cutting away at the CWA authors' goal of establishing a level playing field to regulate discharges from state to state. In our 21st Century economy, hundreds of businesses that operate in multiple states will have the added burden of navigating state surface water regulatory regimes that once shared a common baseline through CWA program implementation.

Another area of regulatory uncertainty is the reliance in the NWPR on determining whether waterbodies are perennial or intermittent in a "typical year." A lack of connectivity or perenniality today or in a "typical year" is not a suitable feature that EPA, ACE and New Mexico can rely upon to define a jurisdictional water. Under the NWPR, ephemeral waters, such as the Santa Fe River, Rio Hondo, Jemez River, Rio Puerco, Tijeras Arroyo, and Rio Grande tributaries on the Pajarito Plateau (which contain legacy contamination from the Manhattan Project), will have severed and interrupted jurisdiction in the middle and lower reaches. This creates a patchwork of jurisdictional and non-jurisdictional segments along the path of a river that make it nearly impossible to implement an effective water quality protection program, and likewise make it difficult for the regulated community to be certain of what is required of them.

Finally, the Agencies failed to address cross-media implications of the NWPR, thereby adding regulatory uncertainty for municipalities and businesses. The federal Resource Conservation and Recovery Act (RCRA) exempts wastewater treatment units from regulation under RCRA if, in addition to a number of other conditions, those units discharge effluent pursuant to an NPDES permit.[12] Under the NWPR in New Mexico, many facilities currently discharging pursuant to an NPDES permit are no longer required to have such a permit due to changed jurisdictional status of the receiving waterbody. As a result, these facilities may be subject to regulation under RCRA for the first time, are likely to not have performed an analysis of whether they are subject to RCRA and will likely be operating in violation of RCRA requirements as a result. Given that a number of these facilities are industrial or municipal facilities that have not contemplated regulation as a RCRA treatment, storage or disposal facility (TSDF), this will present an additional economic hardship on these facilities in New Mexico. If the industrial or municipal facilities discharging to an ephemeral stream lose NPDES permit coverage, these newly regulated TSDFs may also be deemed as land disposing of waste – or hazardous waste – as an implication of WOTUS.

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[10] See https://www.epa.gov/sites/production/files/2016-02/documents/wetlandfunctionsvalues.pdf.
[11] Levick, L., et al. 2008. The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest. U.S. Environmental Protection Agency and USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/233046, 116 pp.
[12] 42 U.S.C. § 6903(27).

CONCLUSION

Enactment of the CWA is one of our nation's great successes. Waters that fifty years ago were thick with pollutants from point and nonpoint sources now support thriving recreational and economic activities and improved ecological conditions for aquatic species and wildlife. Our quality of life has improved as a result.

I appreciate the opportunity today to provide the New Mexico Environment Department's reaction to the NWPR. As illustrated by all of the evidence above, our reaction, in short, is that we now face a perfect storm of water quality devastation and economic harm from the rule itself and its rushed and reckless implementation by EPA and ACE, which precludes any opportunity for New Mexico to cover the regulatory gap before irreversible degradation unfolds.

PETITIONERS' EXHIBIT

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United States Environmental Protection Agency

The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest

RESEARCH AND DEVELOPMENT

EPA/600/R-08/134
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The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest

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Abstract

This report represents a state-of-the-art synthesis of current knowledge of the ecology and hydrology of ephemeral (dry washes) and intermittent streams in the American Southwest, and may have important bearing on establishing nexus to traditional navigable waters (TNW) and defining connectivity relative to the Clean Water Act. Ephemeral and intermittent streams make up approximately 59% of all streams in the United States (excluding Alaska), and over 81% in the arid and semi-arid Southwest (Arizona, New Mexico, Nevada, Utah, Colorado and California) according to the U.S. Geological Survey National Hydrography Dataset. They are often the headwaters or major tributaries of perennial streams in the Southwest. This comprehensive review of the present scientific understanding of the ecology and hydrology of ephemeral and intermittent streams will help place them in a watershed context, thereby highlighting their importance in maintaining water quality, overall watershed function or health, and provisioning of the essential human and biological requirements of clean water. Ephemeral and intermittent streams provide the same ecological and hydrological functions as perennial streams by moving water, nutrients, and sediment throughout the watershed. When functioning properly, these streams provide landscape hydrologic connections; stream energy dissipation during high-water flows to reduce erosion and improve water quality; surface and subsurface water storage and exchange; ground-water recharge and discharge; sediment transport, storage, and deposition to aid in floodplain maintenance and development; nutrient storage and cycling; wildlife habitat and migration corridors; support for vegetation communities to help stabilize stream banks and provide wildlife services; and water supply and water-quality filtering. They provide a wide array of ecological functions including forage, cover, nesting, and movement corridors for wildlife. Because of the relatively higher moisture content in arid and semi-arid region streams, vegetation and wildlife abundance and diversity in and near them is proportionally higher than in the surrounding uplands. In the rapidly developing southwest, land management decisions must employ a watershed-scale approach that addresses overall watershed function and water quality. Ephemeral and intermittent stream systems comprise a large portion of southwestern watersheds, and contribute to the hydrological, biogeochemical, and ecological health of a watershed. Given their importance and vast extent, it is concluded that an individual ephemeral or intermittent stream segment should not be examined in isolation. Consideration of the cumulative impacts from anthropogenic uses on these streams is critical in watershed-based assessments and land management decisions to maintain overall watershed health and water quality.

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1. Introduction

This report addresses the hydrological and ecological significance of ephemeral and intermittent streams in the arid and semi-arid Southwestern United States (U.S.) for the purpose of illustrating their connection and value to perennial stream systems and other "waters of the United States" as protected under the Federal Water Pollution Control Act, otherwise known as the Clean Water Act (CWA). The CWA was established to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Its goal is to prevent pollution of waters of the U.S., and to ensure that our citizens have safe, clean water. Although originally enacted in 1948, the act was revised and expanded in 1972, with nearly annual amendments since then.

In recent years, there have been numerous discussions as to whether ephemeral and intermittent streams are "waters of the United States" under the Act, and if the act applies to those streams. From 33CFR, Part 328.3, the definition of "waters of the United States," as it applies to the jurisdictional limits of the authority of the Corps of Engineers under the CWA, includes (in part):

> (1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
>
> (2) All interstate waters including interstate wetlands;
>
> (3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
>
> > (i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
> > (ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
> > (iii) Which are used or could be used for industrial purposes by industries in interstate commerce;
>
> (4) All impoundments of waters otherwise defined as waters of the United States under this definition;
>
> (5) Tributaries of waters identified in paragraph (s) (1) through (4) of this section (from http://www.usace.army.mil/cw/cecwo/reg/33cfr328.htm).

This definition specifically includes intermittent streams (paragraph 3), and tributaries of any waters identified in the definition (paragraph 5). From these definitions ephemeral and intermittent streams appear to qualify for protection under the CWA; however, there have been some recent court cases that have complicated interpretation of this law. Nadeau and Rains (2007) discussed the Supreme Court decisions of June 2006, concerning the determination of jurisdiction under the CWA, and the implication that non-navigable, isolated, intrastate waters need a "significant nexus" to navigable waters to be jurisdictional under the CWA (see also Leibowitz et al., 2008). Although "significant nexus" has not been defined, the goal of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 U.S.C. 1251). Nadeau and Rains (2007) therefore, consider a "significant nexus" to exist if a headwater stream contributes to the chemical, physical, or biological integrity of navigable water.

Ephemeral and intermittent streams are the defining characteristic of many watersheds in dry, arid and semi-arid regions, and serve a critical role in the protection and maintenance of water resources, human health, and the environment. This report is a compilation of information that describes the significance of ephemeral and intermittent streams to the hydrology, biogeochemistry, flora and fauna of arid and semi-arid region watersheds. This comprehensive review of the present scientific understanding of the ecology and hydrology of ephemeral and intermittent streams will help place them in a watershed context, thereby highlighting their importance in maintaining water quality, overall watershed health, and provisioning of the essential human and biological requirements of clean water. Individual ephemeral or intermittent stream segments should not be examined in isolation. Given their vast extent and the accumulation of impacts to them over large areas in the rapidly developing southwest, a landscape or watershed-scale approach should be employed that considers the cumulative effects on overall watershed function.

The geographic scope of this report is the arid and semi-arid regions of the conterminous U.S. as defined by the Bailey's and EPA/Omernik ecoregion classifications (see Figures 7 and 8), but focuses on the states of California, Arizona, Nevada, New Mexico, Utah and Colorado. The application of this report is for the EPA Region 9 states of Arizona, California and Nevada. This report does not address management, policy, or regulatory issues.

2. Location of Ephemeral and Intermittent Streams

Ephemeral and intermittent streams are found across the Earth's land surface in arid and semi-arid regions that are commonly referred to as "drylands." Approximately one-third of the Earth's land surfaces are classified as arid or semi-arid (Whitford, 2002; Millennium Ecosystem Assessment, 2005a), including most of the Western U.S. (Figure 1).

These lands are characterized by low and highly variable annual precipitation, where evapotranspiration exceeds precipitation. It is because of these dry conditions, which result in great contrast between the moist riparian areas and adjacent dry upland communities, that arid and semi-arid region streams are so important. Riparian ecosystems occupy very small portions of the landscape in arid and semi-arid regions, yet they exert substantial influence on

hydrologic, geomorphic, and ecological processes (Shaw and Cooper, 2008), and typically support the great majority of biodiversity in these regions.

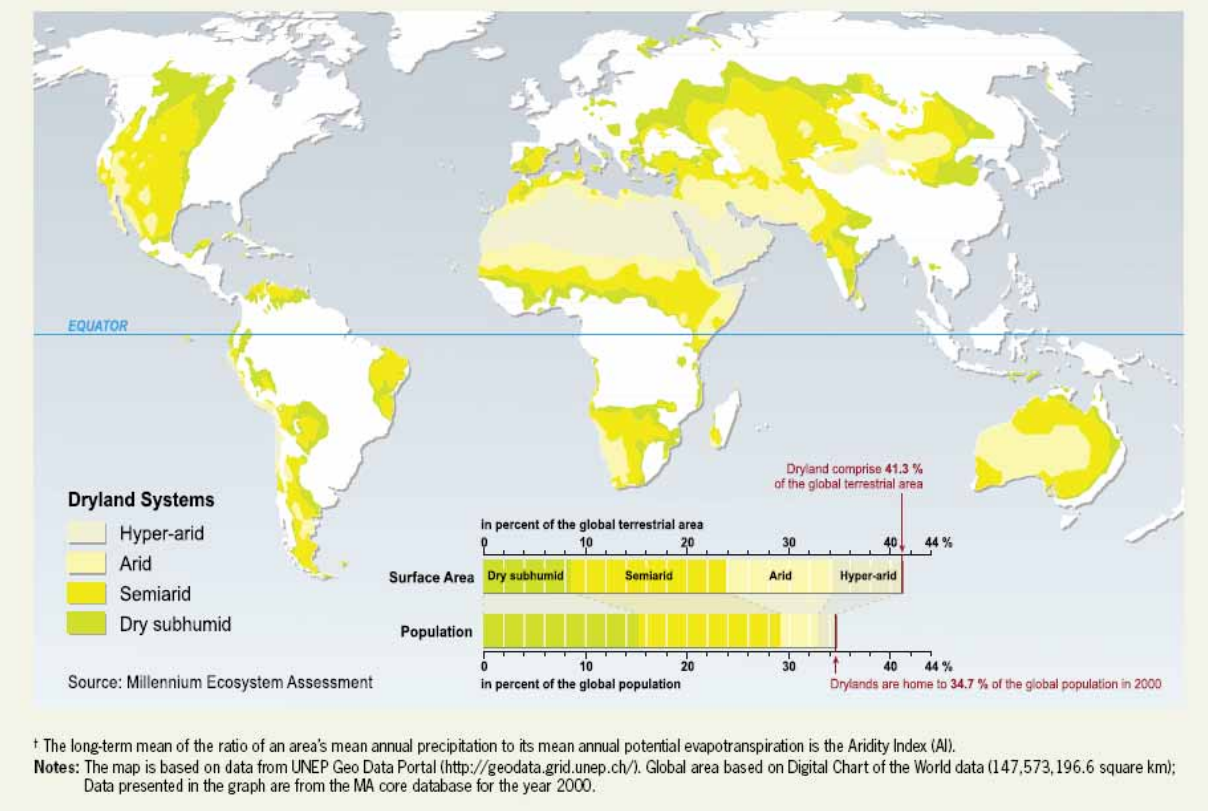

Figure 1. Illustration of the locations of present day drylands and their categories. (Millennium Ecosystem Assessment, 2005a)

Some southwestern landscapes confound typical notions of where water is to be found. The recent CWA discussions generally assume that perennial streams receive water from ephemeral tributaries. But, a person dying of thirst in the Cabeza Prieta National Wildlife Refuge in southwestern Arizona will find surface water in the mountains, not in the valley floor streams. In the San Pedro Valley of southeastern Arizona, perennial and intermittent stream reaches commonly are found in the tributaries, as well as along the main stem San Pedro River (Figure 2). In the Mojave Desert of southern California, some mountain streams are physically isolated from downstream hydrologic systems. Water from these mountain streams takes hundreds or thousands of years to move into and through the regional aquifer and discharge into valley floor streams, springs and wetlands (Izbicki, 2007).

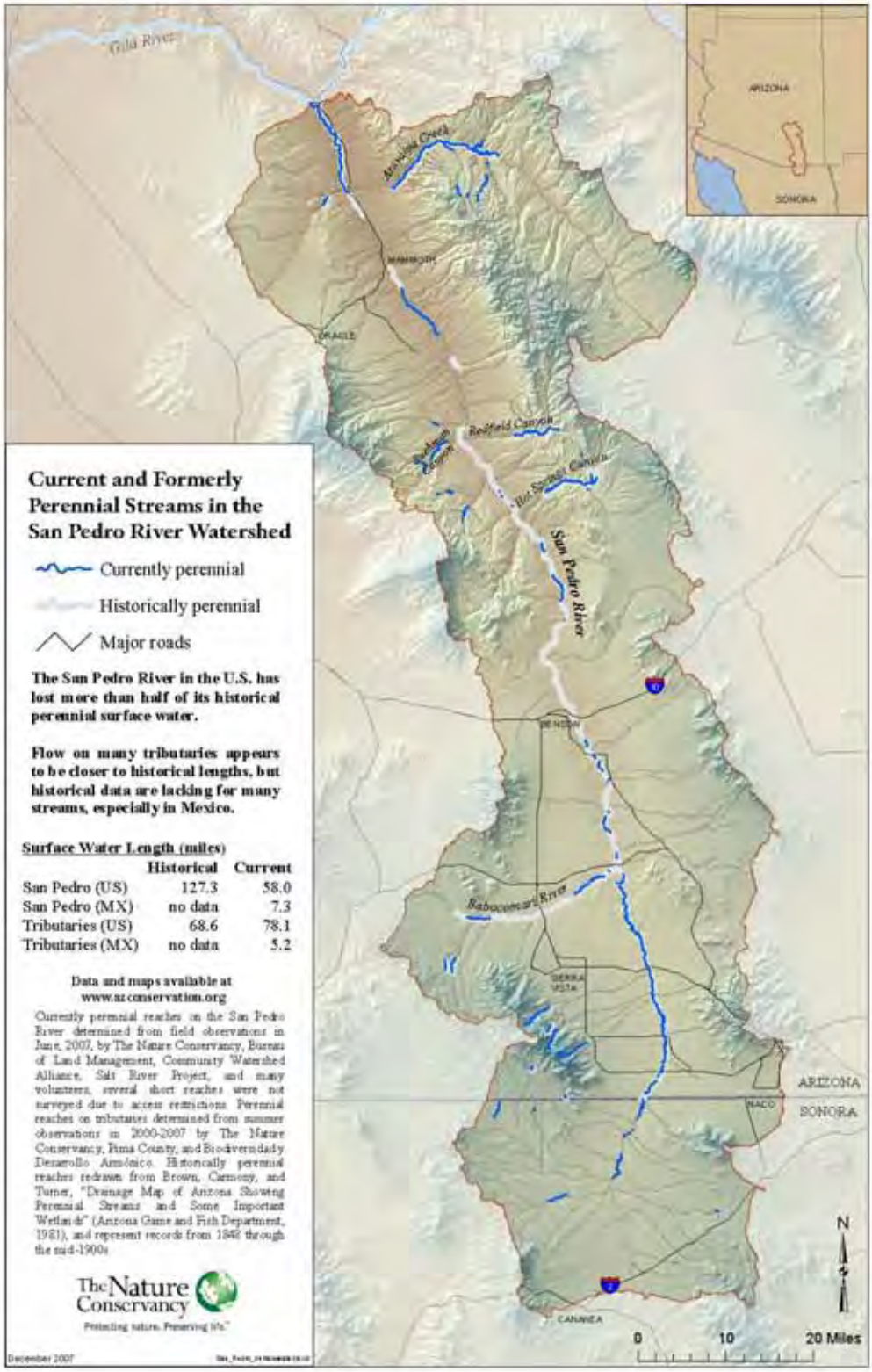

Figure 2. Map showing the San Pedro River Watershed's current and historical perennial reaches (courtesy of The Nature Conservancy, Arizona).

The U.S. EPA, using the National Hydrography Dataset (NHD) (USGS, 2006), has estimated that 59 percent of the streams in the U.S. (excluding Alaska) are ephemeral or intermittent (U.S. EPA, 2005). The NHD combines ephemeral and intermittent streams in its mapping, and identifies them as streams, which contain water for only part of the year. The NHD also identifies start reaches as those that have no other streams flowing into them (at the 1:100,000 scale). These reaches can thus be considered headwater or first-order streams (Nadeau and Rains, 2007).

Among the six states being addressed in this report, Arizona has the greatest percentage, 94 percent, of ephemeral and intermittent streams, whereas California has the least, 66 percent. However, it is not just states in the arid Southwest that contain high percentages of non-perennial streams. For example, 86 percent of South Dakota's streams are ephemeral or intermittent, 81 percent in Kansas, and 84 percent in North Dakota. The percentages of ephemeral/intermittent streams from the NHD for the six Southwestern states that are the subjects of this report are tabulated in Figure 3, and are illustrated using the NHD stream map (National Hydrography Dataset, http://nhd.usgs.gov/).

Arizona	94%
Nevada	89%
New Mexico	88%
Utah	79%
Colorado	68%
California	66%

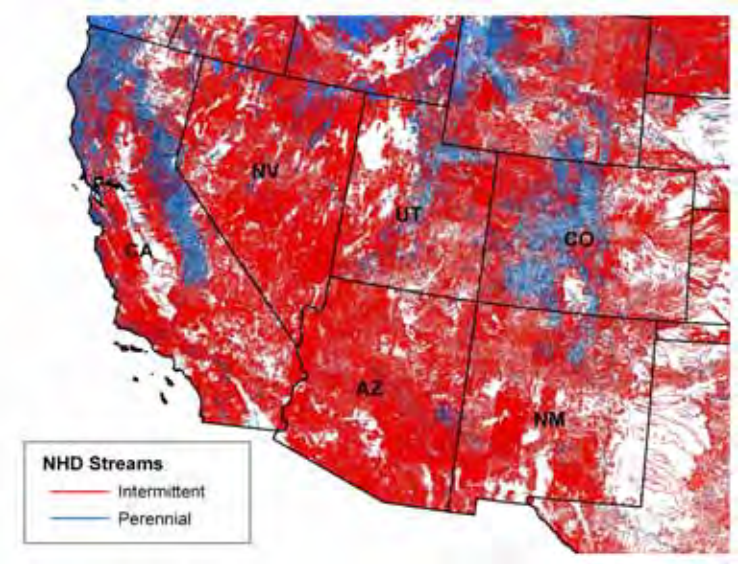

Figure 3. Map of the Southwestern U.S. showing the National Hydrography Dataset (NHD) intermittent/ephemeral (red) and perennial (blue) streams.

It should be noted that the NHD may not accurately reflect the total extent of ephemeral or intermittent streams; it does not include stream segments less than one mile in length, combines intermittent and ephemeral streams, and is based on 1:100,000 scale topographic maps. Washes (dry streambeds that contain water only during or after a local rainstorm or heavy snowmelt) in the arid Southwest are not consistently demarcated. The NHD dataset contains information on naturally occurring and constructed bodies of water, paths through which water flows, and related entities (USGS, 2006), and calculates the percent of streams that are ephemeral or intermittent relative to total stream length using total kilometers of linear streams in watersheds that are totally or partially contained within each state boundary. Watersheds are at the 8-digit Hydrologic Unit Code (HUC) level (U.S. EPA, 2005).

3. Definitions

In humid parts of the world, where precipitation exceeds evapotranspiration, water is plentiful, and rivers will typically flow ceaselessly except in times of exceptional drought or human diversion. In arid and semi-arid regions, flows have a beginning and an ending in time and space, and there are various classification systems for categorizing the permanency of stream flows, or hydrologic continuum.

For this report, we classify streams by the following definitions:

Ephemeral: A stream or portion of a stream which flows briefly in direct response to precipitation in the immediate vicinity, and whose channel is at all times above the ground-water reservoir.

Intermittent: A stream where portions flow continuously only at certain times of the year, for example when it receives water from a spring, ground-water source or from a surface source, such as melting snow (i.e. seasonal). At low flow there may be dry segments alternating with flowing segments.

Perennial: A stream or portion of a stream that flows year-round, is considered a permanent stream, and for which baseflow is maintained by ground-water discharge to the streambed due to the ground-water elevation adjacent to the stream typically being higher than the elevation of the streambed.

Headwater: The low order, small stream at the top of a watershed, when viewed at the 1:100,000 map or image scale; may be perennial, intermittent, or ephemeral (Nadeau and Rains, 2007).

In addition, for this report we clarify the definition of *Riparian area* or *riparian zone* as: the strip of vegetation along an ephemeral, intermittent, or perennial stream, which is of distinct composition and density from the surrounding uplands (see Section 5.d.i Plant physiognomy, density and species composition for further discussion).

Many seemingly perennial reaches of a stream are separated by ephemeral or intermittent segments of flow, as a result of differences in geology along the river. This variation of flow is common enough in the Southwest that hydrologists use the terms *interrupted* or *spatially intermittent* to describe the spatial segmentation of a river into reaches that are ephemeral, intermittent, or perennial.

The active channel of a desert stream is defined by the *hyporheic zone,* the zone between the surface stream and alluvial ground water, and the *parafluvial zone,* the part of the active channel without surface water (Figure 4). A desert stream ecosystem is composed of four interacting subsystems: the riparian zone, the surface stream, the hyporheic and the parafluvial zones (Holmes et al., 1994). Stream ecologists are becoming increasingly aware of the importance of what happens below the channel bed (Boulton et al., 1998) and in these interacting zones (Holmes et al. 1994).

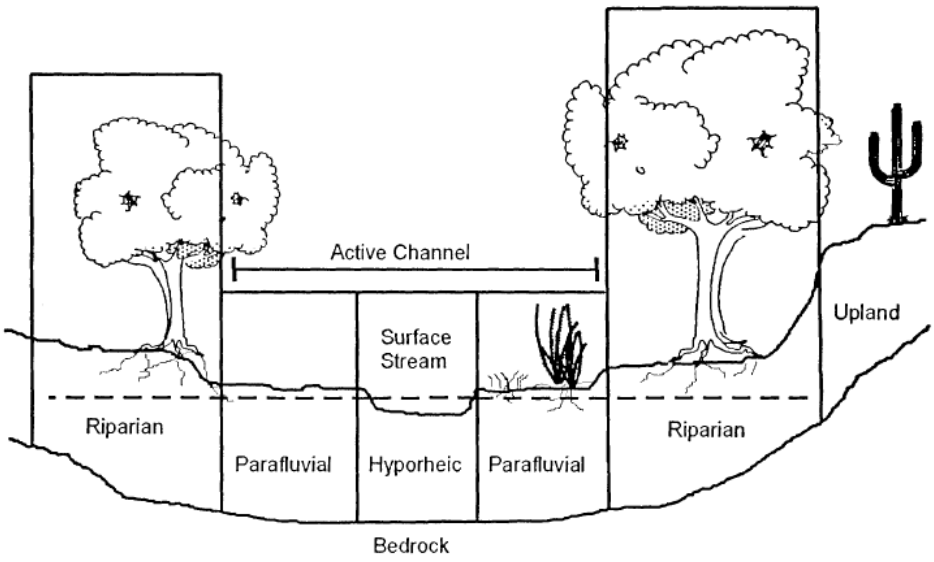

Figure 4. Diagram of the four interacting zones of a desert stream ecosystem: the surface stream, hyporheic, parafluvial and riparian zones (from Holmes et al. 1994).

The hyporheic zone is important to the physical, chemical, and biological integrity of the above-ground portion of the stream. A stream reach that lacks water at all times on the surface may continue to have a thriving hyporheic zone. Water in the hyporheic zone may be discharged into perennial or intermittent reaches of flow downstream. During hyporheic flow, ground water and stream water mix in the beds and banks of ephemeral, intermittent, and perennial streams and sometimes in a larger region surrounding the stream channel. In these zones, there is substantial biogeochemical cycling of nutrients and trace elements that are essential to aquatic life (Valett et al., 1994; Boulton et al., 1998; Hibbs, 2008). The parafluvial zone can be extensive in some systems, and the potential for surface-subsurface exchange is high; however, less is known about these processes than in the hyporheic zone (Holmes et al., 1994).

4. The Watershed Context

Watersheds gradually are becoming regarded as the most appropriate spatial unit for land management, and especially for water-resource management. Managing from a watershed context is more effective than focusing on a specific site, such as an individual ephemeral or intermittent stream segment, because actions by humans, wildlife, and nature can have widespread effects, crossing political boundaries and impacting downstream water quality and ecosystem health. The accumulation of impacts over large areas in the rapidly developing southwest suggests a landscape or watershed-scale approach that considers the cumulative effects on overall watershed function.

Ephemeral and intermittent stream channels are often but not always the smallest channels in the watershed, and often represent the headwaters of a stream. Given their large extent, these streams are important sources of sediment, water, nutrients, seeds, and organic matter for

downstream systems and provide habitat for many species (Gomi et al., 2002) and their inclusion is important in watershed-based assessments (Gandolfi and Bischetti, 1997; Miller et al., 1999b).

An understanding of the key ecological and hydrological functions that watersheds perform is required for effective land and water quality management. These watershed functions, outlined by Black (1997), include:

(1) the collection of water from rainfall, snowmelt, and storage that becomes runoff,
(2) the storage of various amounts of water and sediment,
(3) the discharge of water as runoff, and the transport of sediment,
(4) providing diverse sites and pathways along which chemical reactions take place, and
(5) providing habitat for flora and fauna.

The two integrative watershed responses to these five functions are hydrologic energy attenuation, and the regulated movement or flushing of water through the system which controls the movement of chemicals. Depending on the flow regime, the movement of water affects the concentration or load of materials in suspension or solution in the aquatic environment. Black (1997) referred to this link between hydrology and water quality to demonstrate the importance of considering the entire watershed in the protection of water resources.

Miller (2005) discussed the connectivity of ecosystems in a landscape, and the importance of managing at that scale, noting how the condition of one part of a landscape can affect other portions. Figure 5 illustrates how ecosystem processes, organisms, resources, and disturbances interact across a landscape. In arid and semi-arid regions, ephemeral and intermittent streams provide much of the ecological and hydrological connectivity in a landscape. Although lacking perennial flow, they may constitute a large percentage of the stream network in a watershed, and are connected to the larger stream system.

The disturbance or loss of ephemeral and intermittent streams has dramatic physical, biological, and chemical impacts, which are evident from the uplands to the riparian areas and stream courses of the watershed. Barnett et al. (2002) noted that the condition of upland areas is integral to hydrologic function. The amount of precipitation which immediately runs off the land surface, and that which infiltrates into the soil to either be used for plant growth or to recharge ground water, is dependent on this critical interface. For example, when precipitation falls on the land its fate is affected by the soil and vegetation, which in turn are affected by land uses, both historical and current.

