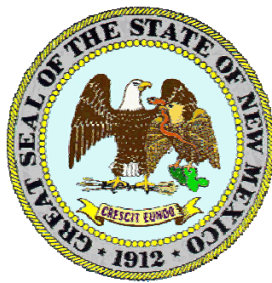


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**WATER QUALITY SURVEY SUMMARY**  
FOR THE  
**LOWER PECOS RIVER WATERSHED**  
(FROM SUMNER DAM TO THE TEXAS STATE LINE)  
**2003**



Prepared by  
Surface Water Quality Bureau  
New Mexico Environment Department

**June 30, 2006**

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## **Acknowledgements**

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## LIST OF ACRONYMS

ADB	Assessment Database
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
C	Celsius
CWA	Clean Water Act
DO	Dissolved Oxygen
DOD	Department of Defense
GIS	Geographic Information Systems
N	Nitrogen
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
P	Phosphorus
QAPP	Quality Assurance Project Plan
STORET	Storage and Retrieval System
SWQB	Surface Water Quality Bureau
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WWTP	Waste Water Treatment Plant

## 1.0 EXECUTIVE SUMMARY

Water quality surveys and assessments are completed in fulfillment of Section 106 of the Clean Water Act (CWA) [33 USC 1251 et seq.], *Work Program for Water Quality Management*. The purpose of the water quality survey is to collect water quality data to identify and prioritize water quality problems within a watershed and to evaluate the effectiveness of water quality based controls. The data collected as part of the survey are compared to current United State Environmental Protection Agency (USEPA) approved water quality standards to determine if waterbodies throughout the watershed are supporting their designated uses, such as the fishable and swimmable goals set forth in the CWA §102(a).

Water Quality Survey Summary Reports focus on information and data collected by the New Mexico Environment Department's (NMED) Surface Water Quality Bureau (SWQB) pertaining to stream reaches that were identified as NOT meeting water quality standards. All data collected as part of a survey are available upon request to the SWQB and can be downloaded from USEPA's computerized environmental data system known as STORET (<http://www.epa.gov/storet/>). The data collected as part of this study are later combined with all other readily available or submitted data that meet state quality assurance/quality control requirements to form the basis of designated use attainment determinations summarized in the biennial *State of New Mexico Integrated CWA §303(d)/305(b) Report*.

The overall water quality of the lower Pecos River surveyed as part of this study is somewhat degraded, particularly in the lower portions of the study area. Numerous water quality standards criteria exceedences were observed throughout the Pecos River watershed; however, few of these exceedences were significant enough to conclude that the waterbody was impaired for those parameters where exceedences were detected (refer to Table 3 for specific waterbodies and associated parameters and to the *Assessment Protocol* (NMED/SWQB 2004a) for information on impairment determinations). Three stream reaches, or assessment units, were determined to be impaired. The Black River from Pecos River to the headwaters is considered impaired based on toxicological data and does not support the designated aquatic life use. The Pecos River from Tansil Lake to Avalon Reservoir is impaired due to dissolved Aluminum exceedences which are likely the result of very localized conditions based on the lack of significant exceedences above and below this assessment unit. The Pecos River from the Texas border to Black River is impaired based on dissolved Boron exceedences which could be attributed to inputs from brine springs in the surrounding area. Additionally, one exceedence of a dissolved oxygen criteria of 5.0 mg/L was observed at Rattlesnakes Springs; however, this site was sampled as a screening survey only because New Mexico has not developed water quality standards specific to springs. Fish kills observed in the lower portion of the Pecos River watershed could not be attributed to violations of the water quality standards for parameters collected as part of this survey, but rather are attributable to golden algae (*Prymnesium parvum*).

