REGION 6
DALLAS, TX 75270

August 14, 2025

**TRANSMITTED VIA EMAIL**

Shelly Lemon
Chief, Surface Water Quality Bureau
New Mexico Environment Department
1190 Saint Francis Drive, Suite N4050
Santa Fe, New Mexico 87505
shelly.lemon@env.nm.gov

RE: Amended Water Quality Standards at 20.6.4.900 NMAC - Copper Site-Specific Criteria on the Pajarito Plateau.

Dear Ms. Lemon:

I am writing in response to your letter dated May 19, 2025, requesting the review and action on revisions to New Mexico's *Standards for Interstate and Intrastate Surface Waters* 20.6.4 New Mexico Administrative Code (NMAC). The revisions to NMAC were brought to the WQCC through a third-party proposal which included the operator of Los Alamos National Laboratory (LANL), Triad National Security, LLC, its environmental contractor, Newport News Nuclear BWXT-Los Alamos, LLC (N3B), and the Department of Energy, Office of Environmental Management (DOE-EM). The revisions include amended copper site-specific criteria for the Pajarito Plateau surrounding LANL. The revised water quality standards were certified by Brecken L. Scott, Special Assistant Attorney General for the State of New Mexico, as having been adopted pursuant to the laws of the state of New Mexico and became effective as state law on May 22, 2025. The U.S. Environmental Protection Agency (EPA) received the submission under New Mexico Environment Department (NMED) Cabinet Secretary delegated signatory authority on May 30, 2025, as required under federal regulations at 40 CFR § 131.5.

The EPA reviewed the supporting demonstration report prepared by Winward Environmental LLC (Winward), that evaluated the background conditions of streams on the Pajarito Platea and developed site-specific copper criteria. The EPA compared its Clean Water Act Section 304(a) nationally recommended criteria for copper to the copper criteria resulting from the multilinear regression equations developed by Winward and has determined that the revised aquatic life criteria for copper as described in *20.6.4.900 I (4) NMAC* are protective of aquatic life. The EPA therefore approves the site-specific criteria for Pajarito Plateau surface waters extending from Guaje Canyon in the north to the Rito de los Frijoles watershed in the south, from their headwaters to their confluence with the Rio Grande and all tributaries and streams thereto. The EPA is not approving the New Mexico water quality

standards for those waters or portions of waters located in Indian Country, as defined in 18 U.S.C. § 1151.

Section 7 of the Endangered Species Act states that “all Federal agencies shall...utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered and threatened species” and “each Federal agency shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species.” The EPA has determined that approval of the site-specific copper criteria will have no effect on federally listed threatened and endangered species or on critical habitat.

I would like to thank the Commission, the NMED and its Surface Water Quality Bureau for their effort in the development of these revised provisions of the state’s water quality standards. If you have any questions or concerns, please contact me at (214) 665-7101, or have your staff contact Jasmin Diaz-Lopez at (214) 665-2733.

Sincerely,

TROY HILL

Digitally signed by TROY HILL
Date: 2025.08.14 14:05:17 -05'00'

Troy C. Hill, P.E.
Director
Region 6 Water Division

Enclosure: Technical Support Document

cc: James C. Kenney, Cabinet Secretary (james.kenney@env.nm.gov)
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# TECHNICAL SUPPORT DOCUMENT

**EPA Technical Review of**
**Site-Specific Criteria Amendments**
**to the**
**New Mexico's Standards for**
**Interstate and Intrastate Surface Waters**
**20.6.4 NMAC**