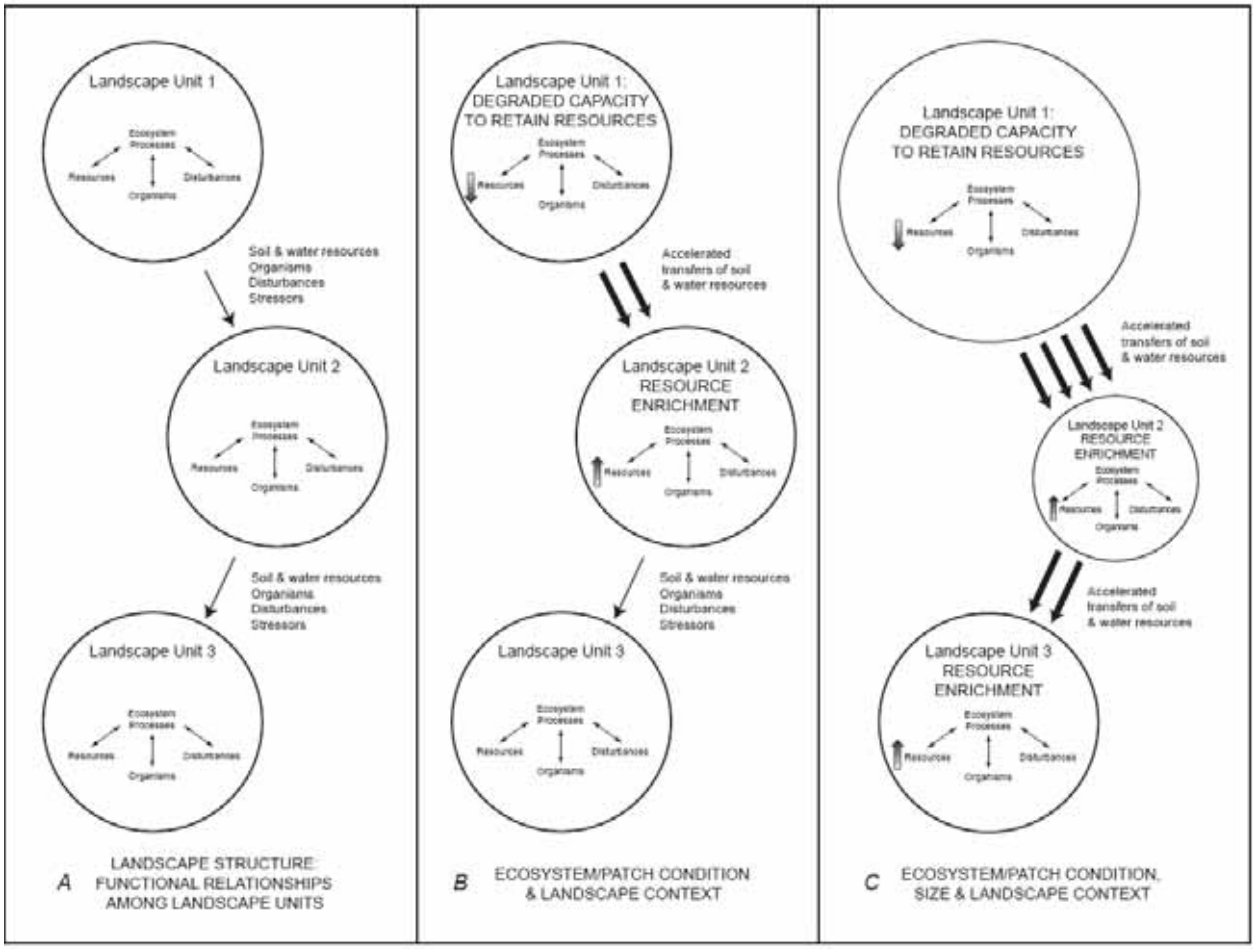

Figure 5. Diagram showing connectivity of landscape-level processes and attributes important for ecosystem monitoring (from Miller, 2005). In box *A*, landscape units are functionally connected by flows of soil and water resources, organisms, disturbances, and stressors. In box *B*, degraded conditions in Unit 1 are shown to cause resource enrichment in Unit 2, illustrating the importance of landscape context. In box *C*, degraded conditions in Unit 1 are propagated to Unit 3 due to increased size of Unit 1 and decreased size of Unit 2.

5. Characteristics, Functions, and Ecosystem Significance

Ephemeral and intermittent streams in arid and semi-arid regions have distinctly different characteristics from perennial streams that are in wetter, more humid (mesic to hydric) environments. These complex systems have developed in a climatic regime of wide fluctuations of precipitation, ranging from drought to flood. Anthropogenic uses, such as urbanization, superimposed on that climatic regime can exacerbate or ameliorate their effects on soils and vegetation, and may affect hydrologic and ecological functions throughout the watershed. Stability and resiliency to disturbance are important for ecological integrity, but because of the deficiency of water, terrestrial arid and semi-arid region ecosystems do not recover quickly from human-imposed disturbance, although desert streams recover more quickly than the uplands.

While hydrologists generally reject the popular concept of an "underground river," the sediment below the channel does convey water. For some streams, in current climatic regimes, there may not be a perennial or intermittent reach, but water may always be present below the ground and accessible to a rich assemblage of plant and animal life. This is illustrated in Figure 6, the San Pedro River, Arizona, an intermittent stream, bordered by a ground-water-dependent cottonwood forest.

Figure 6. Photograph showing ground-water dependent cottonwood trees (*Populus fremontii*) lining an intermittent stream.

Ephemeral or intermittent stream reaches can be headwater reaches or the main stem. Some watersheds consist of only ephemeral or intermittent streams. Generally, these systems occur in arid and semi-arid regions, and their locations can be described using climatic factors, latitude, continental position, and elevation. These features combine to form the world's ecoclimatic zones, which are referred to as an ecosystem region or ecoregion.

The classification of ecoregions provides a method of characterizing the ecological areas of the U.S., and allows for the rich mosaic of environmental conditions to be placed in context with one another, enabling their connections to be better understood. Ecoregion classifications indicate areas of similar environmental characteristics, which can serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and ecosystem components, and can help us to understand the ecosystems in which ephemeral and intermittent streams occur. This is useful for proper understanding and management of our environmental resources, including water (Commission for Environmental Cooperation, 1997).

Both Bailey's Ecoregions (Bailey, 1976) and the EPA Ecological Regions of North America (Commission for Environmental Cooperation, 1997), based on Omernik and others, place the

Southwestern states mainly in dry, desert, or semi-arid classifications. The essential feature of these classifications is that annual losses of water through evaporation at the earth's surface exceed annual water gains from precipitation.

Bailey's Ecoregion classification is based largely on forest and climatic factors. This classification system designates four domains: polar, humid temperate, humid tropical, and dry. The first three are based on humidity and thermal characteristics; however, the fourth, the dry domain, is based solely on moisture, and is defined as those locations where annual losses of water through evaporation at the earth's surface exceed annual water gains from precipitation. Five of the six states considered in this report lie wholly within the dry domain: Arizona, Nevada, Colorado, Utah, and New Mexico. The deserts of Southern California are also within the dry domain, whereas the rest of the state is within the humid temperate domain (Figure 7). The dry domain includes the arid desert and the semi-arid steppe, and represents seven Divisions encompassing a wide diversity in terrain, vegetation structure and composition, climatic regime, hydrologic regime, and ecosystem function. However, the dominant characteristics are variable rainfall and high evapotranspiration.

The EPA Ecological Regions Classification is based on Omernik, who was one of the first to take a more holistic approach by including physical and biotic characteristics (Commission for Environmental Cooperation, 1997). This classification defines four levels of ecological regions that represent increasingly detailed local characteristics. Level II, which is most similar to Bailey's Divisions, is illustrated in Figure 8. Most of the Southwestern states fall into the warm or cold desert ecoregion, the southern semi-arid highlands, or temperate sierras. These areas are described as having an arid to semi-arid climate, with marked seasonal temperature extremes. This aridity is the result of the rain shadows of the Sierra Nevada, Cascade Mountains and Sierra Madre ranges as they intercept the wet winter air masses brought by the westerly and easterly winds.

Both the Bailey's and EPA Ecoregion classifications illustrate the extent of arid and semi-arid regions in the Southwestern U.S. and provide a framework for understanding the unique conditions found in this region where most watersheds are dominated by ephemeral and intermittent streams.

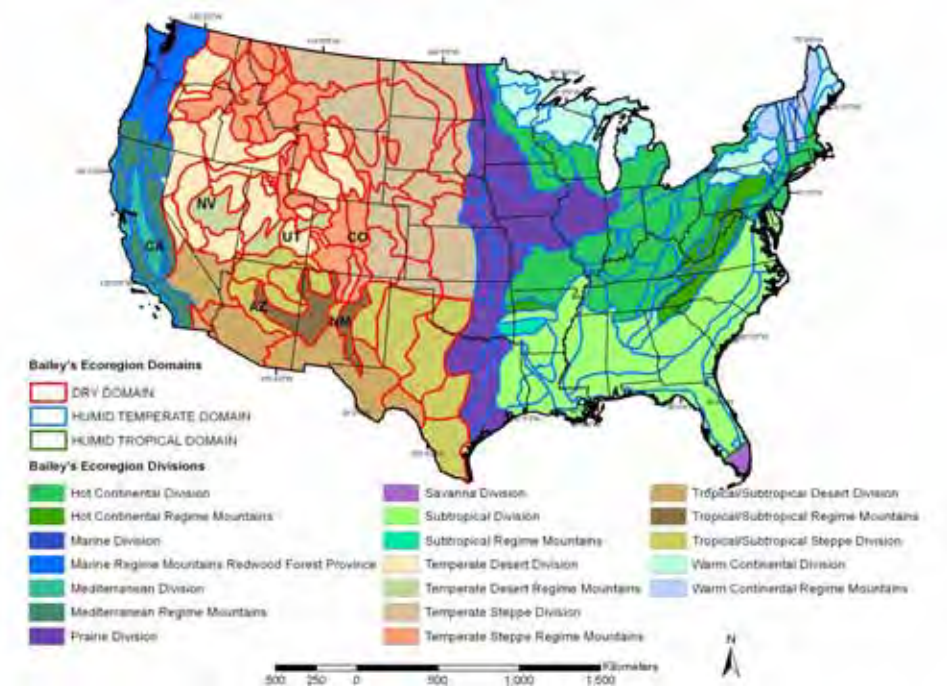

Figure 7. Map of the conterminous U.S. showing Bailey's Ecoregions with the dry domain outlined in red.

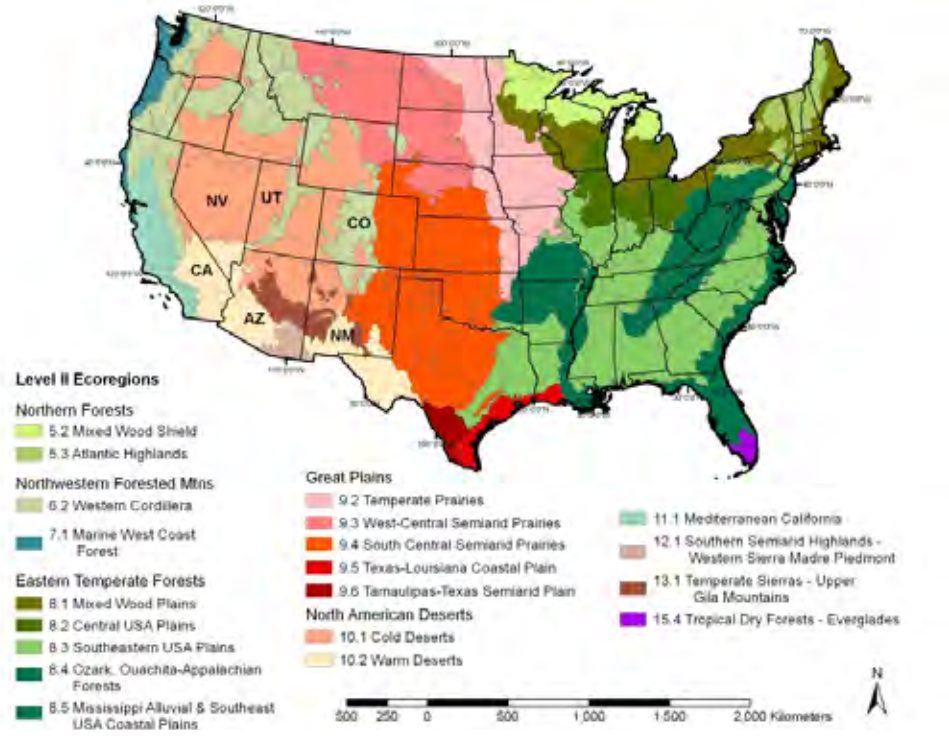

Figure 8. Map of the conterminous U.S. with EPA Level II Ecoregions showing most of Nevada, Arizona, Utah, and New Mexico in the North American Deserts classification.

a. Hydrologic Features

Ephemeral streams are unique in that they lack permanent flow except in response to rainfall events. Intermittent streams flow continuously only in places where it receives water from a ground-water source or from seasonal runoff. Nevertheless, they perform the same critical hydrologic functions as perennial streams: they move water, sediment, nutrients, and debris through the stream network and provide connectivity within the watershed. These streams experience extreme and rapid variations in flood regime (Figure 9), and as a consequence rarely reach process-form equilibrium where flow conditions change too rapidly for bedforms to develop a form matching that flow, so sedimentary structures can give a misleading picture of the flow that occurred (North, 2005).

Although arid and semi-arid region streams perform the same functions as perennial streams, their hydrology and sediment transport characteristics cannot be reliably predicted by extrapolation from humid regions (Scott, 2006; McMahon, 1979). This is due to a much higher degree of spatial and temporal variability in hydrologic processes and also in the resulting erosion and sedimentation processes than in humid regions. Desert environments typically produce more runoff and erosion per unit area than in temperate regions for a given intensity of rainfall due to sparse vegetation cover and poorly developed soils with little organic matter (Thornes, 1994).

Figure 9. Photographs of an ephemeral stream, same location with flow (left), and dry (right), Tucson, Arizona.

The variability of flood magnitudes is much greater for ephemeral stream channel flows as compared to that of perennial stream systems. For example, Graf (1988) reported that in a humid region in Pennsylvania, the 50-year return flood event is roughly 2.5 times the mean annual flow, whereas the 50-year return flow for the Gila River in Arizona is about 280 times the mean annual flow. Although this may also be a function of differences in base-flow, the difference is still significant. Some studies have noted that many of our watersheds in the Western States (up to 90 percent in Arizona, for example) yield less than 12.7 mm of runoff

per unit area, per year, but the vast extent of these arid and semi-arid watersheds makes their total runoff production significant, and their proper management important (Renard, 1970). Osterkamp and Friedman (2000) compared runoff and extreme rainfalls of semi-arid areas with those of other climatic areas in the conterminous U.S. They found that the magnitudes of intense precipitation in semi-arid areas are generally less than in humid areas, but peaks of infrequent floods are typically larger, with many of the greatest recorded unit flood flows occurring in drainage basins of less than 1,000 km^2.

Most of the Southwest receives less than 500 mm of rainfall per year, and a correlation can be seen between locations with low average annual rainfall amounts and locations with ephemeral or intermittent stream flow. Figure 10 shows maps of the average annual precipitation for the Western U.S. for 1961-1990, and the locations of perennial and ephemeral/intermittent streams from the NHD dataset for comparison. Because of the low rainfall amounts, most stream reaches in the Southwest are ephemeral or intermittent.

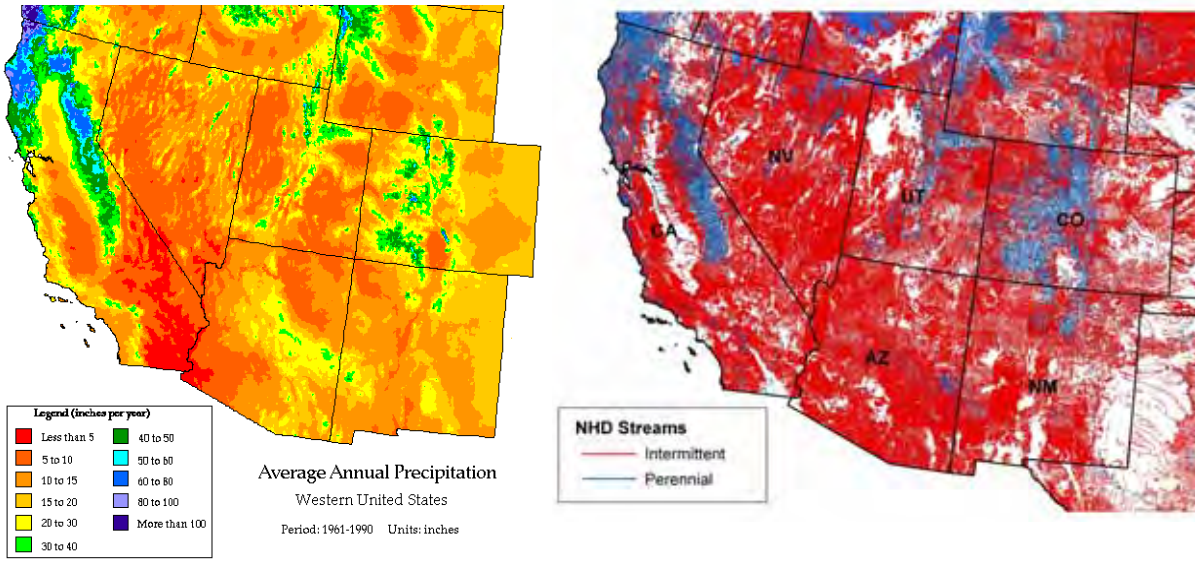

Figure 10. Maps showing average annual precipitation amounts, 1961-1990 (left), and locations of ephemeral/intermittent (red) and perennial (blue) streams (right). (Western Regional Climate Center, http://www.wrcc.dri.edu/precip.html, and National Hydrography Dataset (NHD), http://nhd.usgs.gov/. For NHD see also "Concepts and Contents" at http://nhd.usgs.gov/chapter1/chp1_data_users_guide.pdf).

Rainfall patterns in arid and semi-arid regions influence when streamflow is most likely. The Great Basin and Mojave Deserts have wet winters and relatively dry summers with sporadic thunderstorms. The Chihuahuan Desert receives rainfall primarily during the summer. The Sonoran Desert receives rainfall in both winter and summer (England and Laudenslayer, 1995). Most streamflow events in a large portion of the Sonoran and Chihuahuan Deserts (southern Arizona and New Mexico) occur during the summer monsoon (July through September) from high-intensity, short-duration rainfall events which typically occur as air-mass thunderstorms resulting from convective heating of moisture-laden air masses (Gochis et

al., 2006). This warm-season monsoonal rainfall results from a seasonal reversal of atmospheric circulation that transports moisture from the Gulf of Mexico and/or the Gulf of California (Hereford et al., 2002). Longer duration rainfall events with embedded high-intensity thunderstorms are often the result of dissipating tropical depressions that are common in the fall and sometimes in the winter (Webb and Betancourt, 1992; Gochis et al., 2006), while the lower-intensity events are typical of cool-season precipitation caused by frontal systems originating in the eastern North Pacific Ocean (Hereford et al., 2003).

Significant streamflow events in ephemeral stream channels occur infrequently from low-intensity cool-season precipitation unless there has been regular rainfall for several months and the soil is saturated. Still less frequently (for example, approximately 3 to 5 percent of the annual rainfall in southern Arizona, on average), runoff and streamflow occurs from the remnants of hurricanes and tropical depressions which track north from lower latitudes. The influence of both the summer monsoon and increases in precipitation from tropical depressions decreases northward.

Most of New Mexico and large portions of Arizona and Colorado receive between 30 to 50 percent of their annual precipitation during just two months, July and August, when the monsoon thunderstorms occur. Figure 11 shows maps of the percent of average annual precipitation occurring during the summer season (July and August), and during the 6 months of the cool season (October through March) for a comparison.

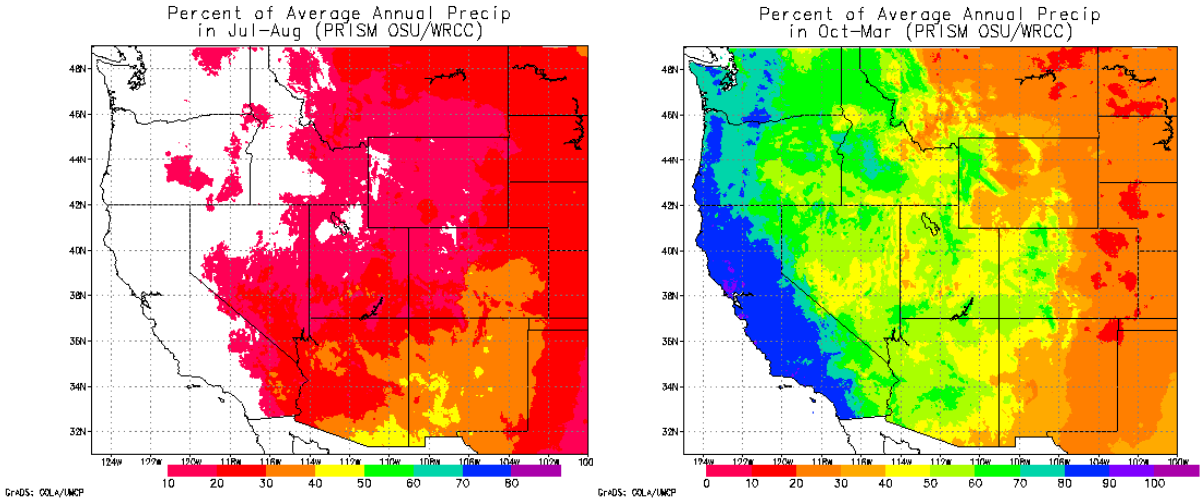

Figure 11. Maps showing percent of average annual precipitation, July and August (left) and percent of average annual precipitation, October through March (right), for comparison, Western Regional Climate Center, http://www.wrcc.dri.edu/precip.html.

i. Variability of arid and semi-arid region flows and floods

Many aspects of arid and semi-arid region floods are highly distinctive. The low annual precipitation in these regions inevitably means low annual runoff, with interannual variability of runoff increasing as annual totals decrease (McMahon, 1979; Rodier, 1985). In North American arid lands, the variability of mean annual runoff is about double that for the

continental area as a whole (McMahon, 1979). In addition, given the spatially variable patterns of precipitation and runoff in arid and semi-arid regions, for any given watershed size there is a large range in annual runoff totals (Reid and Frostick, 1997), and basin response can only be extrapolated to a very limited extent (De Boer, 1992). This implies that watershed area usually cannot be used as a reliable surrogate measure of runoff in arid and semi-arid regions. Goodrich et al. (1997) found that watershed rainfall-runoff response becomes more non-linear with increasing watershed size due to the increasing importance of ephemeral stream channel transmission losses and partial area storm coverage.

With the exception of perennial, mainly allogenic rivers (those that originate and are fed from outside of the area, where precipitation and runoff are sufficient to generate flow), most arid and semi-arid region rivers are characterized by long periods without flow. For example, in the Negev Desert in Israel, Reid et al. (1998) conducted flow duration analysis and found that ephemeral stream channels are hydrologically active only 2 percent of the time, or about seven days per year, and that overbank flow can be expected for only 0.03 percent of the time – about three hours per year. Because of infrequent flows, process studies in arid and semi-arid region channels are dominated by the analysis of flood events (Graf, 1988). In the general fluvial literature, a flood is usually defined in relation to a humid region event (i.e., the near or complete exceedance of bankfull). Nevertheless, several authors (e.g. Leopold and Miller, 1956; Schumm and Lichty, 1963; Hedman and Osterkamp, 1982; Bourke and Pickup, 1999) have referred to the variable size of floods, as this can be important for processes of sediment transport and channel change.

Floods caused by distinctly different climatic processes commonly have distinctly different magnitude and frequency relations. Many studies have examined the nature of these differences by separating flood data for a station into two or more populations on the basis of the climatic causes of the floods (U.S. Army Corps of Engineers, 1958; Elliott et al., 1982; Jarrett and Costa, 1982; Waylen and Woo, 1982; Hirschboeck, 1987). Results of these studies for different regions have indicated that floods caused only by snowmelt, by rain on snow, and only by rain, form distinct populations; floods caused by rain on snow or only by rain tend to have larger magnitudes than do floods caused only by snowmelt. In parts of the arid Southwest, floods caused by precipitation from frontal passages in the winter tend to be larger than floods caused by precipitation from convectional storms in the summer. In the Southwest and Northeast, floods caused by precipitation from tropical cyclones tend to have greater magnitudes than do floods caused by precipitation from storms other than tropical cyclones. Floods caused by precipitation from tropical cyclones commonly include the peak flow of record (USGS, 1997).

Variability of flow is a natural continuum in arid and semi-arid regions, and is affected by climatic and ecological conditions. For example, the peak water demands of a dense riparian forest for transpiration in dry regions can deplete a stream channel of its flow for several hours during a hot summer day. A stream can run continuously for several years, and then go dry, making it difficult to classify the stream as perennial or ephemeral. Increasingly accurate and precise methods of monitoring and measurement, which may now detect these natural phenomena, might change a stream classification, without the river itself changing. Stanley et al. (1997) noted that desert streams are “spatially dynamic ecosystems that undergo cycles of expansion, contraction, and fragmentation; that conventionally hydrologic measurements of

water velocity or volume passing a fixed point represent only one aspect of hydrologic dynamism…"

ii. Types of arid and semi-arid region floods

As well as varying in size, floods in arid and semi-arid regions vary from entirely channeled, to largely unchanneled (Olsen, 1987). In the American Southwest, for example, partly channeled floods occur during major events when river banks are overtopped and flood waters diffuse across vast, low-gradient plains (Hedman and Osterkamp, 1982). Graf (1988) described numerous instances of sheet floods from piedmont settings as examples of unchanneled floods.

Channeled floods in arid and semi-arid region rivers may occur as flash floods, single-peak events, multiple-peak events and seasonal floods (Graf, 1988). The highly variable stream flow in ephemeral and intermittent systems most often occurs as a flash flood, lasting only minutes or hours, or persisting for days or weeks depending on the climatic regime and the nature of the watershed contributing area. Flash floods may occur any time of the year in response to a short-duration high-intensity precipitation event, and after the watershed has received enough precipitation to generate runoff (Figure 12).

Most commentaries on arid and semi-arid region river floods refer to the characteristics of flash flood hydrographs (charts showing change in flow over time), which are typically produced by convectional precipitation in small (< 100 km^2) watersheds. Due to high runoff coefficients and the dominance of Hortonian overland flow in runoff generation, these hydrographs are characterized by steep rising and receding limbs and a short time base (Reid, 1994; Dick et al., 1997). For a simple individual flow event generated by a discrete storm, the rapid rise to peak discharge (almost instantaneous) is followed by the recession portion of the hydrograph. The duration of recession is generally much longer than the time required to reach peak flow, and the resulting flood wave shape is such that almost the entire hydrograph is the recession curve (Figure 13). The recession curve of an ephemeral stream hydrograph has two properties of interest: (1) flow ceases after some period of time, causing the flow to be of finite duration, and (2) the shape of the curve can be compared to an exponential decay reference curve (Chow et al., 1988).

Figure 12. Photograph of a flash flood in an ephemeral channel, Southern Arizona. (Photograph: USDA-ARS/SWRC)

Less well documented are the single and multiple-peak floods generated by tropical storms or frontal systems, or the floods associated with seasonal snowmelt or rainfall. Knighton and Nanson (1997) considered that in moving from single-peak to multiple-peak to seasonal floods there is a corresponding reduction in the steepness of the rising limb of the hydrograph and a broadening of the time base of the floods.

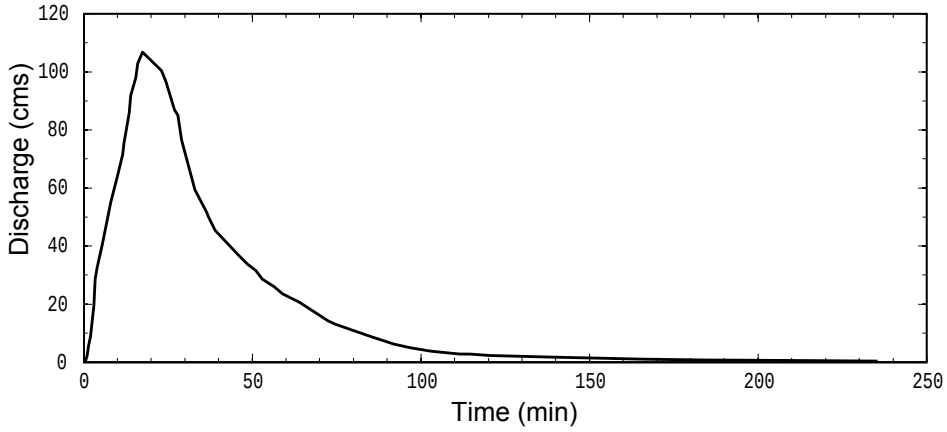

Figure 13. Example hydrograph showing typical rapid rise to peak discharge and long recession curve of a flash flood.

iii. Transmission losses

In a spatial as well as a temporal sense, streamflow in arid and semi-arid region rivers exhibit unique characteristics. Regardless of the source of water, flows in arid and semi-arid region rivers are generally influent, or subject to downstream volume decreases. These decreasing flow volumes principally are due to transmission losses resulting from infiltration of

streamflow into the unconsolidated alluvium forming channel boundaries, losses resulting from overbank flooding, and evaporation of floodwaters (Babcock and Cushing, 1942; Keppel and Renard, 1962; Sharp and Saxton, 1962; Lane, 1983; Goodrich et al. 1997; Cataldo et al., 2004). Transmission losses are also an important source of water for ground-water recharge (see next section).

Downstream volume decreases are sometimes negligible along small, alluvial or bedrock channels, but for larger alluvial channels they can be of great importance, with many flows failing to travel the full length of the channel (Keppel and Renard, 1962; Aldridge, 1970), leaving the lower parts of the watershed dry.

