

**USE ATTAINABILITY ANALYSIS**  
**PUBLIC DISCUSSION DRAFT**

**Aquatic Life Uses**  
**for the Animas River in New Mexico**



**NEW MEXICO ENVIRONMENT DEPARTMENT**  
**SURFACE WATER QUALITY BUREAU**

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*COVER PHOTO: The Animas River near the New Mexico – Colorado Border*

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## USE ATTAINABILITY ANALYSIS AQUATIC LIFE USES FOR THE ANIMAS RIVER IN NEW MEXICO

### SUMMARY

The Animas River in New Mexico is impaired for several parameters, including the aquatic life temperature criteria. The New Mexico Environment Department (Department) conducted a Use Attainability Analysis (UAA) to determine the most appropriate and protective aquatic life uses for this water body. The UAA presents a watershed description, water temperature and fish data, and modeled predictions of water temperatures.

This UAA concludes that **Coolwater** is the most protective aquatic life use attainable for the Animas River from the San Juan River to Estes Arroyo, and that **Coolwater with a segment-specific maximum temperature criterion of 27°C** is the most protective aquatic life use attainable for the Animas River from Estes Arroyo to the Southern Ute tribal boundary.

The coldwater and marginal coldwater aquatic life uses are *not attainable* because of 40 CFR 131.10 (g)(1): "naturally occurring pollutant concentrations prevent the attainment of the use...." (see **Appendix A**). Specifically, thermal pollution (heat) naturally occurring due to ambient air temperatures prevents the attainment of the coldwater and marginal coldwater uses.

### BACKGROUND

The Animas River in New Mexico is currently classified in water quality standards segments 20.6.4.403 and 404 in New Mexico's *Standards for Interstate and Intrastate Surface Waters* (NMAC 2013):

**20.6.4.403 SAN JUAN RIVER BASIN - The Animas river from its confluence with the San Juan upstream to Estes Arroyo.**

**A. Designated Uses:** public water supply, industrial water supply, irrigation, livestock watering, wildlife habitat, marginal coldwater aquatic life, primary contact and warmwater aquatic life.

**B. Criteria:** the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses.

**20.6.4.404 SAN JUAN RIVER BASIN - The Animas river from Estes Arroyo upstream to the New Mexico-Colorado line.<sup>1</sup>**

**A. Designated Uses:** coldwater aquatic life, irrigation, livestock watering, wildlife habitat, public water supply, industrial water supply and primary contact.

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<sup>1</sup> Animas River flows through the Southern Ute tribal land before entering New Mexico, as reflected in the assessment unit description. The Department will correct the segment description as well during the upcoming triennial review.

**B. Criteria:** the use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses, except that the following segment-specific criterion applies: phosphorus (unfiltered sample) 0.1 mg/L or less.

New Mexico specifically defines the term “segment” within the state water quality standards in Subsection S, 20.6.4.7 NMAC, as a classified water of the state. Each segment contains one or more assessment units (AU) with each AU representing homogenous characteristics. The 303(d) Integrated List is a catalog of all AUs with a summary of their current status (i.e. fully supporting, not supporting/impaired, or not assessed). Once an AU is determined to be impaired, a total maximum daily load (TMDL) guidance document for stream restoration may be developed specifically for that AU. In some cases, the designated<sup>2</sup> uses are not existing<sup>3</sup> or attainable<sup>4</sup> and the water quality standards may need to be revised before, or instead of, a TMDL

The Clean Water Act (CWA) §101(a)(2) and 20.6.4.6 NMAC require that wherever attainable, water quality shall provide for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water. Accordingly, federal regulation at 40 CFR 131.10(j) effectively establishes a rebuttable presumption that CWA §101(a)(2) uses (i.e., ‘fishable, swimmable’ uses) are attainable. In order to remove a §101(a)(2) use or change the use to one with less stringent criteria, a state must provide a Use Attainability Analysis (UAA) demonstrating that the use is not attainable due to one or more of the six factors listed in 40 CFR 131.10(g) (**Appendix A**), and to determine the most protective aquatic life and contact uses that are attainable. New Mexico’s UAA procedure is described in 20.6.4.15 NMAC.