**U.S. EPA REGION 6**
**WATER QUALITY PROTECTION DIVISION**

**August 2025**

## Table of Contents

## I. INTRODUCTION

### Background

The purpose of this Technical Support Document (TSD) is to provide the results of the Environmental Protection Agency (EPA) Region 6 review of the revisions to New Mexico's Standards for Interstate and Intrastate Waters, 20.6.4 in the New Mexico Administrative Code (NMAC). These revisions were initiated by 3rd-party petitioners which consist of Triad National Security, LLC (Triad), Newport News Nuclear BWXT-Los Alamos, LLC (N3B), the United States Department of Energy (DOE), and the Office of Environmental Management, Los Alamos Field Office (DOE EM-LA). The petition followed the rulemaking procedures for site-specific criteria (SSC) described in the New Mexico Water Quality Standards (WQS) at 20.6.4.10F NMAC. The Pajarito Plateau is located in Los Alamos County, New Mexico. The site-specific aquatic life copper criteria were developed for Pajarito Plateau surface waters that extend from Guaje Canyon in the north to the Rito de los Frijoles watershed in the south, from their headwaters to their confluence with the Rio Grande and all tributaries and streams thereto. Most of the waterbodies on the Pajarito Plateau are classified in New Mexico WQS as ephemeral or intermittent waters (20.5.4.128) with very few being classified as perennial (20.6.4.121 and 20.6.4.126).

The demonstration report was prepared by Winward Environmental LLC (Winward) for N3B (one of the listed petitioners). Winward developed a workplan in 2021 that was reviewed by both the New Mexico Surface Water Quality Bureau and EPA Region 6 regarding the development of a site-specific copper criteria applicable to the surface waters within the Pajarito Plateau. Provisions regarding SSC in New Mexico WQS are found at 20.6.4.10 NMAC. These provisions provide for entities other than the New Mexico Environment Department (NMED) to petition the Water Quality Control Commission (WQCC) to adopt SSC that are based on relevant site-specific conditions, fully protect designated uses which apply to those waters, and rely on a scientifically defensible method.

The requirements for adopting SSC are outlined in 20.6.4.10. F. NMAC and are consistent with EPA's regulations at 40 CFR 131.11(b)(1) for establishing water quality criteria, which require numeric criteria be based on 304(a) guidance, 304(a) guidance modified to reflect site specific conditions, or other scientifically defensible methods. Specifically, 20.6.4.10. F. NMAC refers to scientifically defensible methods such as the water-effect ratio for metals (EPA-823-B-94-005, 2nd edition, 1994), streamlined water-effect ratio procedure for discharges of copper (EPA-822R-01-005,2001), biotic ligand model (EPA-822-R-07-001, 2007), methodology for deriving 304(a) criteria (EPA-822-B-00-004, 2000), or determination based on natural background.

Typically, SSC for copper are based on EPA guidance on copper toxicity such as the biotic ligand model (BLM) or water-effect ratio (WER) studies. The BLM is a metal bioavailability model that uses receiving water body characteristics and monitoring data to develop site-

specific water quality criteria. The BLM requires ten input parameters: temperature, pH, dissolved organic carbon (DOC), calcium, magnesium, sodium, potassium, sulfate, chloride, and alkalinity (EPA 2007). Winward developed these SSC for copper using a multiple linear regression (MLR) method that combined water chemistry data from Pajarito Plateau surface waters with output from the copper biotic ligand model (BLM). The final MLR equations were simplified from the BLM and narrowed the input parameters to pH, DOC, and hardness.

Winward provided a workplan and drafts of the demonstration report to EPA and NMED for review in September of 2020 and August of 2021, respectively. EPA Region 6 and NMED provided comments on the workplan and draft demonstration report with Winward issuing a response to comments on March 31, 2023. A demonstration report was finalized on November 20, 2023, and a public hearing was held on January 14, 2025, where the petitioners and NMED presented technical testimony in support of the proposed rulemaking before the New Mexico WQCC. The WQCC adopted the revisions to 20.6.4 NMAC for surface waters on the Pajarito Plateau surrounding Los Alamos National Laboratory (LANL) on April 8, 2025. These revisions became effective as state law on May 22, 2025. The NMED submitted these revisions to EPA for action by letter dated May 19, 2025, which was received by EPA on May 30, 2025.

## II. PROPOSED REVISIONS

The proposed revisions to 20.6.4.900 NMAC are presented below. Changes to the existing provisions are noted by the red underlined font.