The nature of the rainfall event can affect downstream reductions in flow. When precipitation is widespread, tributary contributions can increase downstream flows even while losses are still large. For spatially localized events, however, in combination with hydrograph attenuation, and in the absence of appreciable tributary inflows in the lower parts of the watershed, transmission losses can produce significant downstream decreases in total flow volume, flood peak, and flow frequencies (Keppel and Renard, 1962; Lane, 1983; Goodrich et al., 1997; Knighton and Nanson, 1997).

A great deal of research on semi-arid region hydrology has been conducted at the USDA-ARS Walnut Gulch Experimental Watershed (WGEW) near Tombstone, Arizona (Figure 14). The WGEW is one of the most intensively instrumented semi-arid experimental watersheds in the world with nearly 100 years of abiotic and biotic data (Moran et al., 2008). The network of over 125 gauging stations has been continuously collecting precipitation and runoff data for over 50 years.

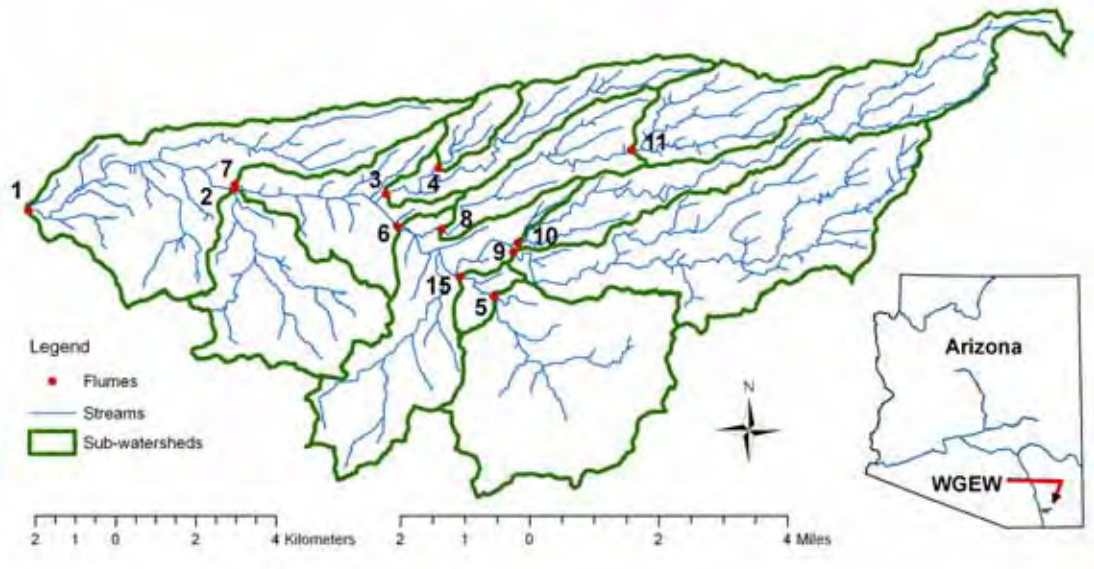

Figure 14. Map of the Walnut Gulch Experimental Watershed (WGEW), Tombstone, Arizona, showing major stream network, flumes and sub-watershed boundaries.

An example of the magnitude of transmission losses within the WGEW is presented in Figure 15. This figure shows the August 27, 1982, storm event that was isolated in Sub-watershed 6 and recorded at Raingage 56 on the upper 95 km^2 of the watershed (although not all of that precipitation produced runoff). The spatial pattern of total storm precipitation depth depicted by the isolines in Figure 15 is interpolated from the WGEW rain gauge network. The temporal distribution of rainfall intensity observed at Raingage 56 is illustrated in the upper right portion of the figure. The runoff measured at Flume 6 was 246,000 m^3, with a peak discharge of 107 m^3/s. Runoff traversing the 10.86 km of dry streambed from Flume 6 to Flume 1 experienced significant infiltration losses. As a result, 90,800 m^3 of water was absorbed in the channel alluvium, and total peak discharge was reduced by 52 m^3/s. Photographs of Flume 1 with and without flow are shown in Figure 16.

The magnitudes and rates of transmission losses for streamflow or flood events in a given arid and semi-arid region river are often highly variable, as both depend on a complex of interrelated factors, including the characteristics of the storm (e.g., size, position of the storm track, location in relation to the drainage network), the hydrograph (e.g., flow volume and duration), and the channel (e.g., width of the wetted perimeter, porosity and initial moisture content of the channel bed, stratigraphy of the channel fill) (Knighton and Nanson, 1997; Reid and Frostick, 1997; Lekach et al., 1998). Cataldo et al. (2004) reviewed about three dozen approaches for predicting transmission losses in ephemeral streams in the U.S., and concluded that approaches that combine differential equations and regression analyses that consider physical processes and statistical methods have the most promise.

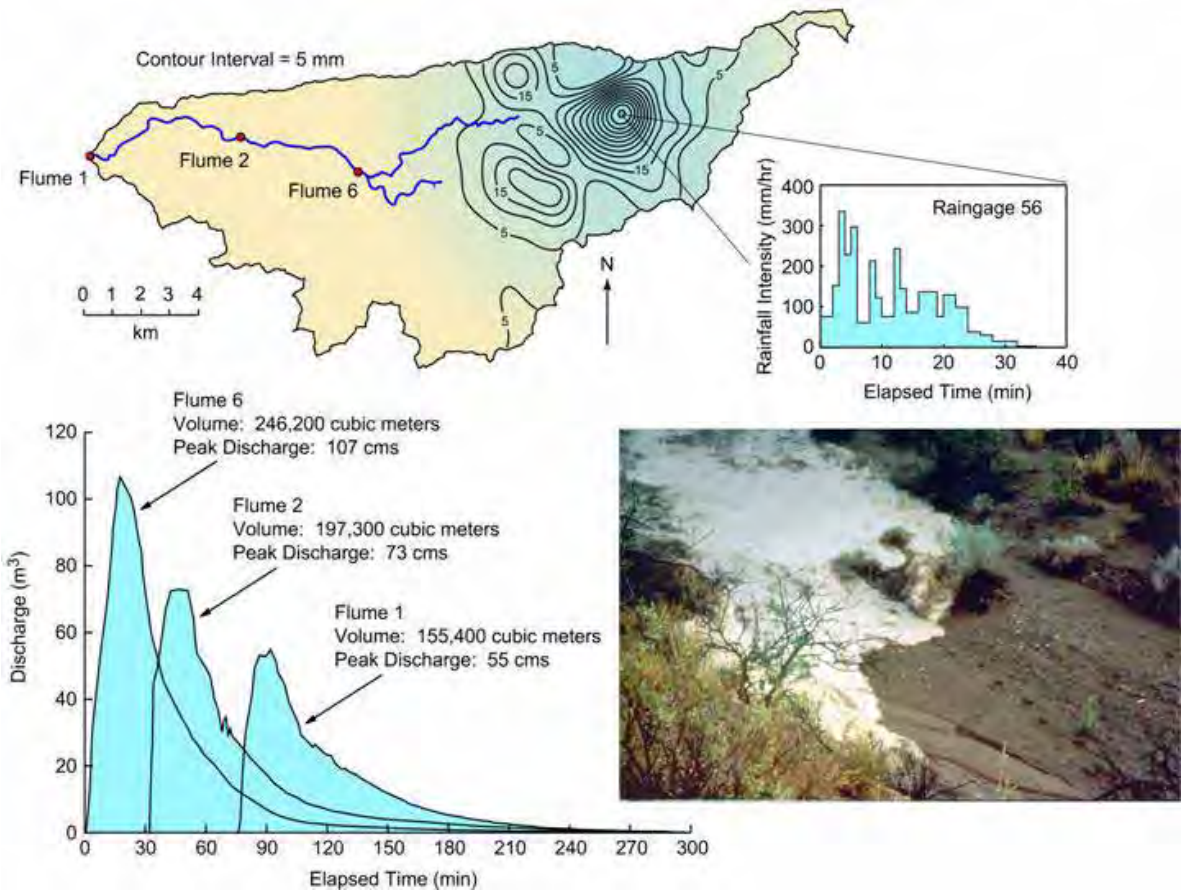

Figure 15. Hydrograph, location map, and photograph of rainfall-runoff event August 27, 1982, illustrating ephemeral stream channel transmission losses as measured within the WGEW (Goodrich et al., 1997).

Figure 16. Photographs of Flume 1 at WGEW, dry (left) and with flow (right). (Photographs: USDA/ARS-Southwest Watershed Research Center, Tucson, Arizona)

iv. Ground-water recharge

Ground-water recharge in arid and semi-arid regions has generally been viewed as the sum of several different distinct pathways including mountain-block recharge, mountain-front recharge, spatially distributed recharge, and ephemeral stream channel recharge. Recent research has expanded this view to include the mediating role of vegetation (i.e. water use by vegetation), and the greater role of ephemeral stream channel recharge in basin floors.

"Mountain-front recharge" refers to the contribution from mountain precipitation to recharge of aquifers in adjacent basins. It includes recharge from the mountain block system and stream channels, and is considered to be the most significant form of ground-water recharge in arid and semi-arid regions, with ephemeral stream channel recharge providing a significant portion in these climates (Goodrich et al., 2004; Coes and Pool, 2005). Basin floor or spatially distributed recharge in arid and semi-arid regions plays a lesser role in the overall recharge volume due to high evaporation rates, low rainfall, and high water use by desert vegetation (Coes and Pool, 2005).

Advances such as environmental tracers and geographic information systems (GIS) based ground-water models have improved our understanding of recharge processes (Phillips et al., 2004; Hogan et al, 2004). However, an accurate representation of ground-water recharge is difficult since it cannot be measured directly on a basin scale, in addition to other reasons, including the extremely small recharge rates and recharge mechanisms that vary greatly in time and space throughout a watershed. The methods used in humid regions, such as a water balance approach, are not applicable in arid and semi-arid regions because these extremely small amounts of recharge are within the measurement error, and potential evapotranspiration exceeds precipitation (Hogan et al., 2004; Phillips et al., 2004). Also, channel transmission losses are more significant in most ephemeral and intermittent channels than in humid region perennial streams, as noted in the previous section. Therefore, methods for calculating recharge are indirect, and subject to cumulative measurement errors. In addition, the annual variability of precipitation in arid and semi-arid regions makes it difficult to apply recharge models, which simulate the direct recharge to the aquifer from infiltration of precipitation. Goodrich et al. (2004) noted that ephemeral stream channel transmission losses play an important role in ground-water surface-water dynamics in numerous arid and semi-arid regions and are potentially significant sources of recharge at the basin scale. However, identification of the processes driving these dynamics is difficult. Specifically, it is difficult to obtain data on the proportion of transmission losses that become deep ground-water recharge instead of being lost to near-channel evapotranspiration (ET) and wetted channel evaporation.

This issue was addressed via coordinated field research and modeling within the WGEW. A variety of methods were used to estimate ephemeral stream channel recharge, including ground water, surface water, chemical, isotopic, tree sap flux, micrometeorological techniques, and changes in microgravity. Changes in microgravity reflect the gravitational pull of the Earth and indicate the presence of subsurface density variations such as those produced by voids or cavities. A cavity usually has a lower density than the surrounding

materials and may be filled with water or sediment, resulting in a very small reduction in the pull of the Earth's gravity (Styles et al., 2006).

Figure 17 illustrates the changes in deep ground-water levels due to multiple runoff events during the 1999 and 2000 monsoon as well as associated microgravity changes. During the relatively wet 1999 and 2000 monsoon seasons the channel recharge estimated from these methods differed by a factor of about 2.9. A rough scaling of these rates to the entire basin shows that these estimates would constitute roughly 15 percent at the low end of the range and 40 percent at the high end, respectively, of all water recharged annually into the regional aquifer as derived from a calibrated ground-water model estimate (Goodrich et al., 2004). However, in 2001 and 2002 no discernable ephemeral stream channel recharge in the intensely studied reach was detected due to weak monsoon seasons, illustrating that ground-water recharge in ephemeral stream channels can be significant in some years and negligible in others.

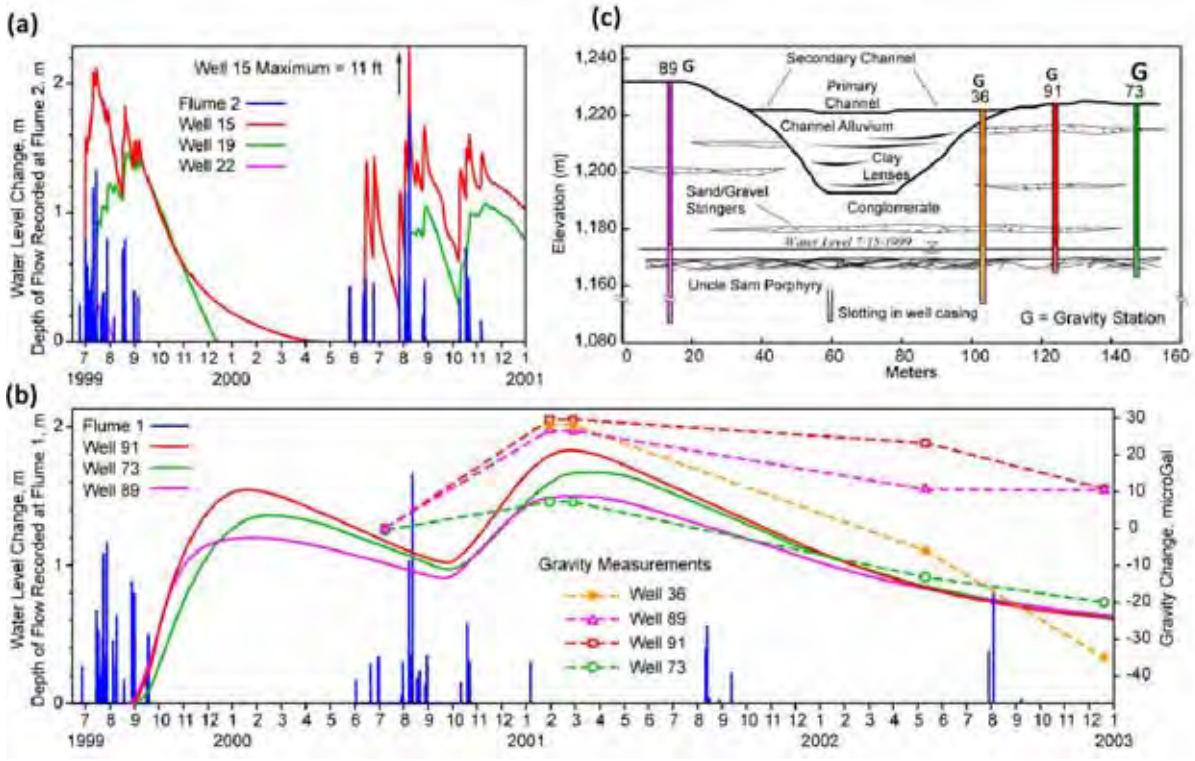

Figure 17. Diagrams of well levels and flow depths at the WGEW. Diagram (a) at top left shows Flume 2 well level changes (m) and flow depths (m), diagram (b) at bottom shows Flume 1 well level changes (m), flow depths (m) and gravity measurements, and diagram (c) on upper right shows a cross section of well transect above Flume 1 (from Goodrich et al., 2004).

Other studies have also noted the importance of locally recharged monsoon floodwater derived from ephemeral stream channels for maintaining river flow. Using a suite of geochemical tracers and a two end-member mixing model, Baillie et al. (2007) found that locally recharged monsoon floodwaters is one of the dominant water sources in the main stem

of the spatially intermittent San Pedro River, with these waters comprising 60 to 85 percent of riparian ground water in losing reaches of the main stem and 10 to 40 percent in gaining reaches. Baseflows in the perennial reaches also contained a significant component of monsoon floodwater: 80 percent at the upstream segment, decreasing to 55 percent after several gaining reaches (Baillie et al., 2007). Various other methods of tracers are described in Cook and Herczeg (1999). Coes and Pool (2005) looked at recharge in the same basin and found that ephemeral stream channel recharge occurs during both summer and winter streamflow events.

v. Landscape and hydrologic connections

Watersheds and their surrounding ecosystems are linked by the flow of water. In a watershed context, landscape hydrologic connectivity refers to the maintenance of natural hydraulic connections of surface and subsurface flow between source, headwater, or contributing areas and downstream/down gradient receiving waters. Nadeau and Rains (2007) defined it as "the hydrologically mediated transfer of mass, momentum, energy, or organisms within or between compartments of the hydrologic cycle." In arid land streams, this hydrologic connection occurs episodically during flood pulses, yet still provides a substantial amount of the mass, momentum, energy and organisms delivered to downstream perennial waters, as well as to ground-water recharge.

Freeman et al. (2007) stated that, "The hydrologic connectivity of small headwater streams to navigable waters is clear and unambiguous to ecologists. Every important aspect of the river ecosystem, the river geomorphic system, and the river chemical system begins in headwater streams." Kennedy (1977) discussed the interactions of stream-riparian-vegetation-energy-nutrients-water production-aquatic life and terrestrial life, noting that the key to wise management of aquatic ecosystems is wise management of the watershed.

As headwater streams occur upstream from, and may ultimately discharge into higher order perennial streams, they connect landscape processes through their influence on the supply, transport, and fate of water and solutes in the watershed (Alexander et al., 2007; Leibowitz et al., 2008).

Shaw and Cooper (2008) noted that biotic patterns within ephemeral stream networks are controlled directly by interactions of hydrologic and geomorphic regimes, and indirectly by watershed and stream-network properties. In their study of riparian vegetation and watershed linkages in ephemeral stream systems, they classified channels into three types based on physical properties and plant community types. Their classification system described functional linkages among watersheds, stream reaches, and riparian plant ecology, indicating a strong landscape connection between processes in the upper watershed and the lower watershed. For example, they found that streamflow and ground water regimes in regional flood plain rivers were driven by climatic patterns from distant portions of the upper watershed and were relatively insensitive to local rainfall.

Figure 18. Photograph of ephemeral and intermittent stream channels connecting to a perennial reach of Cienega Creek, southeast of Tucson, Arizona. (Photograph: Lainie Levick/Aerial flight courtesy of Lighthawk, www.lighthawk.org)

Delivery of water to a stream is dependent largely on the timing, duration, and amount of water that falls on the surface and subsequently runs off, which is dependent on soil type, and condition of the watershed and buffer. The importance of hydrologic connectivity in arid environments relates closely to the delivery of water, sediment, nutrients, compounds, etc. to downstream areas. Small tributaries generally have land-dominated hydrographs as opposed to stream-flow dominated, because they mainly drain adjacent land surfaces. Numerous observed runoff events originating in the uplands of ephemeral tributaries at the WGEW have reached the San Pedro River as evidenced by corresponding hydrograph observations at the USGS Tombstone gaging station just downstream of the confluence of Walnut Gulch and the San Pedro River. Instrumenting additional watersheds would add to the understanding of these arid and semi-arid systems.

Although observed runoff events are more meaningful than simulated results, nevertheless, models are useful in understanding a hydrologic system. In a hydrologic modeling study of ephemeral tributaries to the San Pedro River, Levick et al. (2006) determined that simulated flows from the uplands would reach the San Pedro. Using the AGWA/KINEROS model, they looked at runoff and sediment yield using three design storms: 2-year 1-hour, 5-year 1-hour, and 10-year 1-hour. They determined that under predevelopment conditions, even the 2-year-1-hour design storm event (18.47 mm) was enough to fill the void spaces in channel-bed sediment, overcome transmission losses, and cause a small but measurable flow at the watershed outlet, demonstrating a hydrologic connection from the ephemeral tributaries to the San Pedro River, nearly ten miles downstream. The simulations showed that larger storm events yielded more flow, as did post-development simulations where impermeable surfaces in the watershed increased. For more information on the AGWA/KINEROS model, go to http://www.tucson.ars.ag.gov/agwa.

Figure 19. Photographs of an ephemeral stream, same location during flow (left), and dry (right), Tucson, Arizona.

vi. Energy dissipation

Energy dissipation refers to the transformation and/or reduction in the amount of kinetic energy of flowing water, which is a function of channel roughness, channel morphology, and buffer and landscape vegetation. Stream energy dissipation is important for the prevention of channel erosion and scour, and increased sediment loads that can degrade water quality.

Water flowing in stream channels is subject to two key forces: (1) gravity that moves the water downslope and (2) friction between the water and channel boundaries that resists the downslope movement. These two forces determine, to a large degree, the ability of the water to modify the channel geometry and transport debris. In addition, channel roughness, slope, and depth determine the velocity of the flowing water (Leopold et al., 1964; Wakelin-King and Webb, 2007). Channel slopes in the Southwest are often large so when flows do occur they have high velocities and consequently significant energy and stream power.

Dissipation of energy in channels can occur due to vegetation, curvature (stream sinuosity), obstructions (rocks, debris, dams), and the size, character and configuration of material in the bed and banks. Flow hydraulics and roughness coefficients in some arid and semi-arid channels are strongly influenced by vegetation, which frequently grows on the normally dry channel beds to exploit moisture contained in subsurface sediment.

vii. Sediment mobilization, storage, transport, and deposition

As noted previously, although ephemeral streams do not flow at all times, they still perform the major functions of a stream: the transportation of water, nutrients, and sediment. Unlike perennial streams that continuously move sediment through the watershed, sediment movement in non-perennial stream channels generally occurs as a pulse in response to runoff generated by the short duration, high intensity thunderstorms that are typical of arid and semi-arid regions. These thunderstorms can result in flash floods and yield rapidly rising runoff

hydrographs. The associated high velocity turbulent flash flows contain heavy sediment loads and push large amounts of coarse sediment through the system. In addition, sediment is moved from the uplands and hillslopes into the channels from overland flow. Figure 20 shows photographs from an unusually large flood event in Tucson, Arizona, that moved large quantities of rock and debris through the channel. The rock and debris plugged up the bridge, causing the floodwaters to leave the channel, damaging the roadway and flooding nearby homes.

Figure 20. Photographs from an unusually large flood event in an ephemeral stream that damaged roads and bridges, and flooded nearby homes, Tucson, Arizona, July 31, 2006.

Channels in arid and semi-arid regions tend to have deep sediments that are mostly sands and gravels, with widely scattered shrubs that are resistant to violent flood waters. However, the unconsolidated alluvium can easily be mobilized during flows, unlike the clay bedded or armored channels in more humid regions. These deep sediments cause large transmission losses in the downstream direction, resulting in reductions in both flow volume and velocity over the length of the stream, and subsequent deposition of bed load materials and coarser suspended sediments in the downstream segments (Whitford, 2002).

Storm water is often completely absorbed in the channel network before reaching the outlet. Transmission losses and decreasing discharge in the downstream direction thus promote the stepwise movement, deposition and storage of sediment within ephemeral stream networks (Renard, 1975). The effect is a pulsing style of sediment movement that doesn't always reach the watershed outlet, but is instead remobilized during the next flow and redistributed within the watershed's channel network (Leopold et al., 1964; Thornes, 1977; DeBano et al., 1995).

Ephemeral and intermittent channels contain a wide range of sediment size, with the larger material remaining essentially at rest although a significant portion is available for transport (Renard and Laursen, 1975). These channels are typically transport-limited systems as opposed to detachment limited. The large flows that can move great quantities of sediment are relatively infrequent in arid and semi-arid regions; however the sediment moved by the smaller more frequent flows can add up to a considerable amount (Nichols, 2006).

As a result of decreased flow rates in the downstream direction, more silts and fines are deposited in the channel, which can be advantageous to biotic communities. A study of

ephemeral rivers in the Namib Desert (Jacobson et al., 2000a) found that "Organic carbon, nitrogen and phosphorous were correlated with silt content, and silt deposition patterns influence patters of moisture availability and plant rooting, creating and maintaining micro-habitats for various organisms." Jacobson concluded that "…alluviation patterns associated with the hydrologic regime strongly influence the structure, productivity, and spatial distribution of biotic communities in ephemeral river ecosystems."

Because the small, uppermost channels of a drainage network are important in determining the amount of sediment transported downstream during storm events, their removal will increase sedimentation rates in downstream channels (Meyer and Wallace, 2000). This increased sediment load can have negative effects on channel stability, fish, invertebrates, and overall stream productivity. However, when small or headwater streams are replaced with paved or lined floodways during land development, sediment production may decrease, causing an increase in downstream erosion as sediment starved waters move through the watershed. Figure 21 is a photograph of sediment-laden floodwaters.

Figure 21. Photograph of sediment-laden floodwaters in an ephemeral stream, Walnut Gulch, Arizona. (Photograph: USDA-ARS/SWRC)

Sediment deposition can have varying effects. For example, sediment deposited during flow events can encourage plant germination (i.e. Cottonwood, *Populus fremontii*) by providing seed beds and scarifying seeds, but it also can inhibit the growth of seedlings or some types of vegetation, such as non-native saltcedar (*Tamarix ramosissima*). This can be beneficial in some instances where stream restoration efforts are occurring. However, some aquatic species can be adversely affected by excessive sediment, which can interfere with reproduction and feeding.

b. Geomorphic Characteristics

The variability in time and space of fluvial processes is particularly characteristic of arid and semi-arid area rivers (Tooth, 2000a), yet the role of rivers in shaping desert landscapes has

generally been underestimated by geomorphologists. As a result, there is inadequate information on geomorphic processes and forms in arid and semi-arid regions. This is important because fluvial processes are a cause of so many problems in desert areas (Reid and Frostick, 1989), and also because the geomorphology and hydraulic-geometry relationships of ephemeral and intermittent streams are very different from humid area perennial streams (Graf, 1988; Reid and Frostick, 1989; Thornes, 1994; Tooth, 2000a; Bull and Kirkby, 2002).

Although one of the most universally recognized traits of arid and semi-arid ephemeral stream channels is their enormous variability in form, several broad generalizations have been used to characterize them:

- They are often closely spaced, resulting in a high drainage density.
- They have high width-to-depth ratios.
- They are likely to be braided (Figure 22).
- They have low sinuosity relative to their humid counterparts.

Closely spaced channels and a high drainage density are generally due to high erosion rates and limited runoff, which produce high sediment concentrations in arid and semi-arid region channelized flows (Reid and Frostick, 1997; Bull and Kirkby, 2002). In headwater areas, this may lead to gullying and/or badland development until such time as shrinking contributing area, stabilizing vegetation, and/or surface armoring moderate erosion from rain splash and surface flows. High width-to-depth ratios, braided channels and low sinuosity are often the result of high sediment concentrations and coarse grain sizes (Bull and Kirkby, 2002).

Figure 22. Photograph showing an ephemeral braided stream system, Yuma Wash, southwest Arizona. (Photograph: Susan Howe, Colorado State University)

In most arid and semi-arid river cross sections, depth increases with discharge somewhat faster than does width (Leopold and Maddock, 1953). The width of channels increases much more rapidly in the downstream direction (Breschta and Platts, 1986) than is observed in humid regions, resulting in wide channels in the lower reaches. Wolman and Gerson (1978) compiled data from different arid and semi-arid regions and found that channel widths increased rapidly up to a drainage area of about 50 km^2 (Figure 23). As drainage area increased beyond about 50 km^2, channel widths asymptotically approached a value between 100 and 200 m. It is likely that this stabilization of channel width for larger drainage areas is due to the fact that transmission losses from flows with such a high wetted perimeter compensate for any addition of tributary water (Reid and Frostick, 1997). In ephemeral stream channels with no significant tributary inputs, transmission losses can result in decreasing channel width and capacity in the downstream direction with some ultimately becoming unchannelized alluvial surfaces termed "floodouts" (Dunkerley, 1992; Tooth, 2000b).

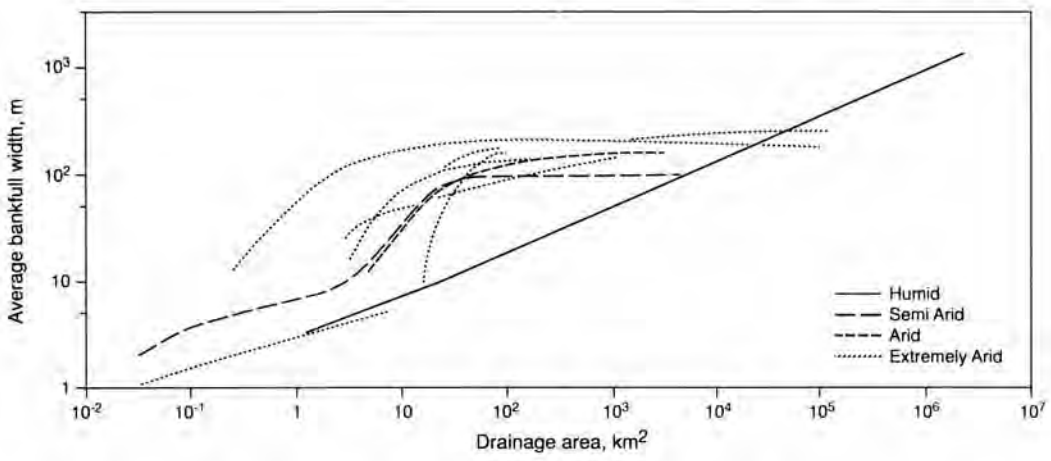

Figure 23. Relation of bankfull channel width to drainage area for different climatic environments (after Wolman and Gerson, 1978).