The New Mexico portion of the Animas River is divided into two segments, each consisting of one AU. Segment 20.6.4.403 contains the lower Animas River AU (*San Juan River to Estes Arroyo*). Segment 20.6.4.404 contains the upper Animas River AU (*Estes Arroyo to the Southern Ute Tribe boundary*). Both AUs were listed in the 2012-2014 Integrated List as impaired due to temperature (NMED/SWQB 2012a). The upper AU is categorized as 5b, meaning that the water quality standards may not be attainable (NMED/SWQB 2012b). Thermograph data from the 2010 survey (NMED/SWQB 2012d) and the current Assessment Protocols were used to determine impairments (NMED/SWQB 2013a).

## WATERSHED DESCRIPTION

The Animas River watershed (HUC 14080104) (**Figure 1**) is 1,357 square mile (mi<sup>2</sup>) and is contained within the larger San Juan River basin in northwestern New Mexico and southwestern Colorado. The New Mexico portion of the watershed is approximately 227 mi<sup>2</sup>. The Animas River is a tributary of the San Juan River, with its headwaters in Colorado. Prior to entering New Mexico, the Animas River flows through the State of Colorado and Southern Ute Indian Tribe land. Elevation in New Mexico ranges from 5300 feet at the confluence with the San Juan River to 6000 feet at the Southern Ute Tribe boundary/Colorado state line.

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<sup>2</sup> “Designated” means a use specified in 20.6.4.9-899 (20.6.4.7 NMAC).

<sup>3</sup> “Existing” means any use attained in the water body since Nov 28, 1975 (20.6.4.7 NMAC).

<sup>4</sup> “Attainable” means achievable through effluent limitations and best management practices (20.6.4.7 NMAC)