**20.6.4.900 NMAC**

**I.** Hardness-dependent acute and chronic aquatic life criteria for metals are calculated using the following equations, excluding aquatic life criteria for copper (Cu) for the Pajarito plateau surface waters in the Rio Grande basin as described in Paragraph (4) of Subsection I of 20.6.4.900 NMAC. The criteria are expressed as a function of hardness (as mg CaCO3/L). With the exception of aluminum, the equations are valid only for hardness concentrations of 0-400 mg/L. For hardness concentrations above 400 mg/L, the criteria for 400 mg/L apply. For aluminum the equations are valid only for hardness concentrations of 0-220 mg/L. For hardness concentrations above 220 mg/L, the aluminum criteria for 220 mg/L apply. Calculated criteria must adhere to the treatment of significant figures and rounding identified in *Standard Methods For The Examination Of Water And Wastewater*, latest edition, American public health association.

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(4) **Copper criteria for Pajarito plateau surface waters**: from Guaje canyon in the north to the Rito de los Frijoles watershed in the south, from their headwaters to their confluence with the Rio Grande and all tributaries and streams thereto is as follows. For purposes of this Section, dissolved organic carbon (DOC) is in units of milligrams carbon per liter (mg C/L); and hardness is expressed in units of mg/L as CaCO3. In waters that contain DOC concentrations greater than 29.7 mg/L, a value of 29.7 mg/L shall be used in the equation. In waters that contain hardness

concentrations greater than 207 mg/L, a value of 207 mg/L shall be used in the following equations.

(a) **Acute aquatic life criteria**: The equation to calculate acute criteria in µg/L is exp(-22.914+1.017×ln(DOC)+0.045×ln(hardness)+5.176×pH-0.261×pH$^2$).

(b) **Chronic aquatic life criteria**: The equation to calculate chronic criteria in µg/L is exp(-23.391+1.017×ln(DOC)+0.045×ln(hardness)+5.176×pH-0.261×pH$^2$).

**J. Use-specific numeric criteria.**

**(1) Table of numeric criteria:** The following table sets forth the numeric criteria applicable to existing, designated and attainable uses. For metals, criteria represent the total sample fraction unless otherwise specified in the table. Additional criteria that are not compatible with this table are found in Subsections A through I and K ~~[and L]~~ through M of [~~this section~~] 20.6.4.900 NMAC.

| Pollutant | CAS Number | DWS | Irr/Irr storage | LW | WH | Aquatic Life | | | Type |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Acute | Chronic | HH-OO | |
| Copper, dissolved | 7440-50-8 | 1300 | 200 | 500 | | a | a | | |

**(2)** Notes applicable to the table of numeric criteria in Paragraph (1) of this subsection.

**(a)** Where the letter "a" is indicated in a cell, the criterion is ~~hardness~~ based on receiving water characteristics and can be referenced in Subsection I of 20.6.4.900 NMAC.

## III. REGION 6 ANALYSIS OF THE MLR SITE-SPECIFIC COPPER CRITERIA

### Introduction

The WQCC submitted aquatic life criteria changes for surface waters in the Pajarito Plateau based on Winward's SSC demonstration report (Winward, 2023). The report is intended to assess the physical and chemical characteristics of Pajarito Plateau waters and whether they alter the bioavailability and or toxicity of copper. Winward's approach aimed to develop copper aquatic life criteria using the best available science, based on EPA's 2007 freshwater copper criteria, the BLM, while requiring fewer data inputs. The SSC demonstration report relied on field data to develop multilinear regression equations that accurately predict the BLM outputs using a subset of the BLM inputs. Although this approach does not use EPA's recommended BLM directly, it is consistent with efforts to develop a simplified modeling approach using empirically-based multiple linear regression models that are expected to perform at least as well as the mechanistically-based BLM.[1]

[1] U.S. EPA Metals. 2022. Cooperative Research and Development Agreement (CRADA) Phase 1. Report. https://www.epa.gov/wqc/metals-crada-phase-1-report