## 2.0 INTRODUCTION

From March to November 2003 the Surface Water Quality Bureau (SWQB) of the New Mexico Environment Department (NMED) conducted a series of multiple-day intensive water quality surveys of the lower Pecos River watershed. The survey included the main stem of the Pecos River from Fort Sumner Dam to the Texas state line, and most perennial tributaries that enter the Pecos River in that reach. The area of the watershed that was surveyed is 46,959.25 km<sup>2</sup>, of which 1,3048.80 km<sup>2</sup> (27.8%) is in Chaves County, 1,3048.80 km<sup>2</sup> (0.33%) is in Curry County, 5,874.11 km<sup>2</sup> (12.51%) is in De Baca County, 10,503.21 km<sup>2</sup> (22.37%) is in Eddy County, 1,743.17 km<sup>2</sup> (3.71%) is in Guadalupe County, 5,585.80 km<sup>2</sup> (11.89%) is in Lea County; 6,330.73 km<sup>2</sup> (13.48%) is in Lincoln County; 1,007.87 km<sup>2</sup> (2.14%) is in Otero County; 1,050.95 km<sup>2</sup> (2.24%) is in Quay County; 1,009.99 km<sup>2</sup> (2.15%) is in Roosevelt County; and 647.31 km<sup>2</sup> (1.38%) is in Torrance County. Historic and current land uses in the lower Pecos River watershed include agriculture (range, pasture, and croplands), barren land, commercial, forest, grassland, residential, shrubland, water, and wetlands. Land ownership in the surveyed portion of the watershed includes the Bureau of Land Management (BLM), National Forest Service, Bureau of Reclamation (BOR), U. S. Fish and Wildlife Service (USFWS), National Park Service, Department of Defense (DOD), and state, tribal, and private parcels.



**Figure 1. Lower Pecos River below Taiban Gage.**

## 3.0 NM WATER QUALITY STANDARDS

General water quality criteria and criteria applicable to attainable or designated uses for portions of the lower Pecos River watershed that were surveyed in this study are set forth in sections 20.6.4.13 and 20.6.4.900, of the *Standards for Interstate and Intrastate Surface Waters* (20.6.4 NMAC, effective July 17, 2005). Segment specific standards for the lower Pecos River watershed are set forth in Sections 20.6.4.201 through 20.6.4.204, 20.6.4.206 and 20.6.4.207 NMAC and read as follows:

**20.6.4.201 PECOS RIVER BASIN - The main stem of the Pecos river from the New Mexico-Texas line upstream to the mouth of the Black river (near Loving).**

- A. Designated Uses: irrigation, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.
- B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 50 cfs: TDS 20,000 mg/L or less, sulfate 3,000 mg/L or less and chloride 10,000 mg/L or less.

[20.6.4.201 NMAC - Rp 20 NMAC 6.1.2201, 10-12-00; A, 05-23-05]

**20.6.4.202 PECOS RIVER BASIN - The main stem of the Pecos river from the mouth of the Black river upstream to lower Tansil dam, including perennial reaches of the Black river, the Delaware river and Blue spring.**

A. Designated Uses: industrial water supply, irrigation, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 34°C (93.2°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 50 cfs: TDS 8,500 mg/L or less, sulfate 2,500 mg/L or less and chloride 3,500 mg/L or less.

C. Remarks: Diversion for irrigation frequently limits summer flow in this reach of the main stem Pecos river to that contributed by springs along the watercourse.

[20.6.4.202 NMAC - Rp 20 NMAC 6.1.2202, 10-12-00; A, 05-23-05]

[NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.218 NMAC.]

**20.6.4.203 PECOS RIVER BASIN - The main stem of the Pecos river from lower the headwaters of Lake Carlsbad upstream to Avalon dam.**

A. Designated Uses: industrial water supply, livestock watering, wildlife habitat, primary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 34°C (93.2°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 235 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.203 NMAC - Rp 20 NMAC 6.1.2203, 10-12-00; A, 05-23-05]

[NOTE: The segment covered by this section was divided effective 05-23-05. The standards for the additional segment are under 20.6.4.219 NMAC.]

**20.6.4.204 PECOS RIVER BASIN - The main stem of the Pecos river from the headwaters of Avalon reservoir upstream to Brantley dam.**

A. Designated Uses: irrigation, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less, single sample 2880 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

[20.6.4.204 NMAC - Rp 20 NMAC 6.1.2204, 10-12-00; A, 05-23-05]

**20.6.4.206 PECOS RIVER BASIN - The main stem of the Pecos river from the headwaters of Brantley reservoir upstream to Salt creek (near Acme), perennial reaches of the Rio Peñasco downstream from**

**state highway 24 near Dunken, perennial reaches of the Rio Hondo and its tributaries below Bonney canyon and perennial reaches of the Rio Felix.**

A. Designated Uses: irrigation, livestock watering, wildlife habitat, secondary contact and warmwater aquatic life.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli bacteria 548 cfu/100 mL or less; single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 50 cfs: TDS 14,000 mg/L or less, sulfate 3,000 mg/L or less and chloride 6,000 mg/L or less.

[20.6.4.206 NMAC - Rp 20 NMAC 6.1.2206, 10-12-00; A, 05-23-05]

**20.6.4.207 PECOS RIVER BASIN - The main stem of the Pecos river from Salt creek (near Acme) upstream to Sumner dam.**

A. Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat and secondary contact.