An oscillating pattern of narrow, incised reaches and wide, shallow reaches has also been observed in ephemeral stream channels (Schumm and Hadley, 1957; Bull, 1997; Pelletier and DeLong, 2004). The wavelength of these oscillations ranges from 15 m to over 10 km (Bull, 1997) and has been successfully modeled as a function of channel slope, width, and depth (Pelletier and DeLong, 2004). Alternating erosional and depositional reaches migrate progressively upstream, resulting in repeated episodes of incision and aggradation at any given point along the channel. Perturbation of these systems by natural or anthropogenic causes can result in the development of continuous incised channels, or arroyos, as described in the next section.

In addition to their pronounced widths, the lower reaches of ephemeral streams are noted for having particularly flat bed topography; the beds of single-thread streams are often near horizontal and planar (Reid and Frostick, 1997) (Figure 24). Channel bars, where present, are also often flat-topped and rise only 10-20 cm above the thalweg (Leopold et al., 1966; Frostick and Reid, 1977, 1979). Bed flatness and channel width are likely related through

flow depth; wide, shallow flows suppress the secondary current cells that encourage the development of bars (Reid and Frostick, 1997). Rapidly receding flows can destroy or modify bedforms such as ripples, dunes, and antidunes that may develop at greater flow depths. Bedforms in streams are created when water currents carry loose grains across the horizontal surface of unconsolidated sediments. The size and shape of bedforms are determined by the flow velocity, direction, and consistency.

Figure 24. Photograph of a typical wide, flat, and sandy ephemeral stream channel, Martinez Wash, Arizona. (Photograph: William Kepner, USEPA/ORD)

i. Channel-forming processes

Fluvial processes are significant agents of erosion and deposition in arid and semi-arid regions and thus, over time, desert rivers can be active land-forming agents (Frostick and Reid, 1987; Reid and Frostick, 1997). Low rainfall in desert regions results in weathering processes dominated by mechanical rather than chemical means. Clay production is thus inhibited and silt-sized fractions are predominant in the soils. The lack of bank-stabilizing clay in arid and semi-arid region ephemeral stream channels may partially explain why these channels typically have wide, shallow, low sinuosity geometries (Schumm, 1961; Scott, 2006). The sparseness of vegetation along some stream banks in arid areas can also contribute to channel widening tendencies (Miller, 1995; Reid and Frostick, 1997). Furthermore, channel-bed armoring is uncommon in desert streams because of the high supply of all sediment sizes, rapid recession of flash flood hydrographs, and extended periods of no flow (Reid and Laronne, 1995).

As event size increases sediment can be moved further downstream, but only the largest, least frequent events are capable of flushing sediment completely through the system and opening up (widening or incising) channels that have become progressively choked with vegetation and sediment. Indeed, Lekach et al. (1992) observed that more than 90 percent of the bed

load yield in an arid-region watershed originated from the mid-catchment channels during larger runoff events. High-magnitude, low-frequency floods thus control channel development, and their effects tend to be modified very slowly by smaller events. The result is a tapestry of highly varied, transient channel forms that are a reflection of the recent flood history rather than an equilibrium state. In addition, the variable flows in combination with sediment characteristics will influence the character of the flood plain (Nanson and Croke, 1992).

The morphology of ephemeral stream channels, in combination with transmission losses, is the result of cyclical patterns of infill and erosion. For example, the smaller, more frequent flows that transport sediment into the channel network can, over time, result in the infilling of channels and decreasing of channel width (e.g., Burkham, 1972), often in association with the growth of riparian vegetation (see section 5.d). In contrast, periods of low (base) flow in perennial steams are characterized by low sediment loads and can cause channel narrowing by cutting into deposits left during larger flows when ephemeral tributaries are active (e.g., Friedman et al.,1996). Dunkerley and Brown (1999) determined that smaller flows are disproportionately impacted by transmission losses than bank-full flows because flat-bottomed channels result in proportionately larger wetted perimeter for a given flow volume. In addition, a steep increase in transmission losses occurs as flows overtop their banks and spread out onto the flood plain, which further limits the potential work that can be accomplished by intermediate floods (Graf, 1983; Lange, 2005). Together these relationships encourage aggradation within the channel network. Over time, however, the threshold flow required to cause a major erosive event is reduced as fine sediment retards infiltration capacity (e.g., Dunkerley, 2008), channel width narrows and the growth of flood plain vegetation encourages the concentration of flow within the main channel. Both channel widening (e.g., Burkham, 1972; Friedman and Lee, 2002) and incision (e.g., Merritt and Wohl, 2003) have been observed when this threshold has inevitably been reached.

In the late 19th century, ephemeral stream channels throughout the American Southwest began to incise into alluvial valleys, creating deep continuous channels that are collectively referred to as arroyos. This arroyo formation episode was one of several periods of channel incision that are evidenced in the Holocene stratigraphic record, and separated by extended periods of aggradation (Cooke and Reeves, 1976). Arroyos are defined by Elliot et al. (1999) as large-scale, continuous, and persistent erosional features created when stream channels incise into their alluvial valleys (Figure 25). The term arroyo is usually used to refer to incised ephemeral stream channels in the American Southwest, but it is important to note that incised channels have also been formed on intermittent streams and have been observed in many regions throughout the world.

Arroyo development is commonly thought to result from a combination of three factors: anthropogenic disturbance, changing climatic conditions, and/or intrinsic geomorphic conditions. Land-use change associated with overgrazing, farming, and timber harvesting was one of the first explanations for arroyo development (e.g., Thornwaite et al., 1942; Antevs, 1952; Cooke and Reeves, 1976; Fanning, 1999). Reduced vegetation and infiltration rates associated with these anthropogenic activities were widespread in the late 1800s, and likely increased both runoff and erosion.

Figure 25. Photograph of a small arroyo or incised channel, southern Colorado.

A factor that is mentioned less frequently in the literature on cyclic incision episodes is the reason why it is observed primarily in ephemeral stream channels. Aside from obvious differences in their discharge regime, the fundamental difference between ephemeral and perennial streams is that ephemeral stream channels are characterized by sizeable transmission losses when they flow. Numerous authors have documented substantial transmission losses in ephemeral streams, frequently to such an extent that flows infiltrate completely before reaching the watershed outlet (Keppel and Renard, 1962; Aldridge, 1970). Schumm and Hadley (1957) suggested that deposition as a result of seepage-induced discharge reductions in the downstream direction eventually causes dismemberment of the drainage system by the sealing off of tributary channels. Resulting increased valley gradients cause the formation of discontinuous gullies and reintegration of the system by arroyo cutting in the fills. Successive episodes of erosion and deposition are then thus the logical course of events as gradients adjust to differential filling along the profile. This explanation is consistent with observations of alternative erosion and aggradation following a flood event in Yuma Wash, a tributary to the Colorado River in southwestern Arizona (Merritt and Wohl, 2003).

Combining these observations under conditions characterized by high transmission losses and decreasing downstream stream power, aggradation will prevail. These conditions are altered during the highest flows when transmission losses are less significant, and increased stream gradients from prior deposition allow streams to cut into the valley fill. Subsequent smaller flows will be contained within the enlarged channel area and subject to reduced transmission loss and increasing stream power in the downstream direction. As a result they will continue to widen and deepen the channel until such time as the downstream distribution of stream power is again decreasing. Whether it is one flood event or a series of events closely spaced

in time that is needed to upset aggraded conditions has still not been resolved, and is likely to vary depending on a suite of other site-specific hydrologic conditions.

ii. Geomorphic response to land management

It is difficult to assess the stability of stream systems that are widely characterized as being in a perpetual state of flux. A single cycle of incision and deposition can last decades to centuries, and numerous cycles would have to be analyzed before it could be decisively concluded that any persistent change was taking place. Despite this, however, enough is known about the functioning of hydrologic and geomorphic systems to make very broad generalizations about the downstream effects of climatic and/or management changes. For instance, if upland surfaces are armored with impervious pavement due to development then it is known that there will be increased runoff (particularly from smaller storms), but less sediment delivered to the channels. Over time it can be expected with some confidence that increased erosion will occur in channels downstream of the developed area, as numerous studies have shown (e.g., Booth, 1990; Chin and Gregory, 2001; Semmens, 2004).

The management of arid and semi-arid lands drained by ephemeral stream channels has a direct impact on the hydrology and geomorphology of the drainage network. Indeed ephemeral streams may be more sensitive to anthropogenic disturbance than perennial streams (Bull, 1997). Impervious surfaces increase the frequency and magnitude of flooding. Storm sewers and lined drainages increase the rate at which these waters are delivered to the channel network, and thus further increase peak flows (Center for Watershed Protection, 2003). The primary geomorphic consequence of these hydrologic changes is the erosional entrenchment of adjacent channels and associated transportation of the excavated sediment further downstream. Ultimately, as headwater streams equilibrate to the new flow regime and their importance as a sediment source declines, channel entrenchment will likely shift further and further downstream.

The cumulative effect of many entrenching channels is a significant increase in sediment load in downstream waters, which may partly explain why many TMDLs in the Southwest are written for sediment. *TMDL* stands for "Total Maximum Daily Load," and is a written, quantitative plan and analysis to determine the daily maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and includes an allocation of that amount to the pollutant's sources (http://www.epa.gov/owow/tmdl/intro.html). In EPA Region 9, twenty out of twenty-six TMDLs that have recently been completed include sediment as one of the pollutants (http://www.epa.gov/region09/water/tmdl/final.html).

In addition to changes in channel form and sediment yield, the geomorphic response to anthropogenic disturbance can also have significant consequences for riparian ecosystems and water supplies. As streams become entrenched, formerly rich biological communities on the flood plain can become hydrologically disconnected from ephemeral streamflow and transform into dry terraces. Additionally, as channels become narrower and unconsolidated alluvial bed material is removed, there is less capacity to absorb passing flows and for vegetation to establish.

iii. Map scale in determining channel network and stream order

Map scale can influence the identification of a stream channel network, which is often the basis for watershed, basin and regional scale assessments of hydrologic systems and surface processes. As mentioned earlier, ephemeral stream channels are oftentimes the smallest channels in a watershed, or headwater streams, and make up a significant portion of the total stream network, making them important in watershed-based assessments. However, because of map scale, they frequently will not be represented on a map.

In conducting a watershed assessment, map scale will influence the level of detail of the drainage network (Miller et al., 1999a). The most common source of drainage network data is from 1:24,000-scale U.S. Geological Survey (USGS) topographic maps (i.e. blue-line streams) and studies have found that USGS 1:24,000-scale maps may grossly underestimate the number and length of drainage networks (Schneider, 1961; Leopold et al., 1964; Mark, 1983; Heine et al., 2004).

Heine et al. (2004) reported that USGS 1:24,000-scale maps under-represented drainage networks by 64.6 percent in a study in Kansas. Mark (1983) found in a study in Kentucky on twenty-nine small watersheds that USGS 1:24,000-scale maps under-represented the number of source channels with an average of 2.15 channels per watershed.

Miller et al. (1999a) compared drainage density of digitized stream channels using different resolution aerial photographs and USGS maps, and found that drainage density decreased with decreasing scale while the underlying structure of the drainage pattern was retained (Figure 26).

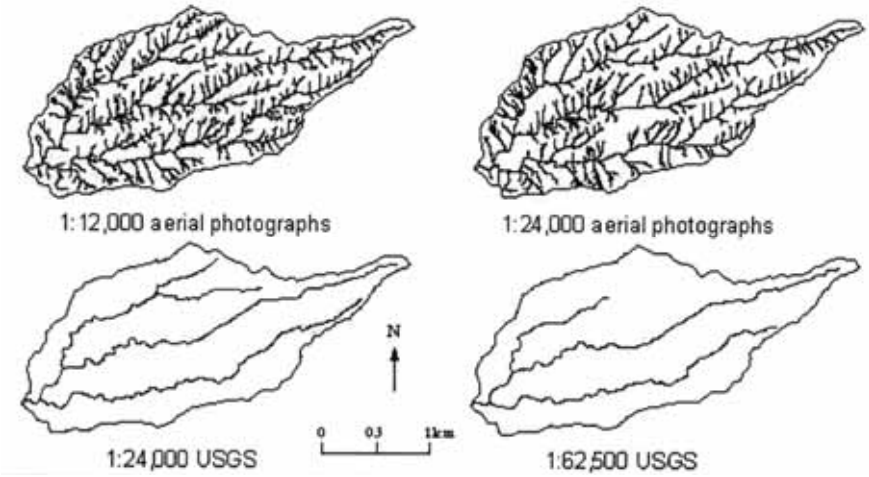

Figure 26. Diagram of digitized stream channels on a subwatershed at WGEW (from Miller et al., 1999a).

In a striking study of importance to arid and semi-arid environments, Leopold et al. (1964) examined the Arroyo de los Frijoles watershed near Santa Fe, New Mexico. Based on USGS 1:24,000-scale maps, the Arroyo de los Frijoles watershed had no identified stream channels;

however, after an examination of the contour patterns, the investigators found a potential drainage network with 258 first-order channels. A field study of one of the first-order channels revealed that its watershed actually contained 86 first-order ephemeral stream channels. The study by Leopold et al. (1964) illustrated that in arid and semi-arid environments even detailed examination of terrain data (i.e. contours or DEM) may still under-represent the number and length of ephemeral stream channels, making the use of "stream order" problematic.

c. Biogeochemical Functions

The biogeochemical functions of ephemeral and intermittent streams include cycling of elements and compounds, removal of imported elements and compounds, particulate detention, and organic matter transport. These functions influence water quality, sediment deposition, nutrient availability, and biotic functions. Biogeochemical features are affected directly and indirectly by land-use and land-cover change. Hydrologic modifications such as direct alteration of flow regime and hydrologic flow paths, and indirect alterations such as increased impervious cover in contributing areas of the watershed can cause biogeochemical changes. Elimination of the surface-water ground-water connection or disruption of the connection between a stream and its watershed by large-scale changes such as urban and suburban development also influence biogeochemical functions (Grimm et. al., 2004).

The spatial and temporal variability of rainfall in the arid Southwest affects the biogeochemical functions of ephemeral and intermittent streams. These systems are driven by pulse inputs of water, sediment, organic matter, and other materials during rain events. Periodic flows in ephemeral or intermittent channels have a strong influence on biogeochemistry by providing a connection between the channel and other landscape elements (Valett et al., 2005). This episodic connection can be very important for transmitting a substantial amount of material into downstream perennial waters (Nadeau and Rains, 2007) where it is an important component of perennial food webs (Jacobson et al., 2000b).

i. Cycling of elements and compounds

Cycling of elements and compounds refers to biotic and abiotic processes that cycle elements and convert compounds from one form to another (Lee et al., 2001, 2004) and is an essential ecosystem function performed by ephemeral and intermittent streams. Biotic processes include net primary production wherein plants and algae take up nutrients from the soil and water, and detritus turnover from which nutrients are released back into the ecosystem by microbial activity (Brinson et al., 1995).

Biogeochemical cycling primarily occurs through chemical transformation in response to redox potentials. These reduction and oxidation reactions are affected by the soil profile, wind inputs, and hydrologic input (Brinson et al., 1995). The recycling of elements and compounds is critical to maintaining their low concentrations in flowing water. As uptake and removal processes primarily occur at the water-sediment interface, physical characteristics such as channel depth and water velocity will affect nutrient recycling (Peterson et al., 2001). In addition, the amount of soil organic matter, coarse and fine woody

debris, and litter within the channel and soil profile will largely determine the ability of ephemeral and intermittent streams to perform certain biogeochemical functions (Lee et al., 2004). In hyporheic zones, there is substantial biogeochemical cycling of nutrients and trace elements, which are essential to aquatic life (Hibbs, 2008). Holmes et al. (1994) found that the parafluvial zone represents a significant source of nitrate to a nitrogen-limited stream ecosystem, which might be expected to contribute to ecosystem resilience following disturbance.

Alteration of channel characteristics (e.g., channel shape and depth) and organic matter input will affect the ability of streams to cycle materials. Because small streams have high surface-area to volume ratios, they are often able to take up and process nutrients at higher rates than larger perennial streams (Pinay et al., 2002), and are important for maintaining downstream water quality.

Water limitation in arid environments results in patchy, sparse vascular plant cover. As a result, algal and soil microbial activity is important for nutrient cycling in these environments (Belnap et al., 2005). Some dominant plant species such as mesquite (*Prosopis sp.)* living along ephemeral streams have nitrogen fixing bacteria associated with their roots, which can be an important influence on local nitrogen availability (Virginia et al., 1992).

Biological soil crusts, or cryptobiotic crusts, are a mixture of mosses, algae, microfungi, lichen and cyanobacteria that live on and just below desert soil surfaces. They are usually found in open, undisturbed areas where vegetation is sparse, for example in upland areas adjacent to ephemeral streams. These organic complexes help to stabilize desert soils, hold in soil moisture, fix carbon and nitrogen, and can stimulate plant growth (Belnap, 2003). In some soil types, biological soil crusts can increase infiltration rates. Biological soil crusts can determine the amount, location, and timing of water infiltration into desert soils, which, in turn, determines the type and size of microbial response. Nutrients resulting from this pulse then create a positive feedback as increases in microbial and plant biomass enhance future resource capture or, alternatively, may be lost to the atmosphere, deeper soils, or downslope patches (Belnap et al., 2005).

ii. Detention of imported elements and compounds

Headwater streams and wetlands are in a unique position to intercept nutrients and contaminants from upland environments before they reach larger perennial streams (Brinson, 1988). As water moves through small, shallow channels and comes in contact with sediment, vegetation, coarse and fine woody debris and soil organic matter, elements and compounds are removed from the water, either by direct uptake or by conversion into inactive forms. Important variables in assessing the capacity of ephemeral and intermittent streams to perform this function include the amount of vegetative cover and soil organic matter (Lee et al., 2004).

Nutrient uptake and removal occurs more rapidly in the small, uppermost channels in a watershed than in larger, downstream channels (Peterson et al., 2001). During intermediate storms, small headwater channels may serve as collection points for organic matter. Material accumulated during drier periods can be released downstream during large, infrequent storm

events (Fisher et al., 2001). In an Arizona watershed, Fisher and Grimm (1985) found that ephemeral streams retained between 50 percent and 90 percent of the nitrogen and phosphorous entering the stream during intermediate storm events. Several authors have hypothesized that headwater streams contribute significantly to downstream productivity (Freeman et al., 2007; Cummins and Wilzbach, 2005; Wipfli, 2005).

The temporally and spatially variable rainfall in the arid Southwest influences nitrogen processing and retention in small streams. Nitrogen cycling is dependent on soil moisture as some processes (e.g., nitrification) only occur in aerobic conditions while others (e.g., denitrification) only occur in anaerobic conditions (Pinay et al., 2002). Therefore, the degree of soil moisture will affect the end products of nitrogen processing, which will affect downstream waters. During high moisture condition (such as after a storm event), ephemeral streams may experience elevated rates of denitrification (Fisher et al., 2001; Rassam et al., 2006). Denitrification converts nitrogen to gaseous forms that can be lost to the air, thereby completely removing it from the system, which can be important in areas that receive excess nutrients from the watershed. Westerhoff and Anning (2000) found that ephemeral streams had higher total organic carbon (TOC) levels than perennial streams, suggesting that ephemeral streams are important for storing and processing organic material between large storm events. Because large amounts of material are only moved into larger streams during extreme rainfall events, much of the nutrient cycling may occur in the smaller streams.

iii. Particulate detention

Factors important in assessing the capacity of ephemeral and intermittent streams to retain particulates include floodway cross-sectional area, channel roughness, and sediment supply (Lee et al., 2004). Because headwater, ephemeral and intermittent streams comprise a large percentage of the total watershed channel distance, in combination they may have the capacity to store large amounts of sediment and particulates. When studying the seasonal dynamics of physical and chemical variables in perennial, intermittent and ephemeral streams, Dieterich and Anderson (1998) found that ephemeral streams were very effective in removing and storing suspended sediment from the water column. This stored particulate matter (e.g., sediment, plant fragments) can be released to downstream ecosystems during large storm events.

The amount of particulate retention will depend on the timing, duration, and amount of water received, as well as the characteristics of the stream channel and the integrity of the vegetative community around the stream (Brinson et al., 1995; Powell et al., 2007). Powell et al. (2007) found little net change in the removal and deposition of sediments in an Arizona ephemeral stream over a three-year period. However, individual storm events resulted in scour or fill depending on storm severity suggesting that ephemeral stream channels may undergo cycles of infill and erosion.

In the southwestern deserts, large amounts of sediment and other particulates are washed into small streams during storms due to compacted soils with low infiltration rates and sparse vegetation in the upland environment (Fisher and Minckley, 1978). Flow events that do not fully connect small streams to downstream waters will result in particulate matter accretion

and storage in the small stream. Sediment deposition in small streams can affect retention of organic material, for example by burying leaf litter (Brinson et al., 1995). Buried organic matter is processed and transformed in the stream sediments, thereby making it available for biological uptake (Richardson et al., 2005).

iv. Organic carbon export

Dissolved and particulate organic matter may be exported throughout the watershed through mechanisms such as erosion, flushing, displacement, and/or leaching (Lee et al., 2004). Organic carbon is the primary source of energy for microbial food webs and its export is critical to the productivity of down-gradient receiving waters (Allan, 1995; Wetzel, 2006). Variables involved in determining the capacity of ephemeral and intermittent streams to export carbon include the condition of the hydrologic connection to downstream reaches, shallow subsurface substrate permeability and porosity, soil organic matter content, shrub and herbaceous canopy coverage, amount and stage of decay of course litter, and coarse and fine woody debris (Lee et al., 2004).

Thoms et al. (2005) found that anabranch channels (channels that branch off the main river and rejoin it downstream) in Australia were important sources of organic carbon for main channels despite being connected only during flood events. Freeman et al. (2007) noted that headwater streams, which can make up most of the length in a river system, are the primary collectors and processors of terrestrially derived organic matter. For example, one study on the San Pedro River found that approximately 98 percent of nutrients came into the river during the summer monsoon thunderstorms from ephemeral tributaries, and that almost 60 percent of that input occurred as a flux of particulate matter (Brooks et al., 2007).

Organic material brought into and stored in small headwater streams, can be broken down and transformed into forms more readily available for use by biota in larger perennial streams (Richardson et al., 2005). This organic matter may originate from terrestrial sources or from algal growth within the stream channels. In arid and semi-arid environments, algae growth in the channel may be a more important source of organic carbon than terrestrial plants due to the low upland plant cover (Jones et al., 1996; Jacobson et al., 2000b). This was also confirmed by Brooks and Lemon (2007) who concluded that in the San Pedro River, high concentrations of organic matter, and especially high concentrations of nitrogen occurred with the inflow of monsoon runoff from lateral ephemeral tributaries.

The degree to which material will be transported out of streams depends on channel integrity and the condition of the downstream hydrologic connection. Organic matter may be transported in multiple ways including leaching, displacement, and flushing (Brinson et al. 1995). Surface runoff into headwater streams brings nutrients that may be stored and transferred to ground-water reserves (Fisher and Grimm, 1985; Belnap et al., 2005). The ground water containing nutrients may reemerge downstream in perennial waters or springs where they can be an important source of nutrients to plants and wildlife (Fisher and Grimm, 1985). Ephemeral and intermittent streams can contribute water and nutrients to perennial streams even in the absence of direct above ground flow.

d. Plant Community Support

Desert washes are easily recognizable by their dense corridor of vegetation that is in strong contrast to the more sparsely vegetated uplands (Figure 27). This corridor contributes to the disproportionately high biological diversity of desert environments relative to their total area (Warren and Anderson, 1985).

Vegetative communities along ephemeral and intermittent streams provide structural elements of food, cover, nesting and breeding habitat, and movement/migration corridors for wildlife that are not as available in the adjacent uplands. Functional services of these communities include moderating soil and air temperatures, stabilizing channel banks and interfluves, seed banking and trapping of silt and fine sediment favorable to the establishment of diverse floral and faunal species, and dissipating stream energy which aids in flood control (Howe et al., 2008).

In arid and semi-arid regions, plants have adapted to limited water, high temperatures, and high evaporation rates. These stresses are only partly alleviated in locations that concentrate water, whether they are perennial, ephemeral, or intermittent stream networks. Such areas are also subject to periodic disturbance from flood flows. Limited water and flood disturbance thus are key factors that structure the vegetation of ephemeral streams (Nilsen et al., 1984; Friedman and Lee, 2002).

Figure 27. Photograph showing dense corridor of vegetation lining an ephemeral wash, Agua Fria River, north of Phoenix, AZ. (Photograph: William Kepner, USEPA/ORD)

The factors affecting riparian vegetation in arid and semi-arid regions are not as well understood as in humid regions with perennial rivers. In turn, the influence of vegetation on ephemeral or intermittent stream systems is not well studied. It is, however, understood that the vegetative structure of desert landscapes reflects the effects of low rainfall. Regardless of low rainfall, even in the driest of deserts, there are productive patches (Whitford, 2002).

i. Physiognomy, density, and species composition

In ephemeral and intermittent streams, the structure and composition of the vegetation is related to the size of the stream and patterns of flow, although most of the diversity is comprised of herbaceous species (Bagstad et al., 2005). In their study of vegetation along the San Pedro River, Stromberg et al. (1996) found that depth to ground water and bottomland elevation and inundation frequency exerted the greatest influence on species composition, followed by soil texture, soil moisture holding capacity, light availability and site elevation. In another study along the San Pedro River, all annuals showed strong increases in richness and cover in the year following a large fall flood, while hydric perennials had a small net increase in richness, indicating that both disturbance and increased moisture conditions caused by floods, as well as moisture from seasonal rains, contribute to increased richness and cover of herbaceous plants in the bottomlands of the San Pedro River, a spatially intermittent desert river (Bagstad et al., 2005).

In regions with seasonal precipitation, depth to ground water is particularly important since ground water is closely coupled with stream flow to maintain water supply to riparian vegetation (Groeneveld and Griepentrog, 1985). As the hydrologic regime shifts from perennial to ephemeral, vegetation composition shifts towards more drought-tolerant species, vegetation cover declines, riparian woodlands give way to riparian shrublands, and canopy height and upper canopy vegetation volume decline (Leenhouts et al., 2006; Stromberg et al., 2007).

The composition of riparian vegetation along desert streams reflects the vegetation composition of its watershed. The plants growing along large ephemeral or intermittent stream channels or smaller ones below about 5,000 feet elevation include species that are obligately associated with riparian environments and ones that typify the surrounding desert uplands (Figure 28). The species composition of ephemeral and intermittent streams within the arid and semi-arid Southwestern U.S. thus varies widely depending on species composition of the watershed and floristic province, as well as with drainage size, climatic regime, latitude, longitude, elevation, aspect, and soil characteristics.

Figure 28. Photograph showing riparian vegetation along a desert stream, western Arizona.

Along small desert washes, vegetation composition and structure overlap considerably with those of the surrounding desert uplands (Bloss and Brotherson, 1979; Warren and Anderson, 1985) and consist primarily of small, xerophytic shrubs and trees. Stem and leaf succulents and perennial grasses often are present, and annual grasses and forbs become seasonally abundant during wet periods. Collectively, the drought-tolerant vegetation that borders ephemeral streams is referred to as xeroriparian vegetation (Johnson et al., 1984).

As water availability increases, the vegetation becomes increasingly distinct from the upland vegetation with respect to physiognomy and species composition. The vegetation becomes taller (Shreve and Wiggins, 1964) and tree canopy cover can increase (Sponseller and Fisher, 2006). Xeroriparian species are still present, but mesoriparian and hydroriparian species increase in abundance. Ephemeral streams with intermediate water availability support drought-tolerant shrubs such as wolfberry (*Lycium spp.*) or brickellbush (*Brickellia spp.*) and small-leaved trees such as acacia (*Acacia greggii*), blue palo verde (*Parkinsonia floridum*), or velvet mesquite (*Prosopis velutina*) (Hardy et al., 2004). Along intermittent and perennial streams, riparian scrublands include seepwillow or batamote (*Baccharis glutinosa*), broom (*Baccharis sarothroides* or *B. emoryi*), arroweed (*Pluchea sericea*), and tamarisk (*Tamarix chinensis*) (Brown et al., 1977). Broad-leaved trees with relatively high water needs (e.g., the mesoriparian species Arizona walnut (*Juglans major*), and the hydroriparian species Fremont cottonwood (*Populus fremontii*)) are typically sustained on large washes by floodwater stored in perched ground-water reservoirs.

The additional water availability in the bottomland and riparian zone of a perennial to intermittent stream in the Sonoran Desert results in greater plant diversity than the arid upland, as measured at temporal scales that capture seasonal variance in resource and disturbance pulses, and at spatial scales that capture the environmental heterogeneity of bottomlands. Although periodically limited by intense flood disturbance, diversity remains

high in bottomlands because of the combination of moderate resource levels (ground water, seasonal flood water) and persistent effects of flood disturbance (high spatial heterogeneity, absence of competitive exclusion), in concert with the same climatic factors that produce seasonally high diversity in the region (temporally variable pulses of rainfall) (Stromberg, 2006). For example, native palms (*Washingtonia filifera*) occur in only two locations in Arizona, both of which are washes (Figure 29).