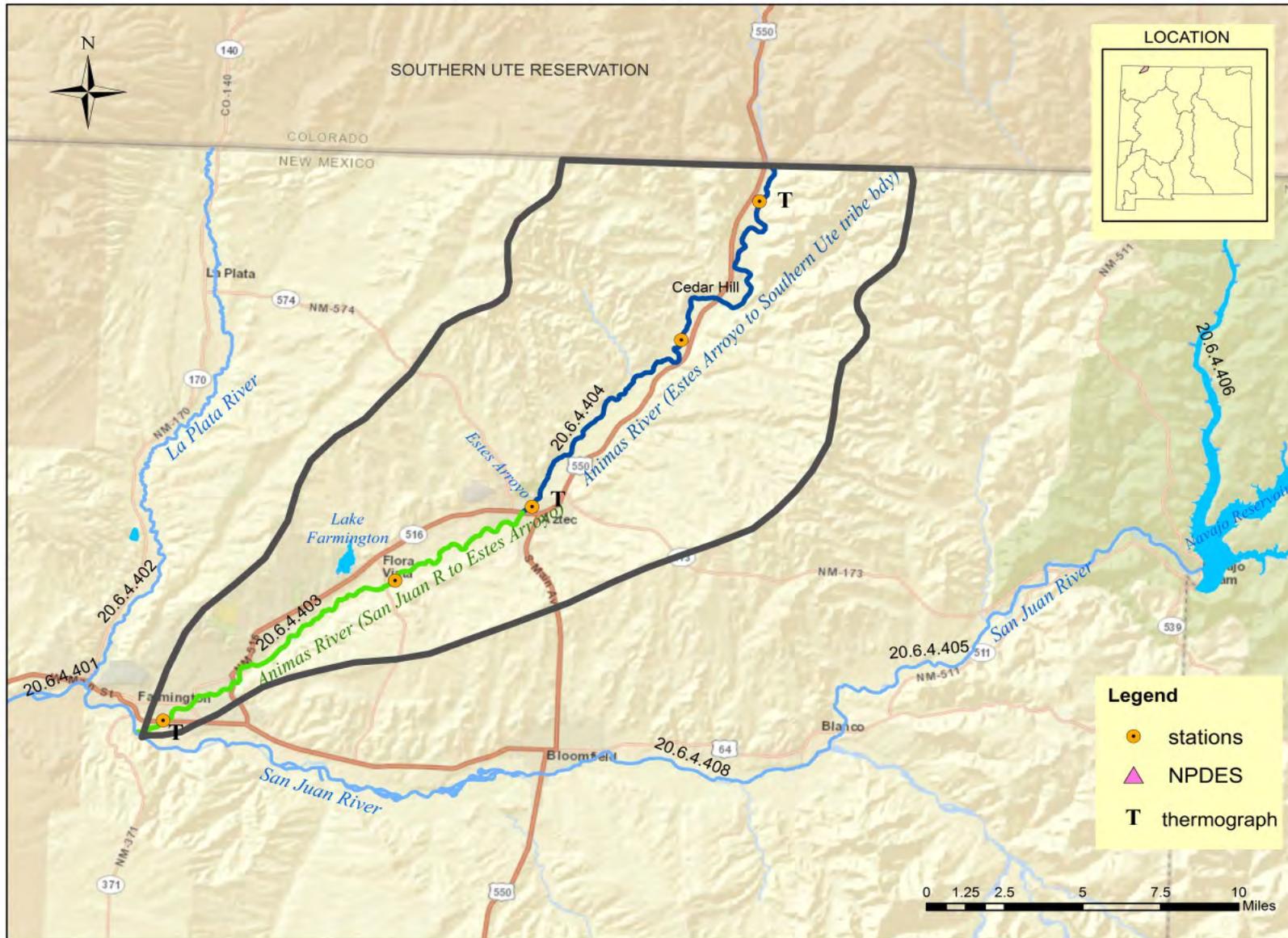


Figure 1. The Animas River Watershed

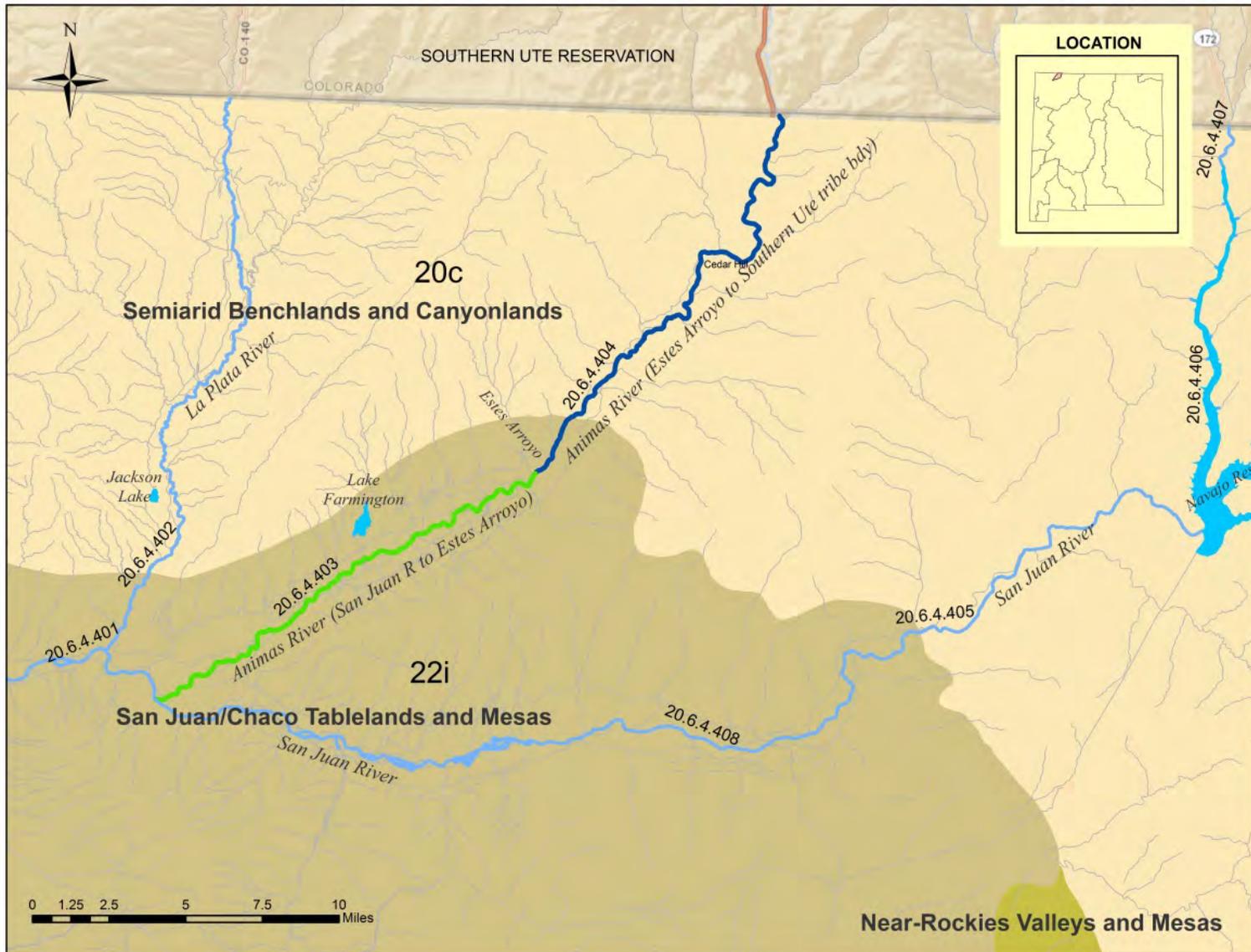
The lower Animas River AU (*San Juan River to Estes Arroyo*) is 16.9 miles long from its confluence with the San Juan River at Farmington upstream to Estes Arroyo in Aztec. The upper Animas River AU (*Estes Arroyo to the Southern Ute Tribe boundary*) is 19.6 miles long from Estes Arroyo to the Southern Ute Tribe boundary at the New Mexico border (**Figure 2**).