**Pajarito Plateau Site-Specific Criteria Boundaries**

The Pajarito Plateau is located on the east flank of the Jemez Mountains in north-central New Mexico, approximately 90 miles north from Albuquerque, and within Los Alamos County. The Pajarito Plateau is composed of up to 300 meters of consolidated ash tuff that was deposited during past volcanic eruptions (Mathien et al., 1993). The town of Los Alamos is situated on the upper end of the Pajarito Plateau, at the base of Sierra de los Valles. The Rio Grande flows through White Rock Canyon which separates the Pajarito Plateau from the Cerros del Rio to the southeast (Mathien et al., 1993). The proposed Pajarito Plateau SSC includes all watersheds within the area of the Pajarito Plateau, from the Guaje Canyon in the north to the Rito de los Frijoles watershed in the south, from their headwaters to their confluence with the Rio Grande and all tributaries and streams thereto.

The SSC demonstration report provided a map depiction of the Pajarito Plateau, related water bodies, surface water sampling locations, the Los Alamos National Laboratory, the towns of Los Alamos and White Rock, and Pueblo and county boundaries. This map is shown below as Figure 1. The proposed SSC for copper applies to 50 Assessment Units (AU) in the Pajarito Plateau. A list of these assessment units and with their corresponding designated uses and applicable criteria is presented as *Table 6-1 Pajarito Plateau AUs Where SSWQC Would Apply* in the SSC demonstration report[2]. Waterbodies classified as ephemeral and intermittent streams are subject to acute criteria only per 20.6.4.128 NMAC. Both acute and chronic aquatic life criteria are applicable to waterbodies classified as perennial (20.6.4.121 and 20.6.4.126 NMAC) and unclassified surface waters (20.6.4.98 NMAC).

[2] 2023.Winward. Copper-SSWQC-Pajarito-Plateau-Demonstration-Final. https://www.env.nm.gov/surface-water-quality/wp-content/uploads/sites/18/2025/05/Copper-SSWQC-Pajarito-Plateau-Demonstration-Final.pdf