Figure 29. Photograph of native palms (*Washingtonia filifera*) in Castle Creek, AZ. (Photograph: William Kepner, USEPA/ORD)

Vegetation structure also shifts as watershed size and flood intensity increase. On large, dry ephemeral streams with intense flood scour, species composition shifts towards pioneer species. For example, in Sonoran Desert washes, desert broom (*Baccharis sarothroides*), a pioneer xeroriparian shrub that produces prolific numbers of wind-dispersed seeds, was more abundant in washes as watershed size increased (Warren and Anderson, 1985). Other pioneer species include burrobush (*Ambrosia salsola*), a xeroriparian shrub that is adapted to disturbance through capacity for clonal growth, and desert willow (*Chilopsis linearis*), a drought-tolerant tree that produces wind-dispersed seeds. Zonation can occur between fluvial surfaces within an ephemeral-stream bottomland, with the pioneer species sometimes being more abundant in the active channel bed than on the stream banks or flood plain (Bloss and Brotherson, 1979).

ii. Primary productivity and plant water sources

Plant productivity in arid and semi-arid regions is often low for much of the year, punctuated by bursts of activity following rain and runoff events. For example, Smith et al. (1995) found that burrobush (*Ambrosia salsola*) is typically dormant (not actively transpiring) for most of the year in a desert wash setting.

Patterns of primary productivity and evapotranspiration vary depending on whether the main water source for the vegetation is direct precipitation, channel flow, or stored water

(Leenhouts et al., 2006; de Soyza et al., 2004). When stored water is accessible, productivity and evapotranspiration of plant species can be high for much of the growing season (Atchley et al., 1999). De Soyza et al. (2004) found that plants along an ephemeral stream channel responded more to channel flow than direct precipitation, indicating the importance of maintaining intact channel networks throughout a watershed.

Productivity patterns also vary seasonally depending on phenology, morphology, and physiological adaptations of the plant species. Some of the perennial plants that grow along desert washes are evergreen (e.g., creosote (*Larrea tridentata*)), and can maintain some level of productivity year-round. Others are summer drought-deciduous (e.g., desert lavender (*Hyptis emoryi*)), or winter cold-deciduous (e.g., desert ironwood (*Olneya tesota*)) (Nilsen et al., 1984).

iii. Temporal and spatial patterns of species diversity

Non-perennial streams with active flood regimes contain a high diversity of plant species that varies depending on the location within the watershed. The complex longitudinal gradients encompassing changes in flood intensity, climate, and water availability result in a wide range of biological conditions along the stream length (Lite et al., 2005; Shaw and Cooper, 2008).

During seasonal dry periods, plant species diversity levels along ephemeral stream channels typically are low, with values much lower than along perennial streams and also often lower than in adjacent uplands (Leitner, 1987). During seasonal wet periods, however, diversity levels along some ephemeral stream channels can equal that along perennial stream channels (Stromberg et al., in press).

Species type and composition are affected by flow regime. Stromberg et al. (2006) found that in the San Pedro River there is a sharp decline in the riverine marsh type as perennial flows become intermittent. As flows become more ephemeral, and the stream channel loses vegetation cover and widens, hydromesic pioneer forests (cottonwood-willow (*Populus fremontii-Salix gooddingii*)) give way to mesic pioneer shrublands (dominated by saltcedar *(Tamarix ramosissima),* an introduced species) as tolerance levels for survivorship relative to ground-water depth and fluctuation are exceeded.

Species diversity varies with seasonal rain and stream flow patterns, and also varies on longer temporal scales. Following infrequent large winter floods, stream flow can be sustained for several months in ephemeral stream reaches of large rivers that drain humid mountains. During this period of sustained runoff, the ephemeral stream washes can support a high density and diversity of wetland (hydroriparian) plant species (Stromberg et al., in press). These “ephemeral wetland” communities develop with a recurrence interval of perhaps once per decade or more, depending on the flow regime of the particular stream.

Water from rainfall and flood flows can trigger a pulse of germination of annual and perennial plant species in ephemeral streambeds (Figure 30). Because the dry-season cover of the woody vegetation is low, and cover of bare soil is fairly high, the seasonal resource pulses can

result in very high diversity levels in comparison to those of the more densely vegetated perennial streams.

Figure 30. Photograph of annual plant species in an ephemeral streambed following spring rains, southern Arizona.

Ephemeral reaches of spatially intermittent rivers maintain diverse soil seed banks (Stromberg et al., in press). Many of the plant species that establish along ephemeral stream channels during water pulses arise from soil seed banks. Along a spatially intermittent stream in central Arizona, the soil seed banks of ephemeral stream reaches included a mixture of species adapted to xeric, mesic, and hydric conditions (Stromberg et al., in press). For example, viable seeds of the wetland taxa *Juncus* (rushes) were found in ephemeral stream reaches. In contrast, wetland species were not found in the soil seed bank of a smaller tributary that was ephemeral over its entire length.

iv. Influences of vegetation on ecosystem processes

Miller (2005: p. 18) noted that "the most important functions in dryland ecosystems are those that control the retention of water and nutrient resources because productivity and diversity cannot be sustained in systems that fail to retain these resources." Vegetation in ephemeral stream channels plays a key role in resource retention by protecting soils from wind and water erosion, slowing floodwater velocity, and moderating temperatures. Ephemeral stream vegetation also influences biogeochemical cycles by providing leaf litter, and food and cover for wildlife. In some cases, vegetation can intercept rainfall, preventing it from infiltrating into the soil, and influencing the local water balance and ecosystem processes (Owens et al., 2006; Miller, 2005). Vegetation structure and diversity determine wildlife species diversity and abundance, and if a portion of habitat on which a species depends is damaged or destroyed, the breeding population of that species could be lost (Anderson and Ohmart, 1977),

Changes in the abundance or composition of the plant community thus affect an array of ecosystem functions and processes. Plants that have the greatest effects on the structure and functioning of dryland ecosystems are small trees, shrubs, sub-shrubs and perennial grasses (Whitford, 2002).

v. Vegetation and channel morphology

Vegetation in arid and semi-arid regions is largely controlled by the availability of water, with flood disturbance and edaphic conditions further shaping plant distribution patterns. Depending on attributes of the particular stream, the highest density of vegetation may occur along the stream bank or within the channel bed (Figure 31). By providing channel and stream bank roughness through standing or downed material, vegetation can influence flow velocities, flow depths, bank and flood plain erosion, and sediment transport and deposition, and can be a major factor contributing both to channel stability and to channel instability (e.g., Heede, 1985). Vegetation along the stream bank stabilizes the soil through the reinforcing nature of their roots, and prevents erosion (Groeneveld and Griepentrog, 1985).

In ephemeral stream channels, vegetation may establish on sand bars, and subsequently initiate the formation of various depositional features such as small current shadows, bars, benches, ridges, or islands (Tooth and Nanson, 2000). Spatially extensive assemblages of any plant species have the potential to alter geomorphology and geomorphic processes through bioturbation, alteration of nutrient or fire cycles, and patterns of succession (Lovich, 1996).

Figure 31. Photograph of vegetation growing in an ephemeral channel bed, Arizona. (Photograph: Lainie Levick/Aerial flight courtesy of Lighthawk, www.lighthawk.org)

In humid climates, the spatial distribution of riparian vegetation is related through the flow and associated disturbance regimes to fluvial landforms that create establishment sites or stress the persistence of established vegetation (Hupp and Osterkamp, 1996). "In semi-arid

and arid areas, bare sites are relatively abundant but water-availability, particularly in the seedling establishment phase, is especially limiting. Thus, in dry climates, patterns of establishment may be strongly influenced by surface flow (floods), whereas ground-water levels my greatly influence persistence" (Hupp and Osterkamp, 1996, p. 293).

vi. Vegetation and geochemical cycles

The dominant plant species of many ephemeral streams are leguminous trees that harbor nitrogen-fixing bacterial symbionts. These trees influence geochemical cycles and local pools of nitrogen (Virginia et al., 1992). The levels of nitrogen-fixation are related in part to plant productivity, and vary temporally and spatially along gradients of water availability.

The trees and shrubs that grow along ephemeral streams vary in the degree to which they resorb nutrients in senescing leaves. The nitrogen-fixing honey mesquite (*Prosopis glandulosa*) had the greatest resorption in one multi-species study (Killingbeck and Whitford, 2001).

e. Faunal Support and Habitat

The riparian environments created by ephemeral and intermittent streams in the arid and semi-arid Southwest provide and maintain important habitat for wildlife, and are responsible for much of the biotic diversity, yet the scientific literature on this topic is limited. The following sections present the current understanding of the contribution of ephemeral and intermittent streams to the biotic integrity of southwestern watersheds.

Riparian systems are one of the rarest habitat types in North America. In the arid Southwest, about 80 percent of all animals use riparian resources and habitats at some life stage, and more than 50 percent of breeding bird species nest chiefly in riparian habitats (Krueper 1993). It has been estimated that over half of all wildlife species in Arizona depend on riparian areas (Arizona Riparian Council, 2004). Riparian habitat is the area between the stream channel and the upland terrestrial ecosystems. The strongest contrasts between these areas are found in arid and semi-arid lands where water is a limiting resource (e.g., Ceballos, 1985).

Because ephemeral and intermittent stream channels have a higher moisture content and more abundant vegetation than the surrounding areas, they are very important to wildlife. Frequently, these streams may retain the only available water in the area, with perennial segments or permanent pools interposed wherever hydrogeological conditions allow. These isolated perennial waters can support fauna not found in an otherwise ephemeral system.

The microclimates created in and around ephemeral and intermittent streams are utilized extensively by wildlife, and especially by less mobile species that cannot avoid the harsh desert environment by moving to more favorable microclimates. As a result, these areas generally support the greatest concentrations of wildlife, providing the primary habitat, predator protection, breeding and nesting sites, shade, movement corridors, migration stopover sites, and food sources.

The importance of streamside or riparian vegetation communities to wildlife is well recognized (Carothers, 1977), and is heightened in the arid and semi-arid Southwestern U.S. due to the high ambient temperatures and intense aridity outside of the riparian community.

i. Spatial structure, connectivity, and corridors in wildlife habitat

The spatial structure of wildlife habitat is described by patch size, number of patches, density and distribution, in addition to the geometric complexity of the patches (Johnson and Lowe, 1985). The term "connectivity" has been used to describe how spatial arrangement and quality of elements in the landscape affect movement of organisms among habitat patches. The term "corridor" refers to a connecting feature in the landscape, and "habitat corridor" generally refers to a linear strip of vegetated land that provides a continuous or near continuous pathway between two larger habitat blocks (Bennett, 1999). One of the key functions of intact and functional migration corridors is to link patches in the landscape.

Ephemeral and intermittent stream channels provide important wildlife movement corridors in arid and semi-arid regions because they contain continuous chains of vegetation that wildlife can utilize for cover and food. In addition, during the summer monsoon season small floods create a more-or-less continuous corridor of water that allows dispersal of herpetofauna such as garter snakes and amphibians, which are active during the summer. Winter rains do not serve the same function, since the cold temperatures prevent much activity in amphibians or reptiles. This dispersal mechanism allows genetic interchange between subpopulations that are isolated for most of the year, and allows recolonization of sites where subpopulations may be lost due to drought or disturbance.

Various authors (e.g. Meyer et al., 2007) have recognized the importance of small stream and headwater habitats, including those of ephemeral and intermittent streams, as vital parts of the biological integrity of U.S. waterways. The degradation of these habitats and loss of their connections to larger streams have negative consequences not only to the inhabitants of these streams, but also for the diversity of downstream and riparian ecosystems, and the biological integrity of the entire river network.

Habitat fragmentation caused by human activities can jeopardize the survival of wildlife species by diminishing their ability to access the resources they need, retain genetic diversity, and maintain reproductive capacity within a population; however, conservation biologists have debated these concepts because of lack of detailed information (Hilty et al., 2006). Recent studies are attempting to clarify this issue. For example, in their study of predator use of corridors in the northern California wine-growing region, Hilty et al. (2006) found that mammalian predator detection rates were 11 times higher in riparian areas than in vineyard locations. More research into this topic is needed.

As previously mentioned, nearly 81 percent of all streams in the six Southwestern states are ephemeral or intermittent (USGS, 2006) and in many watersheds most stream channel reaches are ephemeral or intermittent. From a strictly numerical standpoint, then, the degradation of ephemeral or intermittent streams diminishes ecosystem functions in most southwestern watersheds.

The structural components of wildlife habitat are considered below in terms of the physical, vegetative, and hydrological contributions that ephemeral and intermittent streams provide to the landscape. Habitat needs vary according to species, but this overview treats larger taxonomic groups more generally.

ii. Physical habitat features

The habitat provided by desert streams contracts and expands dramatically in size due to the extreme variations in flow, which can range from high-discharge floods to periods when surface flow is absent. This spatial variation in habitat or ecosystem size is a fundamental, defining feature of these streams (Stanley et al., 1997).

Regardless of whether it is perennial, a stream affects the substrate it flows upon, creating habitat for various species of wildlife. Some physical features of wildlife habitat along ephemeral and intermittent streams include the deposits of river material (sediment and debris), the exposure of rock and subsurface soil layers by erosion, the provision of shade through topographic relief, the creation of microclimatic zones, and the sequestration of moisture and nutrients in alluvium.

River bank material provides shelter for numerous species of wildlife in the arid Southwest, including reptiles, amphibians, birds, mammals and invertebrates. Bank shelters are created through the action of water, wind, and gravity, independent of whether the river contains water year-round. In fact, dry wash embankments are notoriously full of small caves and crevices critical in the life of desert animals such as the desert tortoise (*Gopherus agassizii*) (Van Devender, 2002). These shelters not only provide refuge from predators, but also critical protection from extreme heat and aridity. Table 1 lists species observed to use riverine soil exposures in the Pima County, Arizona, area, and includes bats, birds, snakes, lizards, mammals, insects and amphibians.

Stream alluvium is often looser than the soils or colluvium of surrounding uplands, which enhances the potential for exploitation by specialized sand-burrowing species of wildlife. Woody debris swept in from the watershed collects in the flood plain and stream channel as flood wrack (brush piles), creating additional complex, high-value shelters. If the stream incision is deep enough, it may create a cooler canyon environment in which heat and moisture loss are retarded.

Table 1. List of wildlife species that use riverine soil exposures in Pima County, Arizona (source: Julia Fonseca, Pima County Office of Conservation Science and Environmental Policy, 2008).

Species	Soil exposure use
Townsend's Big-eared Bat	Roost, maternity roost
Western Pipestrelle	Year-round roost
Pallid Bat	Night roost
Myotis species	Roost, maternity roost
Mexican Long-tongued Bat	Roost, maternity roost
Lesser Long-nosed Bat	Roost
Burrowing Owl	Roost, nest
Barn Owl	Roost, nest
Great-horned Owl	Roost, nest
Common Raven	Nest
Rough-winged Swallow	Nest
Cliff Swallow	Nest
Black Phoebe	Nest
Say's Phoebe	Nest
Rock Wren	Nest
Green Kingfisher	Roost
Belted Kingfisher	Roost, nest
Western Diamondback Rattlesnake	Shelter, foraging
Mojave Rattlesnake	Shelter
Sonoran Desert Toad	Shelter
White-throated Woodrat	Nest
Rock Squirrel	Den
Desert Tortoise	Shelter, den
Desert Spiny Lizard	Shelter
Clark's Spiny Lizard	Shelter
Coyote	Den
Kit Fox	Den
Mud-dauber Wasp	Hive
Ringtail Cat	Den
Striped and Hog-nosed Skunks	Den
Kissing Bugs	Foraging
Javelina	Day camp
Raccoons	Foraging, shelter

iii. Vegetative habitat features

The abundance and diversity of riparian vegetation, as compared to uplands, is a critical wildlife habitat feature of arid and semi-arid region streams (Figure 32). Each of the plant

communities found along these streams offers distinct and notable habitat features to wildlife, summarized in Brown (2004).

Major washes with shallow ground-water zones are typically lined with phreatophytic trees including Fremont cottonwood (*Populus fremontii*), Arizona sycamore (*Platanus wrightii*), Arizona ash (*Fraxinus velutina*), distinctive shrubs such as willow (*Salix ssp*), seepwillow (*Baccharis ssp*), burrobrush (*Ambrosia monogyra*), and saltcedar (*Tamarix ramosissima*), or dense grass stands of sacaton (*Sporobolus ssp*). A special case is presented by those southwestern ephemeral streams carrying discharge of treated municipal sewage or other effluent.

Figure 32. Photograph of diverse riparian vegetation, Badger Springs Wash, Arizona.

Ephemeral and intermittent streams which lack a shallow ground-water system or effluent discharge nonetheless give rise to a distinctive vegetative habitat from the surrounding uplands, often referred to as xeroriparian habitat. Tree canopy of ephemeral streams generally includes subtropical legumes such as mesquite (*Prosopis ssp*), catclaw acacia (*Acacia greggii*), ironwood (*Olneya tesota*), and blue palo verde (*Cercidium floridum*). Netleaf hackberry (*Celtis reticulatata*) and Arizona sycamore (*Platanus wrightii*) have been identified as providing exceptional cover for nesting birds on intermittent streams (Powell and Steidl, 2002), and mesquite has been identified as the key provisioner of food for many migrating birds (Van Riper and Cole, 2004).

Krausman et al. (1985) found that xeroriparian vegetation provides forage, thermal cover, and travel zones. For example, deer in their Arizona study sites were much more dependent on xeroriparian systems than were deer in west Texas. In arid parts of western Arizona, many birds such as red-tailed hawks (*Buteo jamaicensis*), and Gila woodpeckers (*Melanerpes uropygialis*), can become dependent on ephemeral streams for nesting sites, as this is where large trees occur due to the increased moisture (Johnson and Lowe, 1985).

iv. Hydrological habitat features

Channel flow is a visually prominent aspect of the hydrological character of a stream, but it is seldom the only hydrological habitat feature of biological significance. A stream may also possess moist banks fed by capillary flow from ground water, which offer sites for turtle or insect reproduction. A hyporheic (subsurface) zone of flow with a distinct invertebrate fauna may underlie a dry streambed. Flooding, erosion, or man-made excavations can give rise to in-channel or off-channel pools where amphibians breed. Springs, which may exist within the stream channel or in the flood plain, can offer distinct chemical compositions or thermal refugia from the main stream. Stream diversion and irrigation systems may spread the river's flow into fields via irrigation canals lined with cottonwoods and willows, altering habitat conditions in both the aquatic and riparian communities. Together, these natural or man-made hydrological features provide a wide variety of important habitat conditions for aquatic and terrestrial organisms.

Stream corridors naturally guide the movement of wildlife. Movement is essential to wildlife survival, whether it be the day-to-day movements of individuals seeking food, shelter, or mates, dispersal of offspring (e.g., seeds, fledglings) to new areas, gene flow, migration to avoid seasonally unfavorable conditions, recolonization of unoccupied habitat after environmental disturbances, or shifting of a species' geographic range in response to global climate change (Beier et al., 2006).

v. Faunal abundance and distribution

Fauna using ephemeral or intermittent waters include fish, mammals, amphibians, reptiles, birds, and invertebrates. Most desert species have developed adaptations to the water-limited conditions of arid and semi-arid regions, allowing them to survive under adverse environmental conditions (Ward and Associates, 1973; Louw and Seely, 1982; Williams, 2006). The natural flow regime in arid lands is a key factor favoring native species over exotics that are adapted to lake and pond conditions (Minckley and Meffe, 1987; Poff et al., 1997). However, the variability of climate and flow regime, which influences species' abundance and diversity, makes evaluation difficult unless surveys are conducted over a period of years in different community types (Anderson et al., 1977; Boulton and Lake, 1992).

Habitat studies seldom partition the various microhabitats that water creates for wildlife, and do not often attempt to separate the natural continuum of flow conditions that exist in a given area into perennial and non-perennial components, particularly since such conditions may exist along the same stream at the same time. The following sections describe in greater detail wildlife uses and benefits of ephemeral and intermittent streams in arid and semi-arid lands, including the collective contributions that water itself makes to faunal composition of southwestern streams. Since habitat values differ among taxonomic groups, the discussion is grouped taxonomically.

Reptiles and Amphibians

Reptiles and amphibians are diverse and abundant in arid and semi-arid regions, and have a variety of physiological and behavioral adaptations that enable them to conserve energy and moisture during harsh conditions of high temperature or low humidity and survive in dry environments. These adaptations include behavioral heat avoidance involving going underground, becoming nocturnal or subterranean, reducing activity levels, developing resistance to dehydration, developing the ability to absorb water through their skin, developing the ability to use temporary waters for breeding, and having rapid larval and egg development. In addition, most arid and semi-arid region reptiles can withstand high levels of electrolyte levels in their body fluids, and have relatively impervious skin which reduces water loss (Stebbins, 1995).

Many researchers have noted that the high diversity of plants and the associated microhabitats in desert riparian systems provides preferred habitat for herpetofauna. Some herpetofauna prefer desert washes to other types of desert habitats, and have the highest number of habitat specific species than other desert habitat types (Jakle and Gatz, 1985). However, the data have been limited until recently. For example, at the Symposium on the Management of Amphibians, Reptiles, and Small Mammals in North America (U.S. Department of Agriculture, 1988), many of the presenters noted the lack of data on amphibians, reptiles and small mammals, possibly due to the difficulty in surveying them because of their small size and secretive habits, or because they have historically not been considered important.

Many, indeed most species of snakes and lizards preferentially utilize xeroriparian habitat because of the dense cover provided by the shrub, vine and groundcover layers of annual and perennial plants. Jones (1988) reported on an extensive survey by the BLM from 1977 through 1981 on Arizona's herpetofauna. This was one of the most comprehensive inventories of herpetological communities ever conducted in North America with 27,885 array-nights in 16 habitat types over a five-year period, on approximately 3,441.296 ha (8.5 million acres) of public land. It was also an important effort to associate herpetofauna with ecosystems. For the Mixed Riparian Scrub (also called xeroriparian) habitat type, the results indicated a high number of species and species diversity for snakes, amphibians, and lizards relative to the other habitat types. Figure 33 is a graph of the number of species (turtles, amphibians, snakes, and lizards) for each habitat type. Mixed Riparian Scrub (xeroriparian) is represented by the "MR" habitat type.

In their study of the herpetofauna at Organ Pipe Cactus National Monument, Arizona, Rosen and Lowe (1996) also found that xeroriparian habitat was preferred by lizard species and certain snake species and hypothesized that it was due to higher prey abundance, higher relative humidity, and the presence of denser vegetation for cover. During drought peaks, almost every non-riparian-dependent snake species used the xeroriparian habitat as refugia, although those that normally used that habitat type had a higher survival rate. They also found that lizard species were most abundant in mesquite woodland or bosque and xeroriparian habitats (see Figure 34). At Organ Pipe Cactus National Monument, mesquite

woodland is restricted to ephemeral and intermittent streams, and therefore constitutes a special type of xeroriparian habitat.

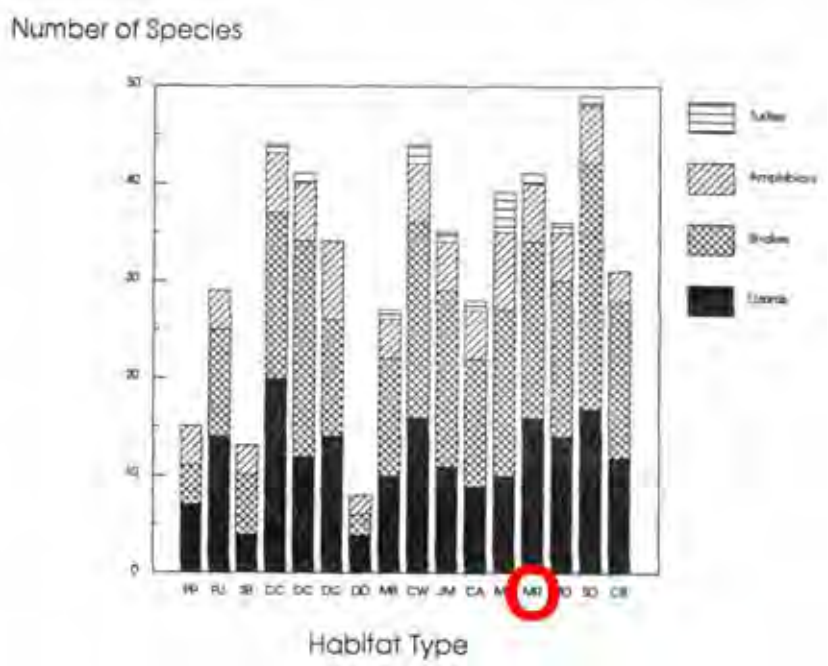

Figure 33. Graph of herpetofauna species by taxonomic group and by habitat type, from BLM surveys in Arizona, 1977-1981 (Jones, 1988). "MR" represents Mixed Riparian Scrub (xeroriparian) habitat type.

Rosen (2005), in his review of the herpetofauna of the 126-mile San Pedro River looked at the riparian herpetofauna assemblages in three reaches of the river from the Mexican border to the confluence with the Gila River. He looked at historic and current records and found a large number of species that occurred in the lower (mainly ephemeral) reach of the river that were not found in other reaches, although many species occurred in all reaches.

Baxter (1988) noted that in the Mojave Desert, washes are important habitat for the desert tortoise (*Gopherus agassizii*) although their burrows tended to be in the uplands. Because desert washes contain a highly diverse plant community, they were probably important foraging locations. McArthur and Sanderson (1992) studied plant associations in arroyos and uplands in southeastern Utah in relation to use by desert tortoise. They found that the arroyos with more shrubs and a rougher topography were good den sites and provided more succulent forage than uplands. In Arizona Upland Sonoran desertscrub, the desert tortoise is absent from the valleys, and occurs only along major upper and middle bajada washes and on rock slopes (Van Devender, 2002).

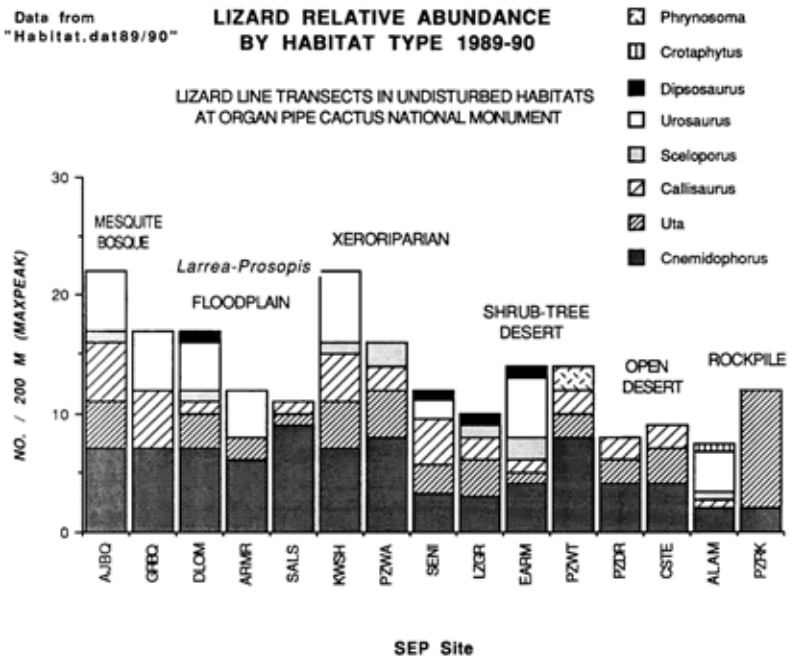

Figure 34. Graph of lizard abundance by habitat type at Organ Pipe Cactus National Monument, Arizona, 1989-1990 (from Rosen and Lowe, 1996). MAXPEAK is maximum peak value observed for all runs of transects within a habitat type at a site. SEP is the Sensitive Ecosystems Program.

Lowe (1985) discussed the obligate riparian turtle, snake, and amphibian species in riparian ecosystems in southern Arizona and adjacent Sonora, Mexico, and their local population extinctions. Many reptiles and amphibians depend on permanent springs, seeps, and ephemeral streams for their survival. Although these species are widely distributed throughout the region, their narrow ecological distributions and low densities make them extremely vulnerable to habitat degradation. Impacts to water quality and quantity, such as acid rain, ground-water pumping, and pollution, are the main threats.

Amphibians are not physiologically well adapted to dry desert conditions; however, they have developed several behavioral adaptations that allow them to survive there, including the ability to avoid the heat and dryness by burrowing underground for extended periods. Species that do not require permanent water may emerge from underground only after rainfall events (e.g., Couch's spadefoot (*Scaphiopus couchi)*). Some amphibians are also very tolerant of dehydration and can survive a water loss equivalent to about 40 percent of their body weight. They handle dehydration by decreasing the rate of urinary water loss and increasing the rate of water absorption through the skin. For example, some amphibians can extract water from moist soil (Mayhew, 1995).