**Figure 2. The Animas River near the New Mexico – Colorado Border**

There are three existing point sources with individual NPDES permits along the lower Animas River (*San Juan River to Estes Arroyo*). The City of Farmington Animas Steam Plant discharges to Willett Ditch immediately above the Animas River (permit NM0000043). The plant is not currently discharging but expects to resume doing so in the near future (NMED/SWQB 2013b). The City of Aztec Water Treatment Plant (permit NM0028762) discharges to the Lower Animas Ditch, thence to the Animas River. The City of Aztec Waste Water Treatment Plant (permit NM0020168) discharges directly to the Animas River. There are no NPDES permitted point source discharges to the upper Animas River (*Estes Arroyo to the Southern Ute Tribe boundary*).

**Ecoregions** (Griffith et al., 2006) are large geographic areas of similar ecosystems. Each ecoregion is characterized by its elevation, air temperature, precipitation, terrain, geology, soils, vegetation and fauna. A Roman numeral hierarchical scheme from I to IV is used for increasing levels of ecological detail. Level III is denoted by a number and level IV is denoted by a letter. Ecoregions describe the great diversity of the natural landscape in New Mexico, which includes



**Figure 3. Ecoregions containing the Animas River Watershed**

forested mountains, semiarid shrub- and grass-covered plains, glaciated peaks, woodland- and shrubland-covered hills, lava fields and volcanic plateaus, river floodplains, and arid deserts.

The Animas watershed is contained in two moderately warm and dry ecoregions: **22i** and **20c** (**Figure 3**). Elevations range from 4800 to 7785 feet. Plateaus, mesas, cliffs and canyons constitute the predominant landforms. July air temperatures in these ecoregions average 21-22°C. Soil moisture is dry to seasonally moist. Vegetation suited to these conditions is predominantly a mix of desert and semi-desert scrub and grassland. Hydrology is characterized by intermittent and ephemeral streams, with some large rivers, such as the Animas, originating in Ecoregion 21 (Southern Rockies). The characteristics of these ecoregions are summarized in **Table 1**.