B. Criteria:

(1) In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric criteria set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of E. coli 548 cfu/100 mL or less; single sample 2507 cfu/100 mL or less (see Subsection B of 20.6.4.14 NMAC).

(3) At all flows above 50 cfs: TDS 8,000 mg/L or less, sulfate 2,500 mg/L or less and chloride 4,000 mg/L or less.

[20.6.4.207 NMAC - Rp 20 NMAC 6.1.2207, 10-12-00; A, 05-23-05]

## 4.0 METHODS

Water quality, benthic macroinvertebrate and fish sampling methods were in accordance with the SWQB's approved *Quality Assurance Project Plan for Water Quality Management Programs (QAPP)* (NMED/SWQB 2003).

**Figure 2. Sampling water quality parameters using a sonde in the Lower Pecos River.**

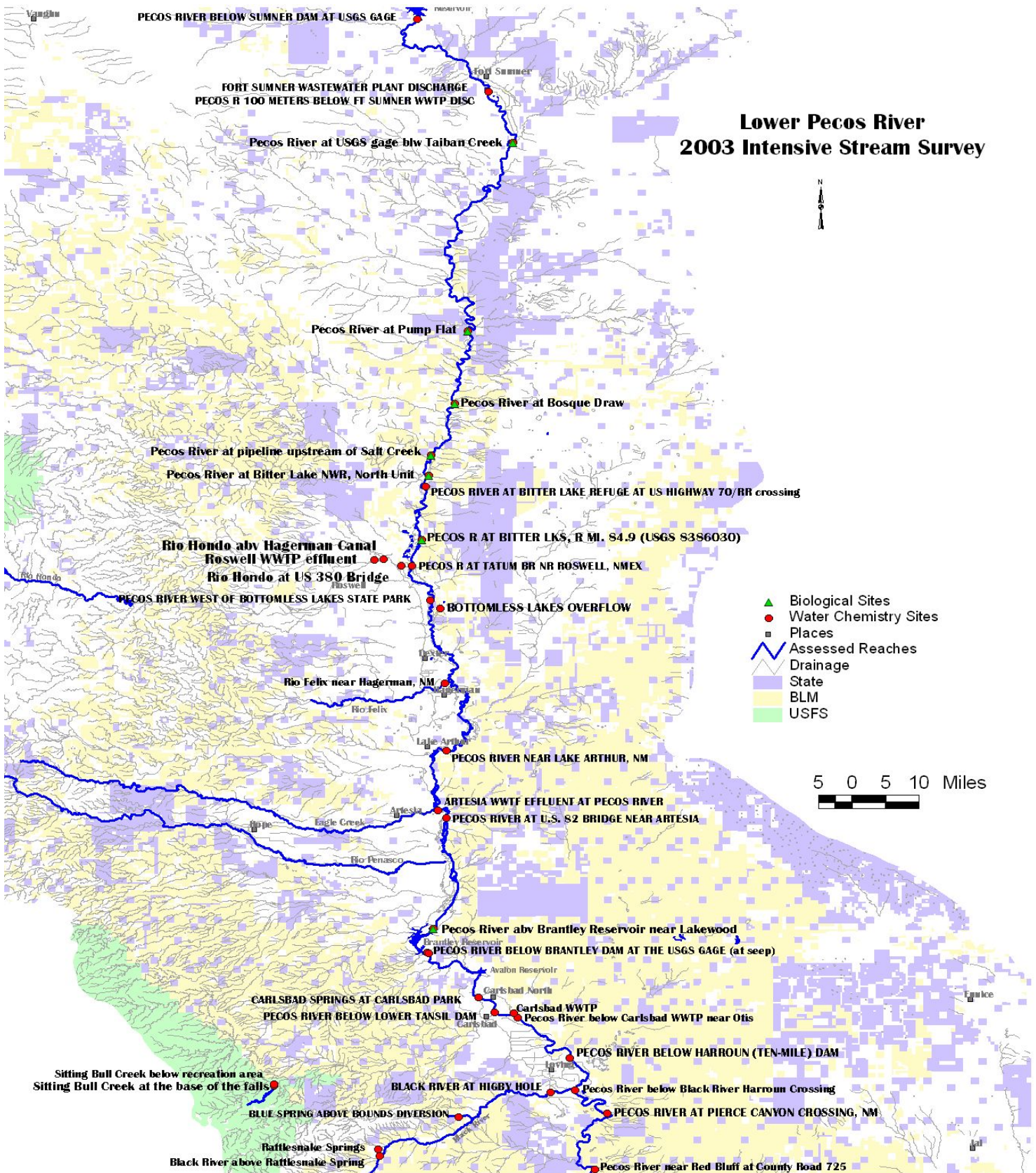


## 5.0 SAMPLING SUMMARY

A map of the study area is provided in **Figure 3**. The station numbers, STORET identification codes (where available), and location descriptions of sampling stations selected for this survey are provided in **Table 1**.