The vast majority of amphibians spend at least part of their life cycle in water, but frequently only for breeding. At the Rincon Mountain Unit of Saguaro National Park near Tucson, Arizona, lowland leopard frogs (*Rana yavapaiensis*) depend on bedrock pools in ephemeral streams that retain water year round for breeding habitat (Parker, 2006). Other amphibian

species, such as the red spotted toad (*Bufo punctatus*), are found only in arid ecosystems (Mayhew, 1995). The canyon tree frog (*Hyla arenicolor*) is found along temporary, intermittent, and permanent streams, springs, and tinajas in rocky desert canyons in much of the Southwest, and uses the temporary pools during summer rains for breeding (Arizona-Sonora Desert Museum, 2007; Arizona Game and Fish Department, 2002). Photographs of some of these species are shown in Figure 35.

In a study of all known occurrences of the California red-legged frog (*Rana aurora draytonii*) in the Central Valley of California (n=143), approximately 64 percent were found in intermittent streams as opposed to perennial streams (Hayes and Jennings, 1988). Six amphibian taxa were captured on ephemeral streams in three southwestern sites by URS Corporation, an environmental consulting firm (2006), including salamanders, frogs, and toads. Tadpoles were commonly observed in longer-lived ephemeral pools.

Figure 35. Photographs of amphibians that inhabit and breed in ephemeral and intermittent streams (clockwise from top left): Canyon tree frog (*Hyla arenicolor*), lowland leopard frog (*Rana yavapaiensis*), red spotted toad (*Bufo punctatus*), Sonoran desert toad (*Bufo alvarius*, photograph: Shea Burns, USDA-ARS), Egg strand of Sonoran desert toad (photograph: Shea Burns, USDA-ARS).

Rosen and Lowe (1996) in their study of herpetofauna at Organ Pipe Cactus National Monument noted that anurans (toads and frogs) are closely tied to permanent or temporary

surface water that lasts long enough to allow their eggs to hatch and produce tadpoles. They found that anurans bred successfully in temporary pools in major washes and ephemeral springs. As little as 7.5 days may be required for the Couch's spadefoot (*Scaphiopus couchi*) to go from egg to toadlet, with a longer period required for the true toads (genus *Bufo*).

Upland desertscrub offers essentially no breeding habitat to the diverse array of summer-breeding toads and frogs characteristic of southwestern deserts and grasslands. The key natural environments for their breeding are the riparian flats along major valley washes, where scour holes in the silts and clays hold floodwaters long enough for tadpole development.

Birds

Birds, more than any other animal group, are highly dependent upon riparian and xeroriparian vegetation in arid and semi-arid lands even though they have the ability to migrate seasonally to find favorable climates. This is thought to be due to the vegetative structure, diversity and productivity of riparian areas as compared to surrounding uplands (Johnson et al., 1977; Ohmart and Anderson, 1982; Johnson and Haight, 1985; England and Laudenslayer, 1995; Kirkpatrick et al., 2007). In the Lower Colorado River Valley subdivision of the Sonoran Desert, dry washes occupy less than 5 percent of the area, but support 90 percent of its bird life (Dimmitt, 2000).

Some birds are particularly adapted to the hot, dry conditions found in deserts: they excrete waste in the form of a semi-solid, requiring one-tenth the water used by mammals; some have a nasal salt gland to excrete excess salts; they have higher body temperatures than most mammals and can tolerate a wide range of body temperatures; and they can store body heat during the day to be released in the cooler evening hours (England and Laudenslayer, 1995).

Kirkpatrick et al. (2007) looked at seventeen sites in southern Arizona (5 sites that had perennial flowing surface water, 9 sites that had intermittent surface water, and 3 sites that had ephemeral surface water) for avian abundance and species richness along riparian areas as compared to uplands. He found that avian species richness and abundance were substantially higher than in the surrounding uplands, even for the dry, ephemeral sites. This was attributed to the riparian vegetation. No association was evident between species richness and abundance in association with surface water at the community level; however, there was a positive association with the volume of velvet mesquite, which provides food sources (high densities of insects and other arthropods).

A study by Stevens et al. (1977) on seven paired sites (riparian and adjacent upland) in Arizona found that the importance of riparian habitat to migrant passerines is substantial. They found that the parameters influencing the use of riparian habitats included: specific habitat preferences of the bird (stop-over habitat selection); floral components (niche diversity and vegetation species composition); location of habitat (island situations and accessibility); and quality of the adjacent habitat (including the amount of grazing and other forms of impact).

Higher bird species richness was found in dry wash systems according to a study of bird use of desert habitats by the California BLM on sixty-six study plots. They found approximately 1.5 times as many breeding species (Kubik and Remsen, 1977; Tomoff, 1977; Daniels and Boyd, 1979a, 1979b) and about twice as many wintering species (Daniels, 1979a, 1979b; Henderson, 1979; Remsen et al., 1976; Tomoff, 1979a, 1979b, 1979c) in the dry washes. This demonstrated that these systems supported a greater diversity of species than did the more common desert scrub possessing overstory vegetation structure.

Skagen et al. (1998) compared migrating birds use of riparian corridors versus isolated oases in the San Pedro River and found that "Small, isolated oases [riverine vegetation isolated from similar vegetation patches] hosted more avian species than the corridor sites, and the relative abundance of most migrating birds did not differ between sites relative to size-connectivity." They concluded that the protection of both the small patches and the more extensive riparian corridors that link these patches is imperative, given the overall habitat limitation in western landscapes. They noted that these areas are critical in providing migration stopover areas, and therefore affect the breeding success of northern bird populations.

Ohmart and Zisner (1993) conducted an extensive literature review of riparian habitat in Arizona, which included perennial, intermittent, and ephemeral streams. They found that nearly every species of bird in Arizona was found in riparian habitats either for breeding, foraging, migration or wintering. This included fifty-seven ducks, geese, and waterfowl; twelve hawks, falcons, and eagles; forty-two shorebirds (breeding habitat); one quail; and seventy-eight songbirds and other birds.

Few studies attempt to separate the effects of water from vegetation on species diversity. In their survey of southwestern streams, Kirkpatrick et al. (2007) found a relationship between the abundance of four bird species (Black Phoebe (*Sayornis nigricans*), Wilson's warbler (*Wilsonia pusilla*), common yellowthroat (*Geothlypis trichas*), and song sparrow (*Melospiza melodia*)), and presence and extent of surface water. They were unable to determine whether the association with surface water might be caused by other factors, such as a higher arthropod biomass along "wet" streams (which included intermittent and perennial sites). The majority of bird richness or abundance was not explained by the presence of water, but was positively correlated with mesquite volume.

A study conducted by the Point Reyes Bird Observatory (PRBO, 2007) during conditions of extreme drought identified 120 bird species using dry washes in western Arizona, including twenty-five breeding species. Skagen et al. (2005) looked at the geography of spring bird migration through riparian habitats in the Southwest and found that all riparian habitat types were used to some degree.

Mammals

A wide variety of mammals inhabits the arid and semi-arid Southwest. Most have adapted to the harsh conditions and lack of water in one or more of the following ways: heat evasion (daily or seasonal estivation, diurnal or nocturnal behavior, or seasonal migration), water conservation, water storage, dehydration tolerance, heat tolerance, and heat dissipation (open-

mouthed gaping, or long appendages such as long ears). Many mammals burrow underground during the hottest part of the day to avoid the heat and increase water conservation.

Nearly all mammals must be able to find free water, making them dependent upon riparian areas to some degree where they can utilize temporary and permanent pools found in ephemeral or intermittent streams. However, some small mammals in desert environments, such as the heteromyid rodents, utilize riparian areas but never drink free water, having evolved to meet their water requirements through the metabolism of carbohydrates, an efficient renal system that concentrates urine, lack of sweat glands, and nocturnal habits (Kepner, 1978; Frank, 1988).

Mammals utilize dry washes in many ways. Krausman et al. (1985) determined that xeroriparian washes and their associated vegetation were an important component of desert mule deer (*Odocoileus hemionus*) habitat in Arizona (Figure 36). They noted that the greater plant densities and diversity in washes allowed deer to find the forage and cover they require. They also found that in central Arizona deer used washes 42 percent of the time in winter, increasing to 83 percent in summer. In the arid and hot King Valley, Arizona, desert mule deer used washes 99 percent of the time. Deer in these areas used washes for forage, cover, travel lanes, and birth sites.

Figure 36. Photograph of a desert mule deer (*Odocoileus hemionus*), Arizona.

Bellantoni and Krausman (1991), and Ragotzkie and Bailey (1991) found that female mule deer especially used xeroriparian or dry wash habitat for foraging during early summer. They suggested that in the Southwest, xeroriparian areas provide thermal cover, forage, and travel corridors for mule deer, and that these areas are most important during the hot, dry period of early summer. In addition, the increased stresses on female mule deer during pregnancy could increase this habitat selection. Other large ungulates, such as Desert bighorn sheep (*Ovis Canadensis*) utilize scattered isolated pools in desert washes (Jones, 1986).

Various authors have noted that collared peccaries (*Tayassu tajacu*) in Arizona used dry washes during certain times of the year for loafing and resting (Bigler, 1974; Bellantoni and Krausman, 1993), or as bedding sites and corridors (Ticer et al., 1998). Bellantoni and Krausman (1991) found that both mule deer (*Odocoileus hemionus*) and peccaries used dry washes for bedding.

When evaluating potential jaguar (*Panthera onca*) habitat, Hatten et al. (2003) found that riparian areas and major wash complexes, mountain ranges, and associated canyons are potentially suitable geographic features. Jaguars occupy a wide range of altitudes as long as food, water, and cover are available. Perennial and intermittent water sources within 20 km were considered important to dispersing jaguars in an arid environment. They noted that any sources of water, even ephemeral ones, may be important because they are usually associated with well-defined channels that serve as travel corridors, and contain riparian vegetation, a cooler microclimate, and higher prey abundance. Beier (1995) looked at juvenile cougar dispersal from their maternal home range in three corridors, including a desert arroyo, in southern California. The study found that the cougar used all three corridors even though few drainages had perennial water; however, seeps and springs were distributed throughout the area.

A variety of other small mammals utilize dry wash habitats and xeroriparian areas, including the Mesquite mouse (*Peromyscus merriami*) (Kingsley, 2006) and a wide variety of other rodents (Jorgensen et al., 1995; Kepner, 1978). Duncan (1990) found that spotted ground squirrels (*Spermophilus spilosoma*) often use dry, sandy washes for their burrows. Jorgensen et al. (1995) studied an arroyo in New Mexico to determine rodent use of the wash area (sandy bottom), terraces, and shoulders (stream banks). They found that the terraces and shoulders were used much more than the wash, and that most animals traveled parallel to the arroyo as opposed to perpendicular to it. This behavior may be due to the high vegetation density along arroyos that offers predator protection.

In Ohmart and Zisner's (1993) extensive literature review of wildlife usage of riparian areas in Arizona, they compiled a list of fifty-five mammals that use riparian areas in any way for breeding, foraging, cover or migration. They noted the importance of riparian areas to birds, bats and large mammals such as elk and deer for migration corridors, and that continuity of these areas was important for population expansion and genetic diversity in small vertebrates. They found that only a few mammals in Arizona, such as the river otter, beaver, muskrat, or water shrew, were truly tied to aquatic habitats. These species were unlikely to be found on non-perennial streams, with the exception of effluent-dependent ephemeral streams. For instance, beaver have reoccupied part of the Salt and Gila River systems near the 91st Avenue waste water treatment plant in Phoenix, Arizona.

Invertebrates

The abundant invertebrates associated with ephemeral, intermittent, and headwater tributaries are important contributions to the biological integrity of river networks. Invertebrates constitute a major portion of the faunal diversity of the earth, and the emergence of aquatic invertebrates from streams is a significant part of the food chain. For instance, Fisher (1991)

reported that flycatchers used a large portion of the insect biomass emerging from Sycamore Creek, Arizona, an intermittent stream.

Ephemeral streams contain rich assemblages of both invertebrates and macroinvertebrates. Kingsley (1998) conducted an extensive survey of the invertebrates at Organ Pipe Cactus National Monument, Arizona, and found a very high species richness in the wash habitats in the Ajo Mountains and Aguajita Wash. He noted that this was to be expected due to the diversity of microhabitats. This study described each of the nearly 1,000 taxa surveyed.

Many invertebrates require a hydrologic connection for their spatial dispersal, even if the connection is ephemeral or intermittent (Nadeau and Rains, 2007). Whiles and Goldowitz (2005) looked at macroinvertebrates in wetlands across a hydrologic gradient from ephemeral to perennial. Although this study was conducted in Nebraska, the results were interesting in that they showed the highest taxon richness and diversity at the intermittent sites. In northern California, Del Rosario and Resh (2000) compared invertebrates in the hyporheic zones of intermittent and perennial streams, and found that intermittent streams had lower densities, similar richness, but higher species diversity than perennial streams.

Intermittent streams in the Southwest provide food sources for the high numbers of macroinvertebrates found there. Disturbances caused by intermittent flows may actually facilitate high food quality and consequently high levels of insect production in warm-temperate desert streams (Fisher and Gray, 1983; Jackson and Fisher, 1986; Grimm and Fisher, 1989; Huryn and Wallace, 2000). For example, in Arizona, macroinvertebrate biomass in Sycamore Creek tends to decline following extended periods without disturbance (e.g., more than 60 to 80 days) because of reduced food quality resulting from cyclical coprophagy (the consumption of feces) (Grimm and Fisher, 1989; Huryn and Wallace, 2000).

Many invertebrates require standing water for part of their life cycle. For example, the caddisfly (*Limnophilus sp.*) requires water only for the egg, larva, and pupae stages of its life cycle; the adult is terrestrial (Erman and Nagano, 1992) (Figure 37). Other species live in sediment, either in encysted form, or within the hyporheic zone. Graham (2002) studied temporary pools in watercourses in Wupatki National Monument, Arizona. He found 22 taxa of aquatic macroinvertebrates and two taxa of amphibians. Ward and Associates (1973) noted that the life cycles of these species are triggered by specific temperature and/or water conditions, and they may remain dormant or aestivate during unfavorable or stress periods. Invertebrate species using ephemeral streams are generally good dispersers, either being swept in from the upland, moving in from the air, or colonizing from hydrologically separate perennial sources, including backwaters, pools, and off-channel ponds (URS Corporation, 2006).

Figure 37. Illustrations of caddisfly larva (www.scientificillustrator.com) (left), and caddisfly adult (www.nps.gov) (right).

Some crustaceans (Phylum Arthropoda, Class Crustacea, e.g., tadpole and fairy shrimp) are able to survive in temporary waters in ephemeral stream channels. Fairy shrimp can complete its life cycle, going from egg to egg, in seven days during summer, and two weeks during winter. As cysts, these creatures are able to dry with the mud and rehydrate later when water returns, hatching 24 to 36 hours after hydration (Carpelan, 1995).

URS Corporation (2006) sampled several ephemeral streams in Arizona, Colorado, and New Mexico during July and August of 2006. Most microinvertebrates were terrestrial, but eighty-six aquatic taxa, including copepods, ostracods, and cladocerans were detected. Seventy-seven aquatic macroinvertebrate taxa occurred in streams with known or likely upstream sources of colonizers, and thirty-five taxa occurred in those without. Macroinvertebrate taxa had a high degree of dissimilarity, either between study watersheds or within them (URS Corporation, 2006).

However, in general it is difficult to understand the dynamics of these communities in intermittent or ephemeral streams due to the irregular nature of the hydrologic regime and their high sensitivity to climatic fluctuations. Boulton and Lake (1992) suggested studying a number of sites over a period spanning several complete cycles of flow to assess adequately these complex interactions. Adams (2000) found that he was able to develop baseline biological conditions for water-quality assessment prior to urban development by sampling macroinvertebrates in ephemeral streams during periods of flow.

A typical conceptual model of the movement of invertebrates through a stream network is exemplified by Cummins and Wilzbach (2005), with headwater intermittent stream reaches responsible for delivery of invertebrates, sloughed algae, and detritus to the downstream perennial stream reaches (Figure 38). Although their research looked at whether fish were present as a criterion for inclusion in management plans, they noted that downstream reaches are always highly dependent on upstream processes, and that successful stream management should include the entire watershed.

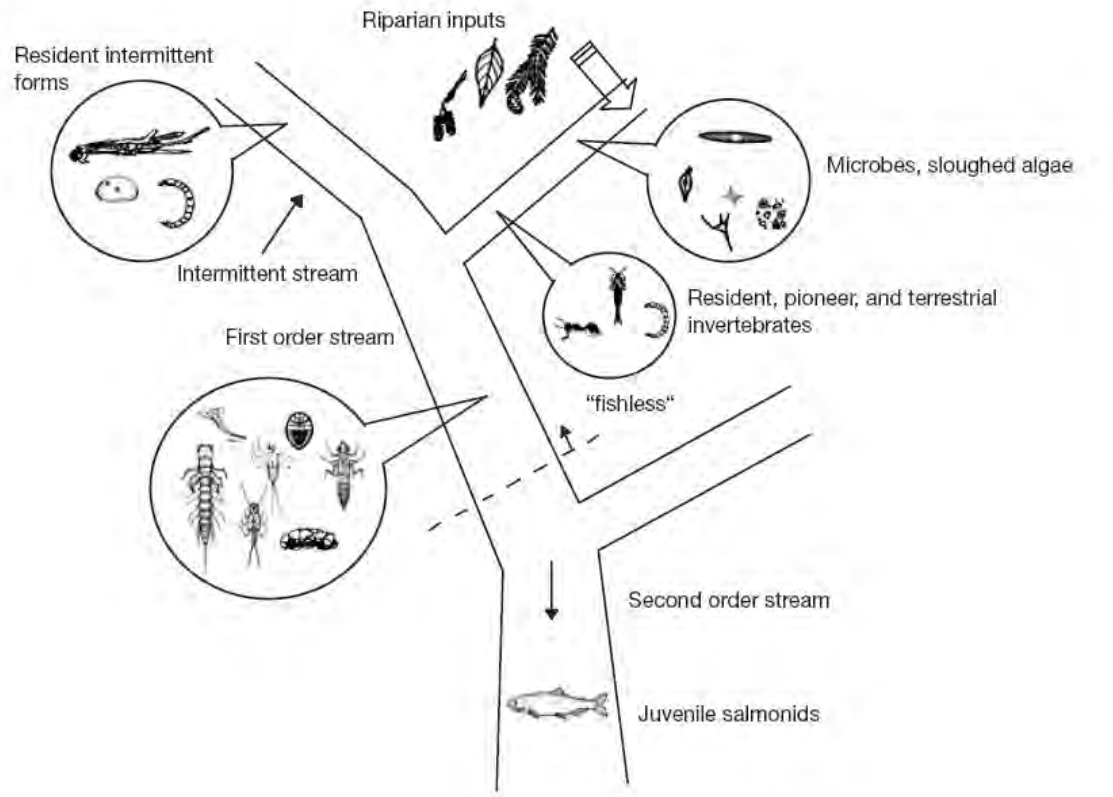

Figure 38. Diagram of a conceptual model of the delivery of invertebrates, sloughed algae and detritus from headwater streams, intermittent and permanent first-order fishless streams to larger fish-bearing streams, illustrating the dependence of downstream reaches on upstream processes (from Cummins and Wilzbach, 2005).

Fish

Native and non-native fish are abundant in perennial streams in the Southwest deserts. For example, seventy-five native fish species have been recorded in Arizona and New Mexico, many of them listed as endangered, although some have been lost due to habitat loss (Hubbard, 1977). Surprisingly, many species of fish, both native and non-native, can be found in isolated perennial pools in otherwise ephemeral or intermittent streams. For example, four fish taxa were collected during a one year study on ephemeral streams in southern Arizona by URS Corporation (2006), including two native species and two non-native species.

Native desert fish are adapted to the harsh and variable conditions of the desert. Pupfish (*Cyprinodon sp.*) can withstand the high temperatures, alkalinity, and salinity of small desert pools (Pister, 1995). Lema (2008) looked at environmental factors influencing phenotypic development of the seven species of pupfish inhabiting the fresh water pools, saline marshes, and small streams in the Death Valley system.

Although pupfish require permanent water, a few of the hardiest desert fish species can survive in areas that periodically go nearly dry, such as in intermittent streams. Longfin dace

(*Agosia chrysogaster*), for example, survive relatively high water temperatures and low water quality and quantity, and have been found alive in moist algal mats where there was not enough water to swim (Hulen, 2007; Rinne and Minckley, 1991). Longfin dace have the most widespread distribution of any native fish in the Southwest, and can disperse rapidly once flow returns (Rinne and Minckley, 1991). The Gila topminnow (*Poeciliopsis occidentalis occidentalis*) also withstands low flows, high temperatures and poor water quality of intermittent desert streams (Arizona Game and Fish Department, 2001).

Although ephemeral streams only temporarily support fish, they indirectly support fish populations by helping to deliver required nutrients and other materials to the perennial segments. Cummins and Wilzbach (2005) noted that ephemeral and intermittent streams are important suppliers of invertebrates and detritus to permanently flowing, receiving streams that support juvenile salmonids. They also acknowledged the connection between headwater streams and downstream perennial waters by noting that it is critical to maintain riparian cover in the headwater systems to prevent increased temperatures of the downstream delivery of water that would interfere with juvenile salmonids.

Intermittent streams are important to some fish species. Erman and Hawthorne (1976) found that trout production in California was dependent on intermittent streams. Over a four-year period, 39-47 percent of rainbow trout recruits in Sagehen Creek, California, came from an intermittent tributary that flowed only four months each year. Loggins et al. (1996) found that five native migratory cyprinid fishes were spawning in intermittent tributaries of the Sacramento River: Sacramento pikeminnow (*Ptychocheilus grandis*), hardhead (*Mylopharodon conocephalus*), hitch (*Lavinia exilicauda*), speckled dace (*Rhinichthys osculus*) and Sacramento sucker (*Catostomus occidentalis*).

Populations of native desert fishes are rapidly dwindling due to destruction of aquatic habitats from urbanization, channelization, land-use change, over grazing, ground-water pumping, dams, water diversions, and pollution (Rinne and Minckley, 1991).

f. Synthesis of Functions

Ephemeral and intermittent streams and tributaries provide a wide range of functions that are critical to the health and stability of arid and semi-arid watersheds and ecosystems in the American Southwest. Most importantly, they provide hydrologic connectivity within a basin, linking ephemeral, intermittent, and perennial stream segments, thereby facilitating the movement of water, sediment, nutrients, debris, fish, wildlife, and plant propagules throughout the watershed. They provide wildlife habitat and connectivity to perennial reaches by providing a relatively more vegetated and moister environment than do the surrounding uplands. The processes that occur during ephemeral and intermittent stream flow include dissipation of energy as part of natural fluvial adjustment, and the movement of sediment and debris.

Ephemeral and intermittent streams are responsible for a large portion of basin ground-water recharge in arid and semi-arid regions through channel infiltration and transmission losses. These stream systems contribute to the biogeochemical functions of the watershed by storing,

cycling, transforming, and transporting elements and compounds. Ephemeral and intermittent streams support a wide diversity of plant species, and serve as seed banks for these species. Because vegetation is more dense than in surrounding uplands, ephemeral and intermittent streams provide habitat, migration pathways, stop-over places, breeding locations, nesting sites, food, cover, water, and resting areas for mammals, birds, invertebrates, fish, reptiles and amphibians. In arid and semi-arid regions, the variability of the hydrological regime is the key determinant of both plant community structure in time and space and the types of plants and wildlife present.

Figure 39. Photographs of the Rillito River, Tucson, Arizona, dry (left) and with flow (right).

6. Anthropogenic Impacts on Ephemeral and Intermittent streams and Riparian Areas

Anthropogenic uses and activities on the landscape can have significant impacts – both good and bad – on water quality and the health of a watershed. Human-related disturbances are numerous and include livestock grazing, land clearing, mining, timber harvesting, ground-water withdrawal, stream flow diversion, channelization, urbanization, agriculture, roads and road construction, off-road vehicle use, camping, hiking, and vegetation conversion. Biological stressors include habitat loss, alteration, effluent discharge, and degradation from decline in water quality, and changes in channel and flow characteristics (Pima County, 2000).

The CWA has regulated many of these uses, but recent changes to the act have weakened or eliminated that enforcement. While many land owners voluntarily employ best management practices for water quality protection, not all do. However, in arid and semi-arid areas, where water is limited and systems do not recover quickly, it is especially important to employ best management practices for water quality protection whenever possible.

As noted earlier, ephemeral and intermittent streams and the adjacent riparian areas perform many of the same functions in a watershed as perennial streams. Especially in arid regions of the country, riparian areas support the vast majority of wildlife species, are the predominant

sites of woody vegetation including trees, and surround what are often the only available surface water sources. These features have made riparian areas attractive for human development, leading to their alteration on a scale similar to that of wetlands degradation nationally (National Research Council, 2002). This is especially true in arid and semi-arid regions because riparian areas are typically greener and cooler than other places. However, riparian areas in arid and semi-arid regions are more sensitive to development impacts than in wetter areas because of their limited geographical extent, drier hydrologic characteristics, and fragile nature (e.g., erodible soils).

In general, human-induced changes to natural hydrological regimes in desert streams reduce temporal and spatial heterogeneity of plant habitats, resulting in the loss of biodiversity and homogenization of plant community composition and structure. Given the ecological importance of plant communities in desert rivers (e.g., for channel bank stabilization and wildlife habitat), there may be significant secondary impacts as well. There is some evidence to suggest that restoration of natural hydrological regimes in ephemeral streams may be partly sufficient to reverse such deleterious changes in plant communities (see for example, Stromberg, 2001).

In the past, riparian habitats represented about 1 percent of the landscape in the West, and it has been estimated that within the past one hundred years, 95 percent of this habitat has been destroyed due to a wide variety of land use practices such as river channelization, unmanaged livestock utilization, agricultural clearing, water impoundments and urbanization (Krueper, 1995). Given the vast extent of ephemeral and intermittent streams and the accumulation of impacts to them over large areas in the rapidly developing southwest, a landscape or watershed-scale approach should be employed that considers the cumulative effects on overall watershed function. This section presents some of the types of human caused impacts on ephemeral and intermittent streams and their associated riparian areas.

a. Land Development

The ecological and hydrological value of ephemeral and intermittent streams has been under appreciated, especially with respect to land conversion and development. Land development includes urban, suburban and exurban development, but is referred to here as urban development.

The Southwest is one of the fastest growing regions of the U.S., having an increase in population of approximately 1,500 percent over the last ninety years. In contrast, the population of the country as a whole has grown by just 225 percent. Arizona and Nevada have grown the most with population increases of 2,880 percent and 2,840 percent, respectively. Most of the growth in Nevada has been in Las Vegas, with Clark County having a 90-year growth rate of 22,480 percent, growing from 3,284 people in 1900 to 741,459 people in 1990. Maricopa County (Phoenix), Arizona, had a one hundred year growth rate of 10,275 percent, with most of that growth occurring between 1960 and 1990 (Chourre and Wright, 1997).

Assuming that the significant trend in population growth in the Southwestern U.S. over the last ninety years continues, it is necessary to develop plans to manage and protect streams and riparian areas that consider cumulative impacts across a watershed. Water and natural resources need to be managed to accommodate future growth, and economies need to be examined to ensure a healthy environment (Chourre and Wright, 1997).

Urban development has the potential to change significantly the hydrologic characteristics of a watershed by covering uplands with impervious surfaces, and removal, channelization or armoring of small or headwater streams. Disruption of the natural stream network interferes with or destroys natural flow patterns and sediment-transport functions, resulting in downstream flooding and changes to the clarity and chemistry of the downstream flows. This can damage wildlife habitat and downstream water supplies for humans (National Wildlife Federation, 2007). Many land-preservation efforts have focused on upland areas, allowing the lowland bottomlands to continue being developed and degraded, although these areas support a rich biota (Rosen et al. 2005). In other areas, the bottomlands are protected from degradation, but not the uplands. Figure 40 shows a network of ephemeral streams that flows through a small community southeast of Tucson, Arizona, to Cienega Creek, a protected perennial stream.

Figure 40. Aerial photograph showing ephemeral tributaries to Cienega Creek, a perennial stream, flowing through the small community of Vail, southeast of Tucson, Arizona. (Photograph: Lainie Levick/Aerial flight courtesy of Lighthawk, www.lighthawk.org)

The influence of impermeable surfaces associated with urbanization increases as the percentage of impermeable surface increases. Various studies have shown that semi-arid stream systems become irreparably impaired once the impervious surfaces within the watershed exceed about 10 percent, and experience dramatic morphological changes once that

percentage exceeds about 20 percent (Coleman et al., 2005; Miltner et al., 2003; Schueler, 1994).

As the amount of impervious surface increases, runoff increases and infiltration decreases, starting a chain of events that includes flooding, erosion, stream channel alteration, increases in man-made pollutants, and ecological damage. Floods will become more severe and more frequent, and peak flows will be many times greater than in natural basins. The greater volume and intensity of flooding will cause increased erosion and sedimentation downstream. To facilitate the increased flow and sediment load, streams in urbanized areas tend to become deeper and straighter over time. The resulting bank erosion destroys valuable streamside or riparian habitat and tree cover, leading to higher temperatures, sedimentation, and disruption of habitat. Ground-water recharge will also be reduced as rainfall runoff leaves the watershed more rapidly than before (University of Connecticut, 1994).