**Table 1. Ecoregions\* containing the Animas Watershed**

Code	Name	Elevation (feet)	Primary Vegetation	Physiography	Hydrology	Mean Annual precip (in.)
<b>20</b>	Colorado Plateaus					
<b>20c</b>	Semiarid Benchlands and Canyonlands	4800-7785	Junipers, some pinyon pine at higher elevations, shrubs and grassland.	Mesas, benches, cuestras, cliffs, and canyons.	Mostly ephemeral and intermittent streams with a few larger rivers originating in Ecoregion 21.	10
<b>22</b>	Arizona/New Mexico Plateau					
<b>22i</b>	San Juan/Chaco Tablelands and Mesas	5500-7100	Mix of desert scrub, semi-desert shrub-steppe, and semi-desert grasslands.	Plateaus, mesas, benches, cuestras, hogback ridges, cliffs, canyons, and valleys.	Mostly ephemeral and some intermittent streams.	6

\*based on Griffith et al. 2006

## WATER TEMPERATURE AND AQUATIC LIFE

Natural water temperatures in a waterbody fluctuate daily, seasonally, or with flow variations. Fish may depend on seasonal changes for different life stages, such as spawning or for hatching of eggs. They normally survive natural temperature fluctuations, or, in the absence of barriers, move to areas with more suitable temperatures. A variety of both native and non-native fish species have been documented in the New Mexico portion of the Animas River (Nehring 1992, Miller 2000). These species and their general temperature preferences are listed in **Table 2** below.

**Table 2. Fish species in the Animas River**

Common name	Species name	Water temperature preference*	Native?
Roundtail chub	<i>Gila robusta</i>	intermediate (cool)	yes
Speckled dace	<i>Rhinichthys osculus</i>	intermediate (cool)	yes
Bluehead sucker	<i>Catostomus discobolus discobolus</i>	intermediate (cool)	yes
Mottled sculpin	<i>Cottus bairdi</i>	intermediate (cool)	yes

Common name	Species name	Water temperature preference*	Native?
Flannelmouth sucker	<i>Catostomus latipinnis</i>	intermediate (cool)	yes
Colorado pikeminnow (extirpated)	<i>Ptychocheilus lucius</i>	warm	yes
Razorback sucker (extirpated)	<i>Xyrauchen texanus</i>	warm	yes
Rainbow trout	<i>Oncorhynchus mykiss</i>	cold	no
Brown trout	<i>Salmo trutta</i>	cold	no
White sucker	<i>Catostomus commersoni</i>	intermediate (cool)	no
Red shiner	<i>Cyprinella lutrensis</i>	warm	no
Common carp	<i>Cyprinus carpio</i>	warm	no
Fathead minnow	<i>Pimephales promelas</i>	warm	no
Western mosquitofish	<i>Gambusia affinis</i>	warm	no
Channel catfish	<i>Ictalurus punctatus</i>	warm	no
Black bullhead	<i>Ictalurus melas</i>	warm	no
Green sunfish	<i>Lepomis cyanellus</i>	warm	no

\*NMDGF 2013

New Mexico's water temperature criteria for aquatic life uses are expressed as upper limits for TMAX, 4T3 and 6T3. TMAX is the maximum temperature, 4T3 is the 4-hour maximum temperature that occurs for 3 consecutive days, and 6T3 is the 6-hour maximum temperature that occurs for 3 consecutive days. These statistics are derived from water thermograph measurements. The criteria vary for each aquatic life use subcategory as shown in **Table 3**.

**Table 3. Aquatic Life Use Temperature Criteria (°C)**

Criterion	High Quality Coldwater	Coldwater (Upper Animas)	Marginal Coldwater (Lower Animas)	Coolwater	Warmwater (Lower Animas)	Marginal Warmwater
	4T3°C	20	-	-	-	-
6T3°C	-	20	25	-	-	-
TMAX°C	23	24	29	29	32.2	32.2

Thermographs are temperature dataloggers that measure water or air temperatures continuously at a set interval *in situ* over several months, and are usually deployed throughout the summer. NMED has water thermograph data for three (3) locations on the Animas River (see **Figure 1**).

Ambient air temperature (ATEMP) is the primary driver of water temperature. NMED recently developed a correlation model to predict TMAX, 4T3 and 6T3 on July 15<sup>5</sup> for water bodies without thermograph data (NMED/SWQB 2012c). The following formulae are used:

$$\begin{aligned} \text{TMAX} &= 1.07 * \text{ATEMP} + 4.95 \\ \text{4T3} &= 1.06 * \text{ATEMP} + 1.82 \\ \text{6T3} &= 1.03 * \text{ATEMP} + 1.30 \end{aligned}$$

<sup>5</sup> The model uses July 15 as a reference date on which the highest annual temperature typically occurs.