Figure 3. Lower Pecos River Watershed Study Area and Sampling Stations



**Table 1. Sampling Stations**

Station	Legacy STORET Code	New STORET Code
Pecos River near Red Bluff at County Road 725	LPR201.000505	60PecosR011.3
Pecos River at Pierce Canyon Crossing, NM		60PecosR011.3
Pecos River below Black River at Harroun Crossing		60PecosR050.2
Delaware River at Highway 285 Bridge	LPR201.000205	62Delawa006.0
Black River above Rattlesnake Spring		60BlackR052.0
Black River at Black River Village		60BlackR023.7
Black River at Higby Hole		60BlackR005.7
Blue Spring abv Bounds Diversion		60BlueSp002.0
Rattlesnake Springs		60BlackR051.0
Pecos River blw Harroun (Ten-Mile) Dam	LPR202.001515	60PecosR061.5
Pecos River blw Carlsbad WWTP near Otis		60PecosR088.4
Carlsbad WWTP		
Pecos River blw Tansil Dam	LPR203	60PecosR093.2
Carlsbad Spring at Carlsbad Park		60PecosR099.7
Pecos River below Brantley Dam at USGS gage	LPR204.004020	60PecosR125.0
Pecos River at US 82 Bridge near Artesia	LPR206.006515	56PecosR169.0
Pecos River near Lake Arthur, NM	LPR206.006520	56PecosR194.6
12S.26E.04.410 Bottomless Lakes Overflow		56BottomlessL
Pecos River at Tatum Bridge nr Roswell, NM		56PecosR273.0
Rio Hondo abv Hagerman Canal		57RHondo009.4
Rio Hondo at US 380 Bridge		57RHondo004.3
Pecos River at Bitter Lake Refuge at US Hwy 70/RR Crossing	LPR206.012540	56PecosR301.0
Pecos River 100m blw Fort Sumner WWTP	LPR.207013034	52PecosR447.1
Fort Sumner WWTP discharge		
Pecos River below Sumner Dam at USGS Gage		52PecosR483.8

**Table 2** summarizes data collected in each assessment unit and at each station. The number of times each parameter (or suite of parameters) was sampled for is indicated (in the case of stream discharge, some of the data are estimated or calculated). Thermograph data, benthic macroinvertebrate and fish sampling are indicated by an “X.” Field data include temperature, specific conductance, pH, dissolved oxygen, and turbidity and discharge.

**Table 2 Sampling Summary**

Assessment Unit / Stations	Field Data	Ions (full suite)	Ions (TDS/TSS/Hardness)	TDS/TSS (only)	Nutrients	Total Metals (full suite)	Total Hg/Se (only)	Dissolved Metals (full suite)	Fecal Coliform	Surfactants	Cyanide	Radionuclides	Organics	Thermograph	Ambient Toxicity	Sonde Deployment	Benthic Macroinvertebrates
<b>Pecos River (TX border to Black River)</b>																	
Pecos River near Red Bluff at CR 725	9	6	3	9	5	4	9				1		X				
Pecos River at Pierce Canyon Xing	9	6	3	9	4	2	6		2		1				X	X	
Pecos River below Black River at Harroun Xing	9	5	3	10	4	4	8				1		X				X
<b>Delaware River (Pecos River to TX border)</b>																	
Delaware River at Hwy 285 bridge	3	2	1	3	2		2										
<b>Black River (Pecos River to headwaters)</b>																	
Black River above Rattlesnake Spring	9	6	1	2	9	5	1	6		1					X		



## 6.0 WATER QUALITY ASSESSMENT (RESULTS AND DISCUSSION)

### 6.1 Water Quality Standards Exceedences

For many water quality parameters, the State of New Mexico maintains numeric water quality standards. However, for several parameters (e.g., plant nutrients, stream bottom deposits), only narrative standards exist. Data are assessed for designated use attainment status for both numeric and narrative water quality standards by application of the *Assessment Protocol* and associated appendices (NMED/SWQB 2004a).