Storm sewers and lined drainages increase the rate at which water is delivered to the channel network, and thus further increases peak flows and erosion. Sedimentation is increased during construction and road building for new urban areas. Improperly constructed and maintained roads, especially dirt roads, can cause alterations to hillslope drainage, and alter baseflow and precipitation-runoff relationships, resulting in erosion and sedimentation into the streams (USDA, 2002). The primary geomorphic consequence of these hydrologic changes is the erosional entrenchment of adjacent channels and associated transportation of the excavated sediment downstream, causing a significant increase in sediment load. Urban areas require storm water management plans both during and after construction to control polluted runoff.

Water-quality impacts from urbanization include nonpoint source pollution, considered to be the single largest water quality threat in the U.S. Pollutants include pathogens, nutrients, toxic contaminants, sediment, and debris. Sediment is of particular concern because many other pollutants tend to adhere to eroded soil particles. These changes to a stream system's form and function result in degraded systems no longer capable of providing good drainage, healthy habitat, or natural pollutant processing (University of Connecticut, 1994).

Stream channelization is often applied in urbanizing areas to protect private property and control stream bank erosion. However, channelization straightens and steepens the stream, resulting in increased flow velocity and sediment movement. It also reduces moisture content along the stream banks by reducing out of bank flows which disrupts water, sediment, organic matter and nutrient enrichment of the flood plain (National Research Council, 2002). In addition, removal of vegetation as part of the channelization process degrades wildlife habitat.

Many authors have noted that habitat fragmentation is one of the consequences of urbanization (University of Connecticut, 1999; Aurambout, 2003; Hilty et al., 2006). New developments can alter large areas of land, removing natural drainage systems and wildlife habitat, and replacing them with houses and roads. Altering, bisecting, or channelizing streams can effectively eliminate the main biological functions of the stream channel by disrupting vegetation communities and hydrologic function. Habitat fragmentation reduces wildlife diversity and abundance, and may cause sensitive species to disappear (University of

Connecticut, 1999). A study by the California BLM that inventoried sixty-six study plots for bird use of desert habitats noted the heavy recreational uses of washes, and the related disturbance to wildlife and habitat degradation (England and Laudenslayer, 1995).

b. Land Uses

Besides urbanization, agriculture (livestock and crops) and mining are other major land uses in the desert southwest. Livestock grazing is one of the more common uses of rural land in the Southwest, and has historically been a large part of the economy. It occurs primarily on state or federal land, but also on private land. In many areas livestock are provided with watering sources, but frequently they must depend on the streams for water. Livestock management plans attempt to avoid overuse of an area, but because water is scarce in arid environments, cattle and wildlife tend to linger near water sources. When they are not properly managed, and remain too long in a riparian area, cattle can trample stream banks, eat the riparian vegetation to the ground, contaminate the water with wastes, and compact the soil. In addition, livestock grazing can introduce exotic plant species from hay or feed brought in from outside the area. Non-native plants may out-compete native species, causing disruption of natural ecosystem functions. (Pima County, 2000).

It has been estimated that by the late 1800's over one and one half million cattle were in Arizona, with another two million in New Mexico. Around that time the Southwest was experiencing its typical climatic pattern of drought and unpredictable rainfall patterns. The resulting desiccation of the uplands drove cattle to the riparian areas, which were heavily damaged as a result. When the rains returned to the denuded landscape, erosive processes took over and down cutting began, forming deep arroyos and lowering the ground-water reservoir. Marshes and riparian vegetation disappeared (Rinne and Minckley, 1991; Krueper, 1995).

A study by Siekert et al. (1985) on grazing impacts on ephemeral streams in Wyoming found that seasonal grazing had an impact on channel morphology. Specifically, spring grazing had no effect, but summer and fall grazing resulted in increased channel cross sections. These impacts in and along a stream channel can cause reduced stream bank stability, decreased ground-water recharge, water quality degradation, increased erosion and sedimentation, removal of vegetation, increased flood risk due to reduced vegetation cover, and dispersal of exotic plants. Many sources have stressed that the cumulative impacts of unmanaged livestock in southwestern riparian ecosystems for the past several hundred years has probably been the single most important factor in riparian ecosystem degradation (e.g., Krueper, 1995; Wagner, 1978; Ohmart, 1995).

Reducing damage to riparian vegetation from over-grazing by livestock is important in arid and semi-arid regions. Riparian vegetation helps stabilize stream banks, reduce water temperatures and evaporation through shading, and provides food and habitat for wildlife. Although in the past it was thought that removal of stream bank vegetation would increase stream flow, recent studies have shown that in some places open water has higher annual water losses from evaporation than riparian trees from evapotranspiration (Leenhouts et al., 2006).

Mining is another activity that historically has had a large place in the economy and land use in the American Southwest. Some of the largest copper and gold mines in the world are found here, and some cover many thousands of hectares. However, mining can cause major impacts on riparian areas both adjacent and downstream by altering the local hydrology. Mining not only dewaters the area, it removes vegetation and soil and changes the topography, severely impacting the watershed. Instream and flood plain gravel mining can cause alteration to the channel dimensions and increase sediment yield. Mining can also decrease water quality by leaching heavy metals and toxic chemicals into the surface and ground water (Ecosystem Restoration Web site, accessed Sept. 12, 2008, http://ecorestoration.montana.edu/mineland/guide/problem/impacts/default.htm)

Agriculture has had a long history in the southwestern deserts, and areas such as the Central Valley in California provide much of the country's food supply. However, most crops must be irrigated due to the low annual rainfall. Impacts to local hydrology from agricultural activities include:

- Increased salinity caused by clearing of native vegetation which raises the ground-water reservoir;
- Reduced flows from ground-water pumping or stream diversions for irrigation;
- Increased nutrients and turbidity from the use of fertilizers that run off into the streams across the land surface or through the soil, causing excessive algae growth;
- Fish, aquatic invertebrate and bird kills from pesticides that run off into the streams or leach into the ground water.

(from South Australia Environmental Protection Authority Web site, http://www.epa.sa.gov.au/water_impact.html, accessed August 7, 2008)

c. Water Resources Impacts

The Southwest has experienced rapid growth over the past several decades, straining the already limited water resources. Lack of surface water flows has placed increased reliance on ground water for domestic, industrial, and agricultural uses. Ground-water pumping creates a chain reaction of events that impact the local and regional ecology.

Ground-water pumping lowers the ground-water reservoir killing near-channel vegetation whose roots no longer reach the aquifer, or desiccates the subsurface to the point that flow frequently is reduced (Stromberg et al., 1996). As riparian vegetation dies, stream banks become unstable due to the loss of the reinforcing nature of the plant roots, resulting in bank erosion (Groeneveld and Griepentrog, 1985). Lowering of the ground-water reservoir helps the invasion of exotic and drought tolerant species. Alteration and degradation of riparian vegetation can adversely affect wildlife species and human uses of those areas.

Dams and retention or detention basins are frequently used in the Southwest to store water or as flood-control devices. They disrupt natural surface flow and sediment transport, interfere with natural geomorphic processes, alter water temperatures, and fragment the natural stream systems both upstream and downstream of the structure. Upstream locations may experience

flooding, whereas downstream locations may be dewatered and become sediment starved. As a result, both vegetation and wildlife communities are altered.

Ephemeral and intermittent streams in the Southwest are often the recipients of effluent from waste water treatment plants. Depending on the level of treatment, effluent can have various effects on the stream ecosystem. For example, Walker et al. (2005) compared four effluent dominated waters in Arizona and found that aquatic macroinvertebrates were most affected by the levels of nitrogenous species, especially un-ionized ammonia, and mean diel dissolved oxygen. Specifically, diversity decreased with increasing levels of nitrogen.

As human population in the desert Southwest continues to grow, water resources will become even more stressed. Ground-water pumping has long been an important source of water in these areas; however, ground-water depletion, ground surface subsidence and impacts to riparian areas are becoming more common. Further research and understanding of the surface-water ground-water interactions is needed for better management of these resources (Phillips et al., 2004; Newman et al., 2006).

d. Climate Change

Most climate models predict severe changes for the southwest U.S., including increased warming and drying, intensification of droughts, and increased variability of precipitation. These changes will result in less runoff, reduced snow packs, changes in streamflow patterns, longer and hotter growing seasons, shifts in vegetation growth patterns, and changes in wildfire regimes (CIRMOUNT Committee, 2006; Betancourt, 2007). The Intergovernmental Panel on Climate Change (IPCC) model simulations suggest that the hydrologic cycle will become more vigorous, with the possibility of greater droughts and/or floods in some regions and reduced occurrences of these phenomena in other areas (Thompson, 1997). Most of these impacts are already occurring to varying degrees, but acceleration over the next century will make management of land and water resources more complex.

7. Discussion

a. Clean Water Act Context

The goal of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters," and to prevent pollution of those waters. Historically, desert washes have been considered to be jurisdictional under the CWA (for example, 408 F.3d 1113 Save Our Sonoran, Inc. v. Flowers). However, as a result of the Supreme Court decision in the consolidated cases *Rapanos v. United States* and *Carabell v. United States* ("Rapanos," 2004), the definition of the Nation's waters or waters of the United States jurisdictional under the CWA has required additional clarification, specifically with respect to tributaries that are "not relatively permanent" (i.e. ephemeral or intermittent streams). Recent guidance from the U.S. EPA and Army Corps of Engineers (U.S. Environmental Protection Agency, 2007) requires that a "significant nexus" exist between a non-relatively permanent tributary and a traditional navigable water of the United States for the tributary to be jurisdictional under the

CWA. This significant nexus evaluation must consider flow characteristics and functions of the tributary to determine if it has a significant effect on the chemical, physical, and biological integrity of downstream traditional navigable waters.
We believe that the information presented in this report shows that ephemeral and intermittent streams in the arid and semi-arid Southwestern U.S. are ecologically and hydrologically connected to downstream waters, and have a significant effect on the chemical, physical, and biological integrity of those waters.

Connectivity in non-perennial streams, however, can be difficult to demonstrate owing to a lack of data. Stream gages and water quality monitoring sites tend to be in perennial reaches, for example. Most ecological studies on wildlife or vegetation have been conducted in wetter environments or in the uplands. Nevertheless, hydrologic models suggest that in arid and semi-arid region watersheds flow in small tributaries does reach the perennial stream courses (see for example Levick et al., 2006). Other studies have shown that non-perennial streams contribute nutrients, seed sources, or spawning areas necessary for biological and aquatic health in downstream perennial waters (see for example Erman and Hawthorne, 1976; Howe et al., 2008).

b. Ecosystem Goods and Services

Many sources recognize that the ecosystem goods and services provided by natural systems are critical to the healthy functioning of the natural environment. They also recognize the significant contribution of these goods and services to human welfare and well-being, both directly and indirectly, and therefore the contribution to the overall social and economic value of the natural environment.

Ephemeral and intermittent streams are integral parts of a watershed, and their condition affects the health of the entire ecosystem. Healthy ecosystems perform a diverse array of functions that provide goods and services to society. In this context, "goods" refers to materials that can be sold (e.g., drinking water, tourism, or timber), whereas "services" provide value but cannot be sold (biodiversity, wildlife habitat, or nutrient cycling) (Whiting, 2000; Wilson et al., 2004)

The Millennium Ecosystem Assessment (2005b) reviewed the consequences of ecosystem change on human well-being. Their multi-year study, published in 2005, presents a state-of-the-art scientific appraisal of the condition and trends in the world's ecosystems and the services they provide, as well as the scientific basis for action to conserve and use them wisely. The report defines *well-being* as including "the basic material needs for a good life, the experience of freedom, health, personal security, and good social relations, which together, provide the conditions for physical, social, psychological, and spiritual fulfillment."

From the Millennium Ecosystem Assessment (2005b):

> Human well-being is supported by ecosystem services, which refers to the benefits received by people from an ecosystem. These may include:

- *provisioning services* such as food, water, timber, fiber, and genetic resources;
- *regulating services* such as the regulation of climate, floods, disease, and water quality;
- *cultural services* such as recreational, aesthetic, and spiritual benefits; and
- *supporting services* such as soil formation, pollination, and nutrient cycling.

Ecosystems also have value for human well-being through the cultural services they provide, through, for example, totemic species, sacred groves, trees, scenic landscapes, geological formations, or rivers and lakes. These attributes and functions of ecosystems influence the aesthetic, recreational, educational, cultural, and spiritual aspects of human experience. Many changes to these ecosystems, through processes of disruption, contamination, depletion, and extinction, therefore have negative impacts on cultural life and human experience.

In most cultures and regions, people generally prefer the aesthetics of natural environments over built-up or urban ones. For example, real estate values tend to be higher near protected open space, and reflect the willingness of people to pay for this amenity (Wilson et. al., 2004). The benefits provided by nature have inspired art, music and clothing throughout human history. Development and degradation of natural areas have reduced these benefits. The use of natural areas for recreation and tourism is growing as populations increase. Nature travel continues to increase, as does nature tourism, or eco-tourism.

The previous sections of this report demonstrate that ephemeral and intermittent streams provide all of these ecosystem services, and therefore support overall human well being in the arid and semi-arid Southwest. One of the strongest points made in the Millennium Ecosystem Assessment was the powerful impact of ecosystem degradation on people with lower incomes, especially in developing countries. Lower income people depend more on natural areas for well-being than more affluent people because they are less able to replace the ecosystem services with purchased goods.

Although the Millennium Ecosystem Assessment report (2005b) did not address specific ecosystems, such as ephemeral and intermittent stream systems, it did make a strong case for the value of local ecosystems to the cultural diversity and cultural identity of a society. People have historically identified with their environment for their sense of culture and value systems. This is especially true in arid and semi-arid areas where water is a major concern that receives significant attention and focus. Areas where water concentrates are cherished and valued, whether or not permanent water is present. Desert cultures have traditionally based their lives around water, rainy seasons and the times when the rivers flowed. This is still true in the desert today: whenever it rains enough to cause the ephemeral streams to flow, people flock to the rivers to watch the water (Figure 41).

Figure 41. Photograph of the Santa Cruz River, Tucson, Arizona, during summer monsoon flows. (Photograph: unknown)

c. Management Principles

Ecologically responsible land management attempts to meet economic and social objectives while maintaining environmental health. It requires a landscape or watershed-scale approach that considers cumulative impacts to ensure that all physical, biological, and chemical components function together. For example, both the upland areas of a watershed and the riparian or stream course areas must be in a healthy functioning condition for the entire watershed to be healthy and to supply clean water for human and ecosystem use, and in many cases, food and fiber production.

Landscape or watershed health can be described as a measure of the balance of anthropogenic uses and ecological function or integrity (Jones et al., 2002). Ecological integrity is the condition in which the productivity of resources and ecological values, including diversity, are resilient to disturbance and maintained for the long term (Reynolds, 1995). It involves maintaining biodiversity, biological productivity, and ecosystem processes. Important aspects of ecosystem integrity include energy flow through the food web, water and nutrient cycles, disturbance/recovery cycles, biotic diversity, evolutionary processes, and human influences. These characteristics and processes function at various rates and across multiple scales. Maintaining ecosystems requires maintaining these processes; it is not sufficient to only preserve the individual pieces (Institute for River Ecosystems, 1997).

The management of arid and semi-arid lands has a direct impact on the hydrology and geomorphology of the drainage network, in addition to wildlife habitat. Bull (1977) noted that ephemeral streams are much more sensitive to climate or anthropogenic disturbance than are perennial streams. Nadeau and Rains (2007) discussed a management approach that considers how hydrological and ecological systems function at various temporal and spatial

scales. They described a watershed management approach that uses an integrated set of tools (federal, state, tribal, local) and programs (voluntary and regulatory), includes all stakeholders, and applies an iterative planning or adaptive management process to address strategically priority water resource goals.

In arid and semi-arid regions, the functions of ephemeral and intermittent streams must be recognized and appreciated to protect and manage them properly; they must not be relegated to second-class status as compared to wetter systems elsewhere in the U.S. Ephemeral and intermittent streams should not be considered in isolation from the entire watershed. Given their vast extent and the accumulation of impacts to them over large areas in the rapidly developing southwest, a landscape or watershed-scale approach should be employed that considers the cumulative effects on overall watershed function. Ecosystem protection would be meaningless and ineffective if these supporting waterways were significantly degraded.

d. Research Recommendations

Many of the underlying physical, ecological, and biological processes and linkages in arid and semi-arid region systems are not well understood or documented. This general lack of information specific to ephemeral and intermittent streams in the arid and semi-arid Southwest leaves a wide range of research opportunities. For example, linking knowledge of past hydrological and channel changes to present-day changes in arid and semi-arid region streams should be a key research priority (Tooth, 2000a).

Nadeau and Rains (2007) noted the need for long term, large-scale monitoring and research that are integrated across spatial and temporal scales to help provide the theoretical and empirical foundations necessary to identify problems and problem sources. For example, more research is needed to determine and classify the suites of flora and faunal species dependent on ephemeral and intermittent streams, and their preferred habitat types. Instrumenting more arid and semi-arid region watersheds with precipitation and stream flow gages would greatly advance the understanding of these systems.

The protection of intact sites and the establishment of “representative” sites would provide reference areas for future studies and comparisons with impacted areas. Predictive models are needed to understand the consequences of alternative management actions on hydrological, ecological, economic and social systems.

Regarding wildlife, a better understanding of the species that inhabit these systems will aid in our understanding of the significance of arid and semi-arid region streams to wildlife. For example, baseline inventories are needed to determine species composition, abundance, and distribution as compared to adjacent upland or perennial areas. Specific ecological information is needed for critical target species, such as habitat requirements and current population numbers and distribution.

Much still needs to be learned about the ecological and hydrological interactions on ephemeral and intermittent streams due to variability and the often highly episodic occurrence of extreme events in these systems. There are unique challenges for work on these desert

rivers. Sometimes the environments are inhospitable, but arguably the greatest challenge is trying to use short-term projects to understand arid and semi-arid region streams whose variable behavior sometimes demands years of data more than are needed on a mesic river. As noted, ephemeral and intermittent streams constitute the vast majority of drainage ways in the Southwest and they play an integral role in overall watershed function. Future research is needed for both the long-term monitoring of these systems over a range of conditions, and on developing modeling tools that can be applied to large temporal and spatial scales.

8. Conclusions

When functioning properly, arid and semi-arid region streams provide many of the same services as perennial streams that affect water quality and ecosystem health. These services include landscape hydrologic connections; surface and subsurface water storage and exchange; ground-water recharge and discharge; sediment transport, storage, and deposition; flood plain development; nutrient cycling; wildlife habitat including movement and migration corridors; support for vegetation communities that help stabilize stream banks and provide wildlife services; water supply and water quality filtering or cleansing; and stream energy dissipation associated with high-water flows that reduces erosion and improves water quality (USFWS, 1993; BLM, 1998). In addition, riparian areas associated with ephemeral and intermittent streams help mitigate and control water pollution by removing pollutants and sediment from surface runoff (Sonoran Institute, 2007). Thus, these streams play a significant role in the physical, biological, and chemical integrity of an ecosystem and must be afforded the same importance as other wetter systems in the U.S. in land management decisions.

Effective management of water resources in arid and semi-arid environments requires awareness of the interdependencies of hydrologic, biogeochemical and ecological processes, and collaboration between ecologists and hydrologists. Stream channel characteristics are based on upland watershed and channel conditions, and physical characteristics such as the hydrology of the system-driven biological values. Non-perennial streams with active flood regimes contain a high diversity of plant species that varies depending on the location within the watershed. The complex longitudinal gradients along arid and semi-arid region streams encompassing changes in flood intensity, climate, and water availability, result in a wide range of biological conditions along its length. Therefore, to protect water quality and riparian habitat, a watershed-based approach to land management must be taken, involving all stakeholders and applying best management practices. Newman et al. (2006) suggest establishing a monitoring network in water-limited environments to facilitate this collaboration, from the experimental design phase, through interpretation and modeling.

In the rapidly developing southwest, land management decisions must employ a watershed-scale approach that addresses overall watershed function and water quality. As shown in this report, ephemeral and intermittent stream systems comprise a large portion of southwestern watersheds, and contribute to the hydrological, biogeochemical, and ecological health of a watershed. Given their importance and vast extent, consideration of the cumulative impacts from anthropogenic uses on these streams is critical in watershed-based assessments and land management decisions to maintain overall watershed health and water quality.

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New Mexico Wetlands

Technical Guide #1

Wetland Functions

New Mexico Environment Department
Surface Water Quality Bureau
Wetlands Program

December 2012

(Cover Photo: Rio Embudo (2011) by John Busemeyer)

Table of Contents

Introduction

This guide is the first in a series intended to broaden the understanding of wetland types, wetland functions and values, and the need for wetland restoration and protection. Because New Mexico is a dry state, wetland resources have been largely overlooked. There is insufficient current data available to provide important long-term trend information about specific changes and the overall status of New Mexico wetlands. The potential ecological impacts for climate change may also intensify stresses on our natural systems including water resources and wetlands (Glick et al. 2011). Assessment data is needed to determine the quality and condition of wetlands and causes for observed changes. This document will provide basic information about New Mexico's wetlands so that wetland practitioners and landowners start on the same page. This document will serve as a valuable resource for natural resource planners, restoration professionals, and landowners in New Mexico. The document includes reference information about the types of wetlands that occur in New Mexico, wetland functions and the value of wetlands, why wetland condition and buffers are important. Future guides will provide information like where to get permits for wetland work, and an overview of wetland restoration techniques.

Long-term comprehensive wetland restoration and protection will require new and improved approaches and regional collaboration to reduce diversion of water away from natural wetlands, reduce over-pumping of aquifers that support ground water-fed wetlands, and mitigate impacts on wetlands caused by infrastructure and urban development projects. This guide addresses some regional landscape health aspects such as the proliferation of non-native phreatophytes, and impacts that conspire to dry wetlands, such as gully erosion in the area around wetlands. Furthermore, this guide builds on a growing base of documents published in recent years, which promote locally-appropriate ecological restoration techniques for wetlands in the semi-arid southwestern landscape. The References and Resources section in the back of this document lists additional sources of information that complement this guide.

Overview

Wetlands are the most valuable and diverse ecosystems in the western United States (Knopf et al. 1988, Fleischner 1994, Belsky et al. 1999, Wuerthner and Matteson 2002). According to current knowledge, wetlands make up only about 0.6% of land area in New Mexico, however, up to 85% of all species depend upon these ecosystems at some point during their life span (Knopf et al. 1988, Fleischner 1994, Deason 1998, Belsky et al. 1999, Wuerthner and Matteson 2002). Besides habitat for wildlife, wetland ecosystems provide numerous benefits for the human population as well. Wetlands help lessen the impacts of floods and droughts, thus stabilizing water supplies, improve water quality by filtering out pollutants and sediment, recharge aquifers and wells, provide opportunities for recreation, hunting, and fishing, provide opportunities for education, and even offer places of spiritual and cultural significance (Mitsch et al. 2007).

Unfortunately, many wetland ecosystems are in poor condition and are declining due in large part to human impacts (Fleischner 1994, Belsky et al. 1999). New Mexico has lost about one-third of its wetlands, mostly due to agricultural conversion, diversion of water to irrigation, overgrazing, urbanization and groundwater depletion. Other causes of loss or degradation have been mining, erosion from forest clear cutting, road construction, streamflow regulation and impoundment, and invasion by non-native plants (Deason 1998). It is crucial that remaining wetlands be protected and degraded wetlands be restored if we want to benefit from the ecological functions and important values they provide. The common goal of wetland restoration projects is to return these ecosystems to a resilient, self-sustaining and ecologically valuable condition (Palmer et al. 2005).

What is a Wetland?

The State of New Mexico defines "**Wetlands"** as 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 (NMAC 20.6.4). In more general terms, a wetland is an aquatic ecosystem at the interface, or transitional zone, between upland, dry ecosystems and deeper aquatic ecosystems, such as rivers or lakes. However, wetlands are also found in isolated locations far from a larger body of surface water. The upland limit of a wetland is where soil and vegetation is not influenced by shallow water or a water table near the surface, displays predominantly dryland plant cover that cannot tolerate saturated soil conditions. The lower boundary between wetlands and deeper water habitat associated with riverine and lacustrine systems lies at 2 meters (6.6 feet) below low water, or the maximum depth at which emergent plants normally grow.

The main distinguishing characteristics of wetlands include three key components:

- Hydrology - wetlands are found in the presence of water, either at the surface or within the root zone of the soil for at least part of the year.

- Unique soils - wetland soils are subject to anaerobic (without oxygen) conditions sometime during the growing season due to the presence of water. These soils are classified as "hydric soils."

- Vegetation - wetlands support plants that are adapted to the wet conditions of the soil (hydrophytes) and generally do not support plants that are intolerant to flooding.

All wetlands share these hydrologic, soil and vegetative characteristics (Brinson, 1993), however beyond these general similarities, wetlands exhibit wide variation in terms of their size, complexity, biology, chemistry and physical characteristics (Mitsch and Gosselink 1993). Wetlands include swamps, bogs, marshes, fens, riparian floodplains and forests, seeps, springs, cienegas, playas and other wet ecosystems. Wetlands are found at the edges of lakes and rivers and in low depressions where rain and snowmelt collect. Because of the climatic variability of New Mexico which sometimes includes long periods of drought that dry up even the most persistent water sources, wetlands are not expected to be saturated each year.

Riparian Areas. Riparian areas are intrinsically connected to and interdependent on the water sources and hydrologic regimes that also support wetlands. Riparian areas normally refer to entire floodplains able to support vegetation dependent on runoff and overbank flow, scour, sedimentation, infiltration and shallow groundwater. They include areas considered as somewhat drier portions of a wetland ecosystem and are characterized by habitats associated with flowing or stationary bodies of water. They are dependent on existence of perennial, intermittent or ephemeral surface water and/or hyporheic zones (local shallow water tables). Riparian areas occupy the same areas of the landscape as wetlands, may contribute to the same functions within the landscape, and are interdependent, and, therefore, are considered together as part of a wetlands ecosystem.

Buffers. Buffers are non-disturbance or minimally disturbed areas surrounding a wetland/ riparian area where natural vegetation is maintained to protect wetlands and riparian areas from the impacts of stormwater floods, a variety of pollutants, and solid waste from adjacent terrain (Kusler et al. 2003). Buffers provide the functions and services associated with contiguous natural habitat adjacent to wetlands and riparian areas. Land cover elements which are considered acceptable buffer include natural uplands (forests, grasslands, shrublands), swales, nature or wildland parks, unmaintained old fields, and rangeland in good condition. These buffer elements are expected not to disrupt ecosystem connectivity, provide habitat connectivity, and provide protective services such as preventing erosion, reducing pollutant contamination and preventing encroachment of undesirable landscape elements and activities that affect wetland resources. Wetland assessments include assessment of the condition and extent of buffer areas.

Types of Wetlands

Regional, geologic, topographical, hydrologic and climatic variability produce the natural diversity observed as wetland types. The differences in the geomorphology (landscape setting), hydrodynamics (energy level and direction of flow) and sources of water (surface flow, direct precipitation or groundwater) provide the basis for classifying wetlands.

The following information is used by the NMED Surface Water Quality Bureau to classify wetland types in New Mexico. This classification of wetlands is modified from *A Hydrogeomorphic Classification for Wetlands* by Mark M. Brinson for the US Army Corps of Engineers (1993).

Depressional Wetlands

Depressional wetlands occur in topographic depressions that allow accumulation of surface water. On a topographic map these wetlands would occur within a closed elevation contour. Dominant sources of water are precipitation, groundwater discharge, and overland flow from adjacent uplands. The direction of water movement is normally from the surrounding uplands toward the center of the depression. Depressional wetlands may have any combination of inlets and outlets or lack them completely. Depressional wetlands may lose water through intermittent or perennial drainage from an outlet, by evapotranspiration, and, if they are not receiving groundwater discharge, may slowly contribute to groundwater. Dominant hydrodynamics are vertical fluctuations, primarily seasonal. Peat deposits may develop in depressional wetlands in wet climatic conditions. Playas of the eastern Llano Estacado are a common example of depressional wetlands where the dominant water source is precipitation. Zuni Lake is an example of a predominantly ground-water supported wetland.

Figure 1. Playa near Wagon Mound, New Mexico (2009)

Figure 2. Playas of the southern high plains in eastern New Mexico support thousands of migrating birds during the winter. Pettigrew Ranch Playa (2013).

Figure 3. Precipitation-dependent playa during the dry season on Johnson Mesa (2011).

Figure 4. Groundwater-dependent depressional wetland at Zuni Lake, Catron County, New Mexico (Preservation Nation photo credit).

Figure 5. This wetland has been ground-water dependent for thousands of years. Recent ground water pumping has lowered the water table and now this wetland depends on precipitation events. Grulla National Wildlife Refuge, Roosevelt County, New Mexico (2013).

Riverine Wetlands

Riverine wetlands occur in floodplains and riparian corridors in association with stream channels. Dominant water sources are overbank flow or side channel flow from the channel, or subsurface hydraulic connections between the stream channel and adjacent wetlands. Additional water sources include overland flow from adjacent uplands and precipitation. When overbank flow occurs, surface flows down the floodplain may dominate hydrodynamics. At their headwaters, riverine wetlands often intergrade with slope or depressional wetlands as the channel (bed) and bank disappear, or they may intergrade with poorly drained flats or uplands.