According to this correlation, the effect of air temperature on aquatic life uses may be *estimated* as follows:

- high quality and coldwater uses may be attainable if ATEMP  $\leq 18^{\circ}\text{C}$ ;
- marginal coldwater and coolwater uses may be attainable if ATEMP  $\leq 23^{\circ}\text{C}$ ;
- warmwater may be the most restrictive use attainable if ATEMP  $> 23^{\circ}\text{C}$ .

NMED applied the temperature correlation model to five roughly equidistant locations, including the three 2010 thermograph locations. Results are shown in **Table 4**.

**Table 4. Thermograph and predicted water temperatures ( $^{\circ}\text{C}$ )**

STATION	STATION # *	ELEV FT	REF DATE**	ATEMP	TMAX	pred TMAX	6T3	pred 6T3
<b>Animas River (San Juan River to Estes Arroyo)</b>					<b>29</b>	<b>29</b>	<b>25</b>	<b>25</b>
Animas R in Farmington	66Animas001.7	5249	7/17/2010	23.0	29.9	29.6	27.2	25.0
Animas R nr Flora Vista	66Animas018.0	5486	N/A	22.5	N/A	29.0	N/A	24.4
<b>Animas River (Estes Arroyo to Southern Ute bdy)</b>					<b>24</b>	<b>24</b>	<b>20</b>	<b>20</b>
Animas R above Estes Arroyo in Aztec	66Animas028.1	5591	7/17/2010	22.2	29.2	28.7	26.0	24.1
Animas R nr Cedar Hill	66Animas042.3	1765	N/A	21.4	N/A	27.9	N/A	23.3
Animas R near state line	66Animas055.8	5912	7/29/2010	21.1	26.1	27.5	24.1	23.0

\* Stations are ordered from downstream to upstream

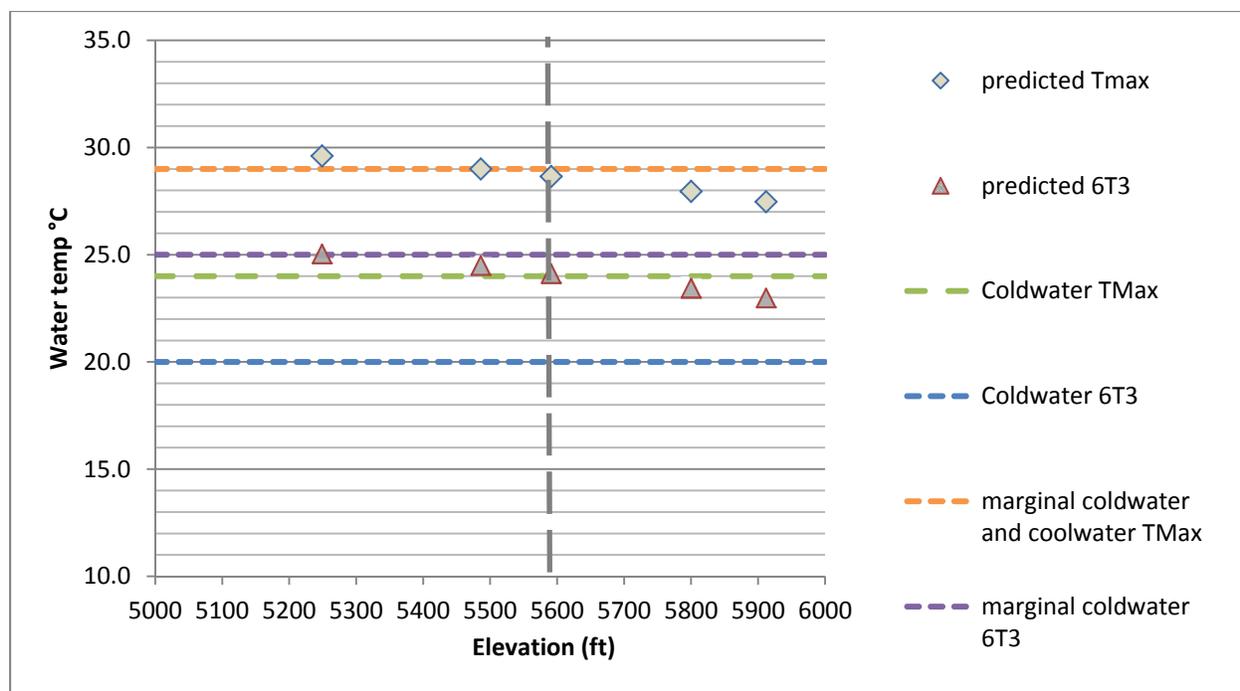
\*\*Reference date is the first date the thermograph TMAX occurs