The following discussion includes information pertaining to all exceedences of water quality standards found during the intensive watershed survey. The purpose of this section of the report is to provide the reader with information on where current water quality standards are being exceeded within the watershed. These exceedences are used to determine designated use impairment status. Final assessment determinations as to whether or not a stream reach is considered to be meeting its designated uses depend on the overall amount and type of data



**Figure 4. Lower Pecos River at US 70 bridge.**

available during the assessment process (Refer to NMED/SWQB's *Assessment Protocol* for additional information on the assessment process, NMED/SWQB 2004a). When available, outside sources of data that meet quality assurance requirements are combined with data collected by SWQB during intensive watershed survey to determine final impairment status. Final designated use impairment status is housed in the Assessment Database (ADB) and is reported in the biennial *State of New Mexico Integrated Clean Water Act §303(d)/§305(b) Report* (NMED/SWQB 2004b).

#### 6.1.1 Physicochemical Data

Physicochemical water quality criteria exceedences are provided in **Table 3**, which is the “exceedences only” report generated from the SWQB’s Water Quality Database. This report does not include data from continuous monitoring devices, such as sondes and thermographs. These data are organized by assessment unit, designated use, analyte, and station, in that order. A complete data set can be obtained by contacting the SWQB.

**Table 3. Physicochemical Water Quality Standards Exceedences**

This report lists physical/chemical exceedences of standards for a given watershed study. These data are broken out by Assessment Units, then "Citations", then sampling stations. The "citations" are designated uses, with these additions:

- Segment-specific criteria.
- Criteria common to various aquatic life uses (cold and warm, acute and chronic)

**Black River (Pecos River to headwaters)**

20.6.4.202. The Black River. There are no use-specific numeric criteria for industrial water supplies or secondary contact (20.6.4.900.I).

Segment Specific Criteria

pH, lower limit

**Black River above Rattlesnake Spring**

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	pH, lower limit	No	6.54	6.6	SU	3/10/2003
Yes	pH, lower limit	No	6.12	6.6	SU	6/9/2003

Warmwater Aquatic Life

Dissolved oxygen

**Black River at Higby Hole**

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	Dissolved oxygen	No	4.79	5	mg/L	5/5/2003

**Rattlesnake Springs**

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	Dissolved oxygen	No	4.76	5	mg/L	10/8/2003

**Pecos River (Avalon Reservoir to Brantley Reservoir)**

20.6.4.204. The main stem of the Pecos River from Avalon Dam upstream to Brantley Dam, including Avalon Reservoir. There are no use-specific numeric criteria for secondary contact (20.6.4.900.I). "Irrigation storage" has the same criteria as "irrigation."

Warmwater Aquatic Life

Dissolved oxygen

**Pecos River below Brantley Dam at USGS Gage**

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	Dissolved oxygen	No	4.96	5	mg/L	5/6/2003

**Pecos River (Black River to Tansil Lake)**

20.6.4.202. The main stem of the Pecos River from the mouth of the Black River upstream to Lower Tansil Dam. Diversion for irrigation frequently limits summer flow in this reach to that contributed by springs along the watercourse. There are no use-specific numeric criteria for industrial water supplies or secondary contact (20.6.4.900.I). There are no use-specific numeric criteria for secondary contact (20.6.4.900.I).

Cold Aquatic Life (chronic)

Ammonia

**Pecos River below Carlsbad WWTP near Otis**

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	Ammonia	No	0.403	0.2722208	mg/L	8/12/2003

Aquatic Life (chronic)

Dissolved aluminum

**Pecos River below Harroun (Ten-Mile) Dam**

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	aluminum	No	0.12	0.087	mg/L	12/2/2003

Irrigation

Dissolved selenium

**Pecos River below Harroun (Ten-Mile) Dam**

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	selenium	No	0.18	0.13	mg/L	8/11/2003

Livestock Watering

Dissolved selenium

***Pecos River below Harroun (Ten-Mile) Dam***

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	selenium	No	0.18	0.05	mg/L	8/11/2003

Aquatic Life (chronic)

Ammonia

***Pecos River below Carlsbad WWTP near Otis***

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	Ammonia	No	0.403	0.3840906	mg/L	8/12/2003

Warmwater Aquatic Life

Dissolved oxygen

***Pecos River below Carlsbad WWTP near Otis***

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	Dissolved oxygen	No	4.13	5	mg/L	8/12/2003

***Pecos River below Lower Tansil Dam***

Exceeds:	Analyte:	Less Than	Result:	Criterion:	Units:	Sampling
Yes	Dissolved oxygen	No	3.03	5	mg/L	4/15/2003
Yes	Dissolved oxygen	No	3.96	5	mg/L	6/10/2003

**Pecos River (Rio Peñasco to Salt Creek)**

20.6.4.206. The main stem of the Pecos River from the headwaters of Brantley Reservoir upstream to Acme. There are no use-specific numeric criteria for secondary contact (20.6.4.900.1).