Perennial flow is not required. Riverine wetlands lose surface water via the return of floodwater to the channel after flooding and through saturation surface flow to the channel during rainfall events. They lose subsurface water by discharge to the channel, movement to deeper groundwater (for losing streams), and evapotranspiration. Peat may accumulate in off-channel depressions (oxbows) that have become isolated from riverine processes and subjected to saturation from ground-water sources. Bosque floodplains are a common example of riverine wetlands. Riverine wetlands are the most common and also the most threatened wetlands in New Mexico (Muldavin et al. 2011).

Figure 6. Riverine wetlands on the broad floodplain adjacent to the Gila River, southwestern New Mexico (2012).

Figure 7. Forested riverine wetlands on the Rio Frijoles at Bandelier National Monument (2002).

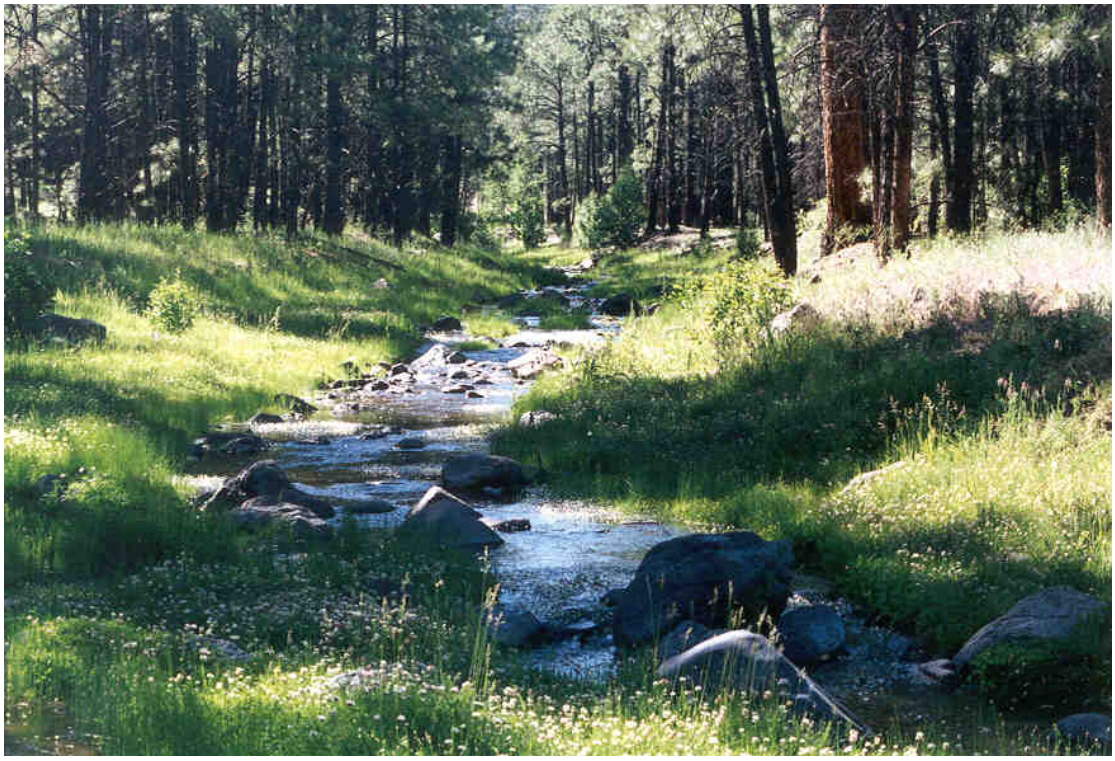

Figure 8. Riverine wetlands along the San Francisco River in Catron County, New Mexico.

Figure 9. Unconfined riverine wetlands along the lower Jemez River, Santa Fe National Forest.

Figure 10. Riverine wetlands along a confined portion of the Rio Grande within the Wild and Scenic River Segment in the Rio Grande del Norte National Monument in northern New Mexico.

Figure 11. Beaver dammed riverine wetlands along the Rio Pueblo de Taos (2007).

Figure 12. Confined riverine wetlands along the Rio San Antonio, Taos County.

Figure 13. Wet meadow riverine wetlands in the Valles Caldera along the Rio San Antonio.

Lacustrine Fringe Wetlands

Lacustrine fringe wetlands are adjacent to lakes where the water elevation of the lake maintains the water table in the wetland. In some cases, they consist of a floating mat of vegetation attached to land. Additional sources of water are precipitation and groundwater discharge, the latter dominating where lacustrine fringe wetlands intergrade with uplands or slope wetlands. Surface water flow is bidirectional, usually controlled by water level fluctuations in the adjoining lake. Lacustrine fringe wetlands are indistinguishable from depressional wetlands where the size of the lake becomes so small relative to fringe wetlands that the lake is incapable of stabilizing water tables. Lacustrine wetlands lose water by flow returning to the lake after flooding, by saturation surface flow, and by evapotranspiration. In New Mexico most lakes are actually man-made reservoirs subject to water level control that may cause inundation or draining of associated fringe wetlands. In some cases, water level control in reservoirs makes it nearly impossible for natural fringe wetlands dominated by perennial wetland plant species to develop extensively. When fringe wetlands are exposed by low water, common annual plants may dominate. Organic matter normally accumulates in areas where the banks around the lakes are flatter or are sufficiently protected from shoreline wave erosion. Marshy areas bordering Abiquiu Lake are an example of lacustrine fringe wetlands.

Figure 14. Lacustrine fringe wetlands developed adjacent to Ramah Lake.

Figure 15. Lacustrine fringe wetlands adjacent to Abiquiu Lake.

Figure 16. Lacustrine fringe exposed at low water in El Vado Lake (2009).

Slope Wetlands

Slope wetlands normally are found where there is a discharge of groundwater to the land surface. They typically occur on sloping land; elevation gradients may range from steep hillsides to slight slopes. Slope wetlands are usually incapable of depressional water storage because the ground lacks the necessary closed contours or are convex in shape. Principal water sources are usually groundwater flow, however interflow from surrounding uplands as well as precipitation may contribute. Hydrodynamics are dominated by downslope unidirectional water flow. Slope wetlands can occur in nearly flat landscapes where groundwater discharge is a dominant source to the wetland surface. Slope wetlands lose water primarily by saturation subsurface and surface flows and by evapotranspiration. Slope wetlands may develop channels, but the channels serve only to convey water away from the slope wetland. Seepage areas that occur along hillsides and can support the growth of wet-tolerant ferns, shrubs, and some of the same herbaceous plants found in other wetlands are included in New Mexico slope wetlands broad classification. Seeps and springs and on a larger scale, fens, cienegas and outflow from the tow of an alluvial fan are common examples of slope wetlands. In fen wetlands, ground water inflows maintain a fairly constant water level year-round, with water at or near the surface most of the time (Rocchio 2005). Constant high water levels lead to accumulation of organic material (peat) and perennially

saturated soils. Fens also have distinct soil and water chemistry, with high levels of one or more minerals such as calcium, magnesium, or iron.

Figure 17. Broad valley slope wetland west of Tres Piedras, New Mexico (2013).

Figure 18. Slope wetlands in fall color along the Rio Grande near the Taos County border.

Figure 19. Cebolla Springs slope wetland in Cebolla Wilderness near Grants, NM (2012).

Figure 20. Slope wetlands at Leonora Curtin Wetland Preserve near Santa Fe, New Mexico.

Figure 21. Spring-fed wetlands on Bonanza Creek near La Cienega, New Mexico (2011).

Figure 22. Hydrothermal spring-fed wetlands at Alamo Bog on upper Sulphur Creek, Valles Caldera (2012).

Figure 23. Slope wetland near Amalia, New Mexico (2004)

Figure 24. Fen wetland in the Valles Caldera, New Mexico, mis-named Alamo Bog.

Mineral Soil Flats

Mineral soil flats are most common on interfluves (a region of higher land between two rivers), extensive relic lake bottoms, or large floodplain terraces where the main source of water is precipitation. They receive virtually no groundwater discharge which distinguishes them from some depressional and slope wetlands. Dominant hydrodynamics are vertical fluctuations. They lose water by evapotranspiration, saturation overland flow, and seepage to underlying groundwater. They are distinguished from flat upland areas by their poor vertical drainage and low lateral drainage, usually due to low hydraulic gradients. Mineral soil flats that accumulate peat can eventually become the class organic soil flats.

Figure 25. The Lordsburg Playa in southern New Mexico is an extensive mineral flat wetland that depends on precipitation.

Organic Soil Flats

Organic soil flats differ from mineral soil flats, in part, because their elevation and topography are controlled by vertical accretion of organic matter. They occur commonly on flat interfluves, but may also be located where depressions have become filled with peat to form a relatively large flat surface. Water source is dominated by precipitation, while water loss is by saturation overland flow and seepage to underlying ground-water. Peat bogs can form in northern

mountainous cooler climates where decomposition of dead vegetation is slowed and, therefore, accumulates over hundreds and thousands of years and can be several feet to tens of feet deep, or where plant matter accumulates under extreme anoxic conditions that prevent or slow its decomposition such that it accumulates in a similar fashion to peat bogs. So far we have not identified organic soil flats in New Mexico. Further mapping and investigation of high mountain wetlands in New Mexico may reveal the existence of organic soil flats.

Regional Wetland Subclasses

As evident in the discussion above, the broad classes of wetlands include a variety of wetland types that can be distinguished further at the subclass level. In order to develop a classification that is simple enough for use by watershed groups and other stakeholders, yet sensitive enough to detect change in function, the level of variability within a wetland class is assigned to a subclass using the HGM classification at a regional scale. Regions are defined as geographic areas that are relatively homogenous with respect to climate, geology, and other large-scale factors that influence wetland function. For example, differences in precipitation (Munger and Eisenreich 1983; Groisman and Easterling 1994) and temperature may cause wetlands in the southern part the State to function differently from wetlands in the north. There is considerable flexibility in defining wetland subclasses within a region. The hierarchical nature of the HGM classification makes it possible to work at different scales of resolution depending on the region, HGM class, or projects under consideration. The number of regional wetland subclasses defined will depend on a variety of factors such as the diversity of wetlands in the region, assessment objectives, the ability to actually measure functional differences with the time and resources available, and the predilection towards lumping or splitting. In many regions, wetland classifications have already been developed that account for interegional and intraregional differences in wetland ecosystems (Wharton 1978; Golet and Larson 1974; Stewart and Kantrud 1971). These classifications serve as a convenient starting point for identifying regional wetland subclasses.

Regional subclasses, like the HGM classes, are distinguished on the basis of geomorphic setting, water source, and hydrodynamics. However, additional ecosystem or landscape characteristics may also be useful in certain regions. For example, regional subclasses of depressional wetlands could be based on dominant water source (i.e., groundwater versus surface water) or based on salinity gradients. In the slope class, subclasses could be based on the degree of slope, landscape position, elevation, or the source of water or other factors. In the riverine class, subclasses could be based on water source, position in the watershed, stream order, watershed size, channel gradient, or floodplain width. Implicit in the hydrology of a particular wetland is its landscape position, or “geomorphic setting,” which will accommodate the flows and storages of water. From a broad and long-term geomorphic perspective, water flows and wetland position are inextricably linked.

Functions of Wetlands

Wetland functions are defined as a process or series of processes that take place within a wetland (Novitski et al 1997). Wetlands are important for the functions that they provide and the essential role that they play in the environment at the land and water interface. Managing wetlands at the watershed scale requires an understanding of the functions that wetlands provide to the watershed (Center for Watershed Protection 2006).

Wetland functions can be broadly divided into three categories, physical, chemical and biological functions. Not all wetlands provide the same types of functions or to the same degree, due to differences in type, size, location and other factors. Below is a description of the most important wetland functions. The description of wetland functions below has been modified from a variety of sources including Brinson et al. 1995, Hauer et al. 2002, and Tiner 2003.

Physical Functions

Dynamic Surface Water Storage: This function is the ability of riverine wetlands and riparian zones to catch and detain moving waters from overbank flows, side channel flows and/or overland inputs during a flood event. Water is routed and/or stored under the influence of surface and subsurface flows during these events. Also referred to as Flood Water Detention, the ability of riverine wetlands to detain water and slow the velocity of a flood event alters the intensity and impact of peak flows downstream. The capacity of a wetland to control the movement of surface water through the wetland and dynamically store water is related to its roughness, slope, and width. The length of time that the wetland is able to detain flowing water as it moves through the wetland improves the performance of this function, which directly supports other wetland functions.

As the wetland performs this function, sediment and other particulates can settle out of the water improving water quality. The saturation of wetland soils can lead to nutrient cycling and the removal of contaminants. The lowered velocity of the flowing water allows for the export of particulate organic matter for use in the aquatic food chain as well as transport of plant propagules. Slowed and detained flow across the floodplain and in floodplain side channels provides a refuge for aquatic organisms from the strong current in order to feed and recruit (Brinson, et al. 1995). Many aquatic invertebrates, amphibians, and fish are completely dependent on the habitats associated with this function for portions of their life cycle (Hauer et al. 2002).

Performance of the function is essential to the performance of virtually all other characteristic floodplain functions and separates the role of the floodplain in the larger landscape from upland environments (Hauer et al. 2002). Hydromodifications, such as dams and diversions, alterations to the geomorphology of the floodplain by dikes and/or levees, and incision of the streams so that they cannot access their floodplains during storm events, greatly impact the floodplain and

associated wetlands ability to fully support this function and therefore the related wetland functions.

Long-Term Surface Water Storage: The ability of a wetland to temporarily store (retain) surface water over long periods. The water that is under long-term storage is standing (not moving) and present for seven days or longer. Often associated with Dynamic Surface Water Storage, Long-Term Surface Water Storage is the retention of surface water in oxbows, depressions, and other backwater areas after the flowing waters have dissipated. The surface water can come from overbank or side channel flow, overland flow, precipitation and/or subsurface flow.

The retained water can percolate into surficial ground water moderating the local water table as well as regulate base flow timing and volume. The retention of surface water extends the period of soil saturation and anaerobic chemical transformations that occur under these conditions. Excess sediments and nutrients settle out into the wetland leading to other wetland functions. The standing water provides important habitat for both aquatic and terrestrial species (Brinson et al. 1995).

Figure 26. Backwater wetland on the Gila River floodplain is located in a side channel supported predominantly by the local water table (2012).

Subsurface Storage of Water: The ability of a wetland to store water below its surface. A wetland is able to perform this function through drawdown of the water table or when soil saturation decreases due to evapotranspiration or vertical or lateral drainage. Soils with small pores allow for percolation and long term storage of water when they are not already fully saturated. As these soils lose water through drainage or evapotranspiration, the pores are filled with air. Wetland plants (hydrophytes) can tolerate long periods of soil saturation and are highly adapted to the fluctuation between aerobic and anaerobic soil conditions. This short and long-term storage of water in the soils maintains the biotic communities and the biogeochemical processes in the soils that lead to other wetland functions. It also recharges surficial ground-water and base-flow timing and volume (Brinson et al. 1995).

Surface Water Storage in a Depressional Wetland: The ability of a depressional wetland to store water above the groundwater table for a period of time that is sufficient for developing other wetland characterisitics. Depressional wetlands are generally dependent upon precipitation and snowmelt within the catchment area but can be influenced by interception with the groundwater table. The stored water is generally lost to evapotranspiration and ground water recharge. The stored surface water effects the biogeochemical cycling within a wetland, the vegetative community, and habitat for invertebrate and vertebrate species. Anthropogenic modifications can cause serious impacts to the ability of a depressional wetland to store surface water. Stressors such as changes to the buffer or wetland edge, soil compaction, roads, tilling and cultivation, or evapotransporation changes due to grazing can have severe impacts (Hauer et al. 2002).

Figure 27. Water from precipitation on its surrounding catchment is captured and stored in this playa (2004).

Energy Dissipation: A wetland's ability to slow down the velocity of water as its energy is allocated to other forms due to roughness of the wetland, vegetation structure, and other factors. This function is linked to Dynamic Surface Water Storage but is more related to how the energy is translated or dissipated as the water moves into, through, and back out of the wetland. The vegetation structure, topography, and roughness of the wetland dissipate the energy of the flowing water as it moves through the wetland. This lowers the pressure on channel beds and banks reducing the erosion of shorelines and floodplains by removing large sediment and debris loads from the flows. This also increases the ability of suspended particles to settle out of the flowing water and into the biogeochemical functions that take place in the wetland environment. (Brinson et al. 1995)

Chemical Functions

Nutrient Cycling: The ability of a wetland to encourage the cycling of nutrients from inorganic to organic and back to inorganic forms. Nutrient cycling is a fundamental function in all ecosystems, but is accomplished at much higher rates in wetlands. In wetlands nitrogen and phosphorus cycles are of most interest. Wetlands are one of the only places where N2 (N gas) is produced. All wetlands recycle nutrients, but wetlands with a fluctuating water table function at a

much higher rate in recycling nutrients. Wetlands with seasonally flooded and wetter water regimes contain soils with higher amounts of organic matter near the surface that promote microbial activity when wet (Tiner 2003). Also some types of nutrient cycling are much higher in freshwater wetlands such as methane production.

The characteristic plant community (producers) provide the food and habitat structure (energy and materials) needed to maintain the animal community (consumers). Eventually, the plant and animal communities deposit detritus that is the source of energy and materials necessary for a healthy community of decomposers. The decomposers break down these organic materials into simpler forms that can be used by the plant community. This sustained supply of nutrients in the soil provides the ability of a wetland to maintain the plant community and continue to recycle the nutrients. This plant community (surface roughness) slows surface water flows allowing mineral and organic particles (nutrients) to settle out of the water column into the wetland. The capturing of these nutrients and continued recycling within the wetland help improve the water quality by reducing the amount of dissolved nutrients in the adjacent water bodies (Brinson et al.1995).

Removal of Imported Elements and Compounds: Wetlands are well documented as interceptors of nonpoint source pollution and this function is often referred to as the capability of a wetland to act as a "sink" for pollutants. More specifically, this is a wetland's ability to remove elements (i.e., macronutrients and heavy metals) and imported materials (i.e., herbicides, pesticides, oils, salts, etc.) either long-term or permanently from incoming water sources. Each individual element, nutrient, chemical compound or heavy metal has its own biogeochemical pathway once in the wetland, but the main mechanisms of removal include sorption, sedimentation, denitrification, burial, decomposition to inactive forms, and uptake and incorporation into long-lasting woody and long-lived perennial herbaceous biomass. Some losses to groundwater seepage, animal export, or as a gas to the atmosphere do occur, but a large percentage may be more or less permanently buried in deeper sediments where they are broken down into innocuous and biogeochemically inactive forms. The elements and compounds that are captured in the wetland reduce downstream loading (Brinson et al. 1995) (Hauer et al. 2002).

Retention of Particulates: This function is capability of a wetland to decrease the velocity of water through increased roughness and area of discharge. As a result, the discharge has a decreased velocity and deposition of particulates suspended within the water column occurs in the wetland. The retention of particulates function is similar to nutrient cycling and removal of imported elements and compounds but relies on physical processes (e.g., sedimentation, flocculation and filtration.) Sediments can then undergo such processes as weathering and the release of elements in forms that are more readily available for mineral cycling. This deposition of sediment can also help trap litterfall and other detritus for decomposition into smaller organic particles for transport back into the adjacent water body or into the nutrient cycle of the wetland. Sediment deposition also increases surface macrotopographic complexity of the wetland (Brinson et al. 1995).

Organic Carbon Export: The export of dissolved and particulate organic carbon by a wetland due to the increased residence time for water in a wetland to be in contact with organic matter in leaf litter and soil. Wetlands export organic carbon at higher rates than terrestrial ecosystems due to the biogeochemical processing in the wetland environment. Mechanisms for export include leaching, flushing, displacement and erosion. Microbial food webs rely on organic carbon as an energy source which is the base for the aquatic food web.

Wetlands with organic rich sediments and long contact times of shallow water allow organic matter to accumulate in surface water. Precipitation events can transport this matter to adjacent water bodies, but floodplains with overbank flow have a much greater water turnover and perform this function at a much higher level (Brinson et al. 1995).

Biological Functions

Maintain Characteristic Plant Communities: A wetland's ability to maintain a diverse native living plant community characteristic of a wetland in reference condition, and the maintenance of properties such as seed dispersal, propagules, density, and growth rates that permit response to natural variation in climate and disturbance (e.g., fire, herbivory). A characteristic plant community accounts for most of the biomass in a wetland and is maintained by heterogeneity of environmental conditions, especially geomorphology, water regime, natural disturbances, and water/soil chemistry.

Wetlands are partly characterized by the vegetative community that they support. This vegetative community is strongly influenced by the depth of water, chemistry of water, nutrient cycling, soil development, disturbance regime, and climatic changes. Invasion by nonnative plants or uncharacteristic native species is an indication that this function has been diminished. Invasion by nonnative plants is known to alter ecosystem processes, causing both structural and functional change in the vegetative community, including fire frequency and intensity.

The maintenance of a characteristic plant community significantly affects a number of other wetland processes. Emergent vegetation provides most of the wetlands primary production and nutrient cycling, and contributes most of the annual detrital material for soil development. As the primary producer, the vegetation also provides most of the trophic support for secondary production, whether through direct grazing or recycling through the detrital-based food web. Plant communities also provide the habitat structure for nesting, resting, and cover for many animal species, maintaining the local and regional diversity of animals.

A vegetative community is dynamic, responding to natural variation and anthropogenic influence, and strongly influenced by periodic disturbances, such as flood and fire, that reset successional patterns. The ability of Riverine wetlands and floodplains to maintain a characteristic plant community is important for species diversity and the many attributes,

functions, and processes floodplain vegetation performs. Primary productivity, nutrient cycling, and the ability to provide a variety of habitats are directly related to the plant community. In a riverine system, the quality of the physical habitat and biological diversity of adjacent rivers are also affected by the modification of the quantity and quality of water and the export of carbon from the plant community. Thus, vegetation is an interactive component of the river-floodplain-wetland ecosystem structure and function, operating both as a response variable to driving mechanisms (e.g., hydrologic regime, geomorphology) as well as being a driving mechanism for other functions (e.g., nesting habitat, primary productivity). Vegetation should not be considered as static, but rather as changing in composition and characteristics over a hierarchy of temporal scales; annual cycles, multi-year life history cycles, and as floodplain surfaces are affected by cut and fill alluviation (Brinson et al. 1995)(Hauer et al. August 2002)(Hauer et al. May 2002).

Maintain Characteristic Detrital Biomass: The capacity of a wetland to produce, accumulate, and disperse dead plant biomass of all sizes either on site or from upslope and upgradient. This function refers primarily to categories of fine and coarse woody debris. Functioning ecosystems rely on woody debris to reduce erosion and help build soils. The decomposing detritus can be the primary support for the detrital-based food chains which support the major nutrient –related processes (cycling, export, import) within wetlands. Larger woody debris can provide important resting, feeding, hiding and nesting sites for animals of higher trophic levels, and can create debris dams playing an important role in the dynamics of floodplain-stream ecosystems. This provides surface roughness that decreases velocity of floodwaters, allowing for particulate retention/detention, which contributes to downstream water quality through reduction in peak flows and sedimentation. This also provides wildlife habitat and stores nutrients and water, providing a major source of energy and habitat for decomposers and other heterotrophs (Brinson et al. 1995).

Maintain Spatial Structure of Habitat: The ability of a wetland to maintain a complex structure of vegetative spatial configurations suitable for animal habitat. Plant communities provide complex, three-dimensional structure for both vertebrates and invertebrates. Food, shelter (cover), nesting, breeding, and foraging are all dependent upon the complexity and composition of the vegetation. Vegetation structure refers to dimensional complexity (cavities, canopy gaps, vertical portioning of strata, etc.) not species composition.

Structure is an important component for resident and nonresident animals, including those with wide ranges and migratory animals. Wetland and riparian areas with greater structural complexity, including habitat patchiness, are more diverse and species rich. This heterogeneity of the landscape also allows for gene flow between separated populations and progeny to exploit new areas (Brinson et al. 1995).

Maintain Interspersion and Connectivity: This function is a landscape feature that maintains the habitat interconnectivity and proximity necessary for characteristic plant and animal diversity and abundance. This includes the potential for a wetland to provide scattered conduits to a river for aquatic organisms through overbank flow, hyporheic flow, and permanent or ephemeral channels and the wetland's capacity to provide habitat corridors for terrestrial or aerial organisms.

This function relies on the patterning of landscape elements including the density of wetlands in the landscape, the proximity of a wetland to its nearest neighbor, and land use around the wetland. Vegetation strata in wetlands, from herbaceous layers to tree canopy, provide wildlife corridors between different wetland types, between uplands and wetlands, and between uplands. The decline of many species has been linked directly to habitat loss and fragmentation making this wetland function highly important in species conservation (Brinson et al.1995) (Hauer et al. May 2002).

Maintain Distribution and Abundance of Invertebrates: A wetland's capability to maintain density and distribution of aquatic, semi-aquatic, and terrestrial invertebrates by providing wet and dry conditions. Invertebrate species are incredibly diverse and abundant in wetlands due to their ability to exploit almost every microhabitat in a wetland. Their ability to consume plant materials and detritus including both submerged and surface vegetation and litter, breaks down coarse particulate organic matter and greatly assists in the nutrient cycling functions of the wetland. In drier conditions, the presence of many invertebrates contributes organic material and aeration that are important to soil development. They also provide important food sources to higher level consumers (eg., amphibians, retiles, birds, and mammals)(Brinson et al. 1995) (Hauer et al. August 2002).

Invertebrates are also sensitive to diminished water quality and are therefore good indicators of the condition of a wetland site. Invertebrates are subject to considerable variation over the annual climatic cycle, so this function is generally based on the evaluation of habitat, vegetation structure, hydrographic regime, and the complexity of the floodplain mosaic rather than the direct measurement used in many stream and lake protocols (Hauer et al. August 2002).

Maintain Distribution and Abundance of Vertebrates: A wetland's capability to maintain the habitats/resources necessary for the diversity and abundance of fish, amphibians, reptiles, birds, and mammals. Many vertebrates utilize wetlands for food, cover, rest, and reproduction. Many of these animals are extremely mobile with a high variability in spatial and/or temporal utilization of wetlands. Migratory birds and waterfowl utilization is extremely temporal, while frogs, toads, and salamanders are less mobile and will generally stay within 1 km of the wetland throughout their lifetime. Small mammals, such as voles and shrews, have relatively small ranges, while larger mammals, such as elk, deer, and bear, may range over incredibly vast areas in a single day.

Vertebrate uses of wetland resources and habitats vary as widely as the diversity of species and requires a diverse structure and density of vegetation and water regimes. Some, like beavers, can greatly influence hydrologic regimes, nutrient dynamics, and vegetation structure. Wetlands are generally considered to support a richer fauna than adjacent upland communities, and many that utilize upland habitats require wetlands for some portion of their life cycle. In turn, vertebrates assist in maintenance of the wetland through dispersal of seeds, pollination of flowers, and alteration of hydroperiods and light regime by herbivory and rearrangement of the vegetative structure.

Alteration of hydrographic regimes or geomorphic configuration and land use in the adjacent uplands (transportation corridors, construction of homes, cultivation, grazing by cattle, haying) can have an extremely adverse impact on vertebrate habitat. Alteration of vegetation affects trophic structure and the nutrient and energy cycling that are required to support vertebrates (Brinson et al.1995) (Hauer et al. August 2002).

Importance of Wetland Functions

As described above, wetlands provide a number of ecological functions either at the faster or greater rate or are those that are not provided by either terrestrial or other aquatic environments. These functions are recognized as particularly crucial in New Mexico where only a small percentage of the land area is occupied by wetlands. Wetlands are called the “kidneys of the landscape” (Mitch et al. 2007) because of their functions as downstream receivers of water and waste from both natural and human sources. They stabilize water supplies lessening the extreme effects of floods, drought and fire. Wetlands are critical to the food chain and biodiversity with a significant percentage of terrestrial animals using wetlands for a portion of their lifecycle. At the global level, wetlands contribute to the stability of global levels of available nitrogen, atmospheric sulfur, carbon dioxide and methane (Mitch et al. 2007). Wetlands are important sinks for carbon and increase landscape resilience and adaptation to climate change.

Finally, functioning wetlands directly provide benefits to humans in the form of food, air and water quality, energy resources (peat), shade and aesthetic values.

Conclusions

Wetlands should be managed to achieve and protect their natural state so that they can continue to provide important ecological functions. The different wetland types and subclasses require different management objectives and strategies based on the key characteristics that distinguish the wetland. Some management principles that apply to wetlands have been offered by Baldassarre and Bolen (2006) (from Mitch et al 2007). Wetlands should be protected to include a wide variety of wetland hydroperiods and wetland sizes. Some researchers argue that

distribution and abundance may be just as important as wetland size. Protection measures should include small wetlands which can be key to wetland connectivity or provide important habitat requirements for reproduction and survival of certain animal populations. Large wetlands and wetland complexes should be protected in their entirety for species with complex life-history requirements and for the complex interactions and processes of wetland functions. Natural buffer and upland habitats that are contiguous with wetlands should be protected and maintained to maximize the benefits of wetland functions.

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