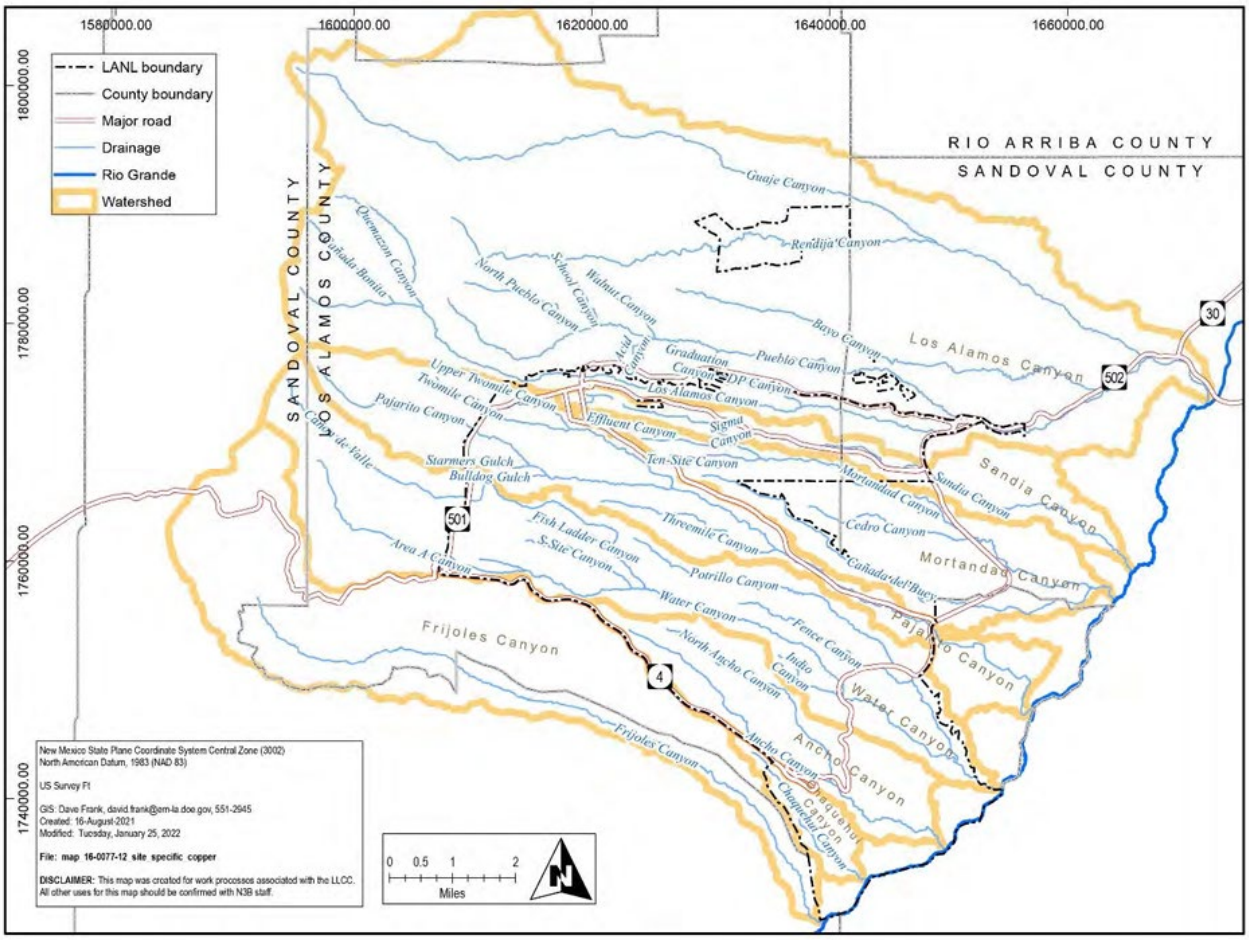


**Figure 1. Spatial boundary for proposed copper SSWQC**

## Sampling and Methods

The primary source of information used in the SSC demonstration report was surface water monitoring data collected by LANL. The monitoring data used was from 2005 to 2019 and was collected on behalf of different water quality monitoring programs across several locations on the Pajarito Plateau. Parameters collected were those needed for the copper BLM; pH, DOC, calcium, magnesium, sodium, potassium, sulfate, chloride, alkalinity, temperature, percent humic acid (%HA), and sulfide. Some substitutions were used to estimate concentrations for missing BLM parameters using existing mathematical relationships. The complete dataset for the Pajarito Plateau spans from 2005 to 2019 and includes a total of 531 discrete samples collected from 50 locations across 9 large watersheds: Ancho, Chaquehui, Frijoles, Jemez River, Los Alamos/Pueblo, Mortandad, Pajarito, Sandia, and Canon de Valle. Samples with concentrations outside the prescribed ranges for the BLM were removed and a set of 517 samples spanning 8 watersheds was carried forward to the first round of MLR modeling.

The final BLM dataset was input into the copper BLM software (version 3.41.2.45) (Windward, 2018a) to generate acute and chronic BLM-based water quality criteria for all samples.

A Spearman correlation analysis was performed on the BLM parameters[3] which identified pH (rho = 0.57) [4], potassium (rho = 0.57), alkalinity (rho = 0.55), and DOC (rho = 0.54) as the strongest correlations with the BLM output (acute and chronic). The BLM criterion maximum concentration (CMC) and criterion continuous concentration (CCC) correlations are identical because the acute (CMC) and chronic (CCC) BLM values only differ by an acute-to-chronic ratio (2007, EPA). The candidate MLRs were developed using pH, DOC, and hardness after sensitivity analyses of the copper BLM established potassium was not as significant to the model as the other parameters. Candidate MLRs were developed, evaluated, and compared using standard statistical and visual methods, such as goodness-of-fit (e.g., adjusted $R^2$) and model assumptions (e.g., tests of the normality and homoscedasticity of residuals). Additional hydrology factors were included in the model candidates such as hydrology classifications for ephemeral/intermittent, intermittent, and perennial streams. A curvilinear relationship between the MLR model residuals and pH was observed and to address this, a $pH^2$ term was added to the third round of model comparisons to eliminate this pattern and meet the model assumptions[5] (2023, Winward). After three rounds of fitting the model, the final MLR included pH, $pH^2$, hardness, and DOC. Hydrology classifications were not included in the final MLR as they did not significantly improve the model and removing them would lead to a more parsimonious model. The proposed MLRs for acute and chronic criteria each had an adjusted $R^2$ of 0.980, indicating a good fit.