## DISCUSSION

The Animas River in New Mexico is located in the semi-arid and semi-desert landscapes of Ecoregions 22i (lower Animas) and 20c (upper Animas). Summer air temperatures, soil moisture, precipitation, limited vegetation, and little surface water are characteristics which ultimately affect water temperatures and attainable aquatic life uses in this region. Aquatic life criteria and the predicted water temperatures for the Animas River in New Mexico are illustrated in **Figure 4**. The plot illustrates that the coldwater aquatic life temperature criteria are unlikely to be achieved on the Animas River in New Mexico.

### *Animas River (San Juan River to Estes Arroyo)*

A TMDL was prepared for this AU to address the temperature impairment of the marginal coldwater aquatic life criterion (NMED/SWQB 2013b). The Farmington thermograph measured 0.7% exceedences (15 out of 2169 measurements) of the coolwater/ marginal coldwater TMAX criterion of  $29^{\circ}\text{C}$ . Predicted and measured temperatures in Farmington exceed the TMAX criterion by less than  $1^{\circ}\text{C}$ . Predicted temperatures in Flora Vista, 16 km. upstream from Farmington, do meet the criteria. Considering the slight and relatively few measured and predicted exceedences in Farmington, and the predicted temperatures in Flora Vista, the current criteria appear appropriate for this AU. The TMDL identified possible contributors to temperature exceedences as low flows, removal of riparian vegetation and natural causes including ecoregion. Increased shading and other restoration may be adequately effective in attaining the WQS in this AU.



**Figure 4. Aquatic Life Criteria and Predicted Water Temperatures (°C)**

*Animas River (Estes Arroyo to Southern Ute boundary)*

By contrast, there were many large exceedences of the coldwater criteria throughout the upper AU. Thermographs measured 10.8% exceedences (235 out of 2175 measurements) of the TMAX above Estes Arroyo, and 4.1% exceedences (89 out of 2177 measurements) near the state line (NMED/SWQB 2013b). Predicted temperatures at all three locations also significantly exceed the coldwater criteria. It is unlikely that restoration would be effective in attaining the coldwater WQS in this AU. However, predicted temperatures easily meet the coolwater and marginal coldwater criteria, and only three thermograph measurements (0.1%) exceeded 29°C. An intermediate water temperature appears more appropriate for this AU.

The Southern Ute tribe has jurisdiction over the Animas River upstream of New Mexico, and applies its own criteria and aquatic life uses (**Table 5**). The tribe’s *Cold water* threshold is 68°F (20°C) and their *Cool water* threshold is 75°F (24°C). Above 75°F is considered *Warm water*. The tribe’s *Cool water* threshold is the same as New Mexico’s Coldwater TMAX. Therefore, although the *Warm water* use has no upper threshold, it is similar to New Mexico’s Coolwater use. According to the tribe’s data, summer water temperature in the Animas River often exceeds the *Cold water* and occasionally the *Cool water* thresholds, depending on flow conditions (SUIT 2013). The tribe has designated their section of the Animas River as *Warm water*.

**Table 5. Aquatic life Criteria for New Mexico and the Southern Ute Tribe (TMAX °C / °F)**

	Coldwater	Coolwater	Warmwater
<b>Southern Ute Tribe</b>	<20 / 68	24 / 75	>24 / 75
<b>New Mexico</b>	24 / 75	29 / 84	32.2 / 90

NMED reviewed several sources for documentation of fish in the Animas River in or near New Mexico. Fish abundance by temperature preference is summarized in **Table 6**.