The SSC demonstration report compared the final MLR and BLM water quality criteria outputs by plotting the MLR criteria against the BLM criteria. This resulted in a scatter plot of 517 points which were distributed across a solid diagonal 1:1 line, suggesting a strong correlation. Additional comparisons between the MLR and BLM using varying concentrations and combinations of DOC, pH, and hardness were simulated[6] (2023, Winward). The correlation across these simulations remained strong when the input parameter was within the 95$^{th}$ percentile. Notable deviations were only seen for simulations outside the 95$^{th}$ percentile of hardness values. Exceedance ratios which quantify the likelihood of the predicted outcome (copper criteria) exceeding an observed threshold (dissolved copper), were calculated by dividing the dissolved copper concentrations by the copper criterion. The exceedance ratios were plotted and compared between the MLR and BLM criteria and between the MLR and hardness-based criteria, which are New Mexico's current statewide criteria. These comparisons demonstrated exceedance ratios closely aligned to the 1:1 line between the MLR and BLM criteria[7] (2023, Winward), demonstrating that the MLR predicts exceedances of the hardness-based criteria consistent to that of the BLM. On the contrary, the plotted exceedance ratios

[3] 2023. Winward. Table 5-3. Spearman correlation analysis results (rho).
[4] rho represents the Spearman rank correlation coefficient.
[5] 2023. Winward. Figure 5-4. Comparison of MLR model residuals with and without a $pH^2$ parameter.
[6] 2023. Winward. Figure 5-6. Comparison of BLM and MLR based acute criteria.
[7] 2023. Winward. Figure 5-7. Comparison of copper exceedance ratios between EPA (2007) BLM WQC and site-specific MLR WQC.

between the MLR and hardness-based criteria resulted in scattered points below the 1:1 line[8] (2023, Winward). These results indicated that the MLR more closely predicts exceedance of dissolved copper concentrations to that of the BLM than the hardness-based equation.

To help with its review, EPA requested the LANL data set used to develop and compare the proposed MLR and BLM criteria. EPA used the data set to run the BLM on the HydroQual[9] (Version 2.1.1) software and compare with the BLM and MLR resulting criteria across the 517 samples. The Winward and HydroQual software run the same model but have different developers. The dataset yielded similar BLM results for acute and chronic criteria from both the HydroQual and Windward softwares. Differences in criterion values between the two softwares were minor, with an average difference of 0.01. A few exceptions presented a relatively larger difference between 0.2- 0.99. However, these differences were only noted among sampling sites where the criterion was significantly greater and do not indicate a significant disparity between the two software outputs. Additionally, the BLM criteria yielded by the HydroQual software was compared with that of the MLR. The criteria resulting from the MLR was within a factor of 2 from that of the BLM, with the median factor being 1.005 and 1.006 for the acute and chronic criterion, respectively. The largest factor difference calculated within a sample (Location ID: SEP-REF-SJM1 at RF17SJM01, Date: 9/26/2017) was 5.86 and for which the MLR (CMC: 25.07, CCC: 15.56) resulted in a more stringent criteria than the BLM (CMC: 146.82, CCC: 91.19). Lastly, a paired t-test ($\alpha$=0.05) was used to compare the outputs between the MLR and BLM for the acute and chronic criterion. The p-value for the acute (p-value: 0.0877) and chronic (p-value: 0.0842) criteria data sets were both greater than the significance level. This indicates there is no significant difference between the performance of the MLR and BLM models.