**Table 6. Abundance of Fish in the Animas River (in or near NM)**

	1974-1989*	1990-2000*	1992**
<b>Animas River (San Juan River to Estes Arroyo)</b>			
Cold (trout)	0	16	-
Intermediate (cool)	1465	202	-
Warm	108	215	-
<b>Animas River (Estes Arroyo to Southern Ute bdy)</b>			
Cold (trout)	6	194	-
Intermediate (cool)	2655	3219	-
Warm	221	68	-
<b>Animas River (state line to Florida River)**</b>			
Cold (trout)	-	-	233
Intermediate (cool)	-	-	17994
Warm	-	-	4397

\* derived from Miller 2000

\*\* derived from Nehring 1992

Brown trout are relatively common in the Animas River in New Mexico, although their numbers compared to the native species suggest that the habitat is not optimal. Brown trout tend to occupy deeper, lower velocity, and warmer waters than other trout species. Research has reported optimal temps from 12-19°C, and lethal temperature at 27°C (Raleigh 1982 *in* NMDGF 2013). However, field investigations of habitat occupied by brown trout recorded summer water temperatures between 24.2 to 26.3°C (Wehrly 2000).

The vast majority of fish recorded in the Animas River in or near New Mexico are species with intermediate or warm water temperature preferences. Optimal water temperatures for native fish species in the San Juan basin range from 20°C – 26°C (ERI 2007). Two federally listed endangered species, the Colorado pikeminnow and razorback sucker, are warmwater species that have been extirpated from the Animas River (D. Propst, personal communication). These species cannot survive or reproduce in consistently cold waters (NMDGF 2013).

The large populations of intermediate and warmwater native species compared to the limited numbers of non-native coldwater fish suggests that natural conditions have always been more supportive of intermediate and warm water fish. Predicted water temperatures, as well as actual measured water temperatures in and near New Mexico, are closest to the coolwater aquatic life temperature criteria. The coolwater TMAX criterion of 29°C is protective of the native species, but may not be protective of the brown trout known to inhabit the upper AU. Based on the temperature tolerances of the various species in the river, the ability of fish to migrate upstream to cooler waters, the absence of any barriers to movement, and the attainable temperatures indicated by modeling, a TMAX of 27°C for this AU is more appropriate. The coolwater aquatic life use is the most protective aquatic life use attainable in the Animas River in New Mexico, with a maximum temperature of 27°C to protect the aquatic life in the upper AU.

## CONCLUSION

This UAA demonstrates that the natural characteristics of the Animas River in New Mexico support aquatic life habitat that is intermediate between coldwater and warmwater. The UAA concludes that **coolwater** is the most protective aquatic life use attainable for the lower Animas River (*San Juan River to Estes Arroyo*), and that **coolwater with a segment-specific maximum temperature criterion of 27°C** is the most protective aquatic life use attainable for the upper Animas River (*Estes Arroyo to the Southern Ute tribal boundary*). The lower Animas River has two designated aquatic life uses: marginal coldwater and warmwater. Although both marginal coldwater and coolwater have a maximum temperature criterion of 29°C, these uses describe different habitats. Marginal coldwater refers to habitat that would be coldwater were it not otherwise limited by certain conditions. Coolwater describes habitat that is naturally intermediate between cold and warm. Based on the existing aquatic life described in this UAA, coolwater is the best description of the attainable use. The 6T3 criterion is intended to protect coldwater aquatic life and is not applicable to the coolwater aquatic life use. The coldwater and marginal coldwater aquatic life uses are *not attainable* because of 40 CFR 131.10 (g)(1): "**naturally occurring pollutant concentrations prevent the attainment of the use....**" (see **Appendix A**). Specifically, thermal pollution (heat) naturally occurring due to ambient air temperatures prevents the attainment of the uses.

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**APPENDIX A**

40 CFR 131.10(g):

(g) States may remove a designated use which is not an existing use, as defined in Sec. 131.3, or establish sub-categories of a use if the State can demonstrate that attaining the designated use is not feasible because:

(1) Naturally occurring pollutant concentrations prevent the attainment of the use; or

(2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or

(3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or

(4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or

(5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or

(6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.