**Consideration of Downstream Waters**

The are no new discharges or sources of copper associated with the proposed SSC for copper that would potentially increase copper loads into the Rio Grande. Copper concentrations for waters downstream of the Pajarito Plateau were collected and analyzed in the demonstration report and found to be low and stable, not exceeding the hardness-based criteria or the BLM. Additionally, both the MLR and BLM address the bioavailability of copper to aquatic life by considering site-specific physiochemical characteristics of water that may alter copper toxicity. Therefore, EPA finds the proposed SSC for copper is also protective of aquatic life downstream of the Pajarito Plateau and will not affect downstream designated uses.

**Threatened and Endangered Species**

EPA obtained a species list for the defined action area from the U.S. Fish and Wildlife Service's Information for Planning and Consultation (IPaC) site, Project Code: 2024-0123706. EPA evaluated the potential effects to these species resulting from the approval of New Mexico's *Standards for Interstate and Intrastate Surface Waters 20.6.4 NMAC* and determined

[8] 2023. Winward. Figure 5-8a and 5-8b. Comparison of copper exceedance ratios between site-specific copper MLR WQC and New Mexico hardness-based WQC, and between EPA (2007) BLM calculations and New Mexico hardness-based WQC.
[9] HydroQual is the software used in EPA's 2007 304(a) Recommended Criteria for Copper.

that this action will have no effect on the listed species, none of which are aquatic or aquatic-dependent. Therefore, EPA has concluded that its approval of the revisions to 20.6.4 NMAC referenced above is not subject to consultation under Section 7 of the ESA.

**Table 1**. *Listed Species within the approximate Pajarito Plateau defined action area.*

| **Mammals** | **Scientific Name** | **Status** | **Critical Habitat** |
|---|---|---|---|
| New Mexico Meadow Jumping Mouse | *Zapus hudonius luetus* | Endangered | Final |
| Mexican Wolf | *Canis lupus baileyi* | Endangered | None designated |
| **Birds** | | | |
| Southwester willow flycatcher | *Empidonax traillii extimus* | Endangered | Final |
| Mexican Spotted Owl | *Strix occidnentalis lucida* | Threatened | Final |
| Yellow-billed Cuckoo | *Cuckoo Coccyzus americanus* | Threatened | Final |
| **Amphibians** | | | |
| Jemez Mountains Salamander | *Plethodon neomexicanus* | Endangered | Final |
| **Insects** | | | |
| Monarch Butterfly | *Danaus plexippus* | Proposed Threatened | Proposed |
| Suckley's Cuckoo Bumble Bee | *Bombus suckleyi* | Proposed Endangered | None designated |

## III. REGION 6 DETERMINATION

### Conclusion

Based on a review of the supporting SSC demonstration report, EPA found the Pajarito Plateau SSC for copper expressed as MLRs are appropriate in establishing criteria that are fully protective of aquatic life uses in surface waters of the Pajarito Plateau. Given the large dataset used to develop the MLR and comparisons to EPA's recommended BLM, EPA considers the MLR criteria to be based on a scientifically defensible method and appropriate for the site-specific conditions of the Pajarito Plateau. Based on the analysis described above, EPA is approving the revised aquatic life criteria described in *20.6.4.900 NMAC* for the Pajarito Plateau, from the Guaje Canyon in the north to the Rito de los Frijoles watershed in the south, from their headwaters to their confluence with the Rio Grande and all tributaries and streams thereto.

## IV. LITERATURE CITED


Federal Water Pollution Control Act (Clean Water Act) (CWA) Title 33, Navigation and Navigable Waters, Chapter 26-Water Pollution Prevention and Control, Section 101 [As Amended Through Pub.L. 111-378, January 4, 2011] (33 U.S.C. § 1251 et seq.) Federal Clean Water Act. 33 U.S.C. 1251 et seq.

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