Aquatic Life (chronic)

Dissolved aluminum

***Pecos River at Tatum bridge near Roswell, NM***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	aluminum	No	0.2	0.087	mg/L	8/12/2003

Total recoverable selenium

***Pecos River at Bitter Lake Refuge at Hwy 70/RR crossing***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	selenium	No	0.006	0.005	mg/L	5/14/2003

Irrigation

Dissolved boron

***Pecos River at US 82 bridge near Artesia, NM***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	boron	No	0.8	0.75	mg/L	8/12/2003

Segment Specific Criteria

Temperature

***Pecos River at Bitter Lake Refuge at Hwy 70/RR crossing***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	Temperature	No	32.95	32.2	°C	7/15/2003

Wildlife Habitat

Total recoverable selenium

***Pecos River at Bitter Lake Refuge at Hwy 70/RR crossing***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	selenium	No	0.006	0.005	mg/L	5/14/2003

Dissolved Oxygen

***Pecos River 100m below Fort Sumner WWTP***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	Dissolved oxygen	No	4.45	5	mg/L	4/16/2003

Segment Specific Criteria

pH, lower limit

***Pecos River below Sumner Dam at USGS Gage***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	pH, lower limit	No	6.1	6.6	SU	7/14/2003

**Pecos River (Tansil Lake to Avalon Reservoir)**

20.6.4.203. The main stem of the Pecos River from Lower Tansil Dam upstream to Avalon Dam, including Tansil Lake. There are no use-specific numeric criteria for industrial water supplies (20.6.4.900.I).

Aquatic Life (chronic)

Dissolved aluminum

***Carlsbad Springs at Carlsbad Park***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	aluminum	No	0.17	0.087	mg/L	4/15/2003

Segment Specific Criteria

Turbidity

***Carlsbad Springs at Carlsbad Park***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	Turbidity	No	40	25	ntu	5/13/2003
Yes	Turbidity	No	57.9	25	ntu	10/8/2003

Warmwater Aquatic Life

Dissolved oxygen

***Carlsbad Springs at Carlsbad Park***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	Dissolved oxygen	No	4.99	5	mg/L	4/15/2003
Yes	Dissolved oxygen	No	4.72	5	mg/L	6/10/2003

**Pecos River (TX border to Black River)**

20.6.4.201. The main stem of the Pecos River from the New Mexico-Texas line upstream to the mouth of the Black River. There are no use-specific numeric criteria for secondary contact (20.6.4.900.I).

Aquatic Life (chronic)

Total recoverable selenium

***Pecos River at Pierce Canyon Crossing, NM***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	selenium	No	0.009	0.005	mg/L	5/12/2003

***Pecos River near Red Bluff at County Road 725***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	selenium	No	0.01	0.005	mg/L	7/14/2003

Irrigation

Dissolved boron

***Pecos River at Pierce Canyon Crossing, NM***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	boron	No	0.9	0.75	mg/L	5/12/2003
Yes	boron	No	1.1	0.75	mg/L	7/14/2003
Yes	boron	No	1.2	0.75	mg/L	9/15/2003
Yes	boron	No	1	0.75	mg/L	10/7/2003

***Pecos River near Red Bluff at County Road 725***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	boron	No	0.9	0.75	mg/L	5/12/2003
Yes	boron	No	1	0.75	mg/L	7/14/2003
Yes	boron	No	1.5	0.75	mg/L	9/15/2003
Yes	boron	No	1.1	0.75	mg/L	10/7/2003

Wildlife Habitat

Total recoverable selenium

***Pecos River at Pierce Canyon Crossing, NM***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
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Yes	selenium	No	0.009	0.005	mg/L	5/12/2003
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***Pecos River near Red Bluff at County Road 725***

Exceeds:	Analyte:	Less Than	Result:	Standard:	Units:	Sampling
Yes	selenium	No	0.01	0.005	mg/L	7/14/2003

**6.1.2 Data from Continuous Monitoring Devices**

Temperature data loggers (thermographs) were deployed at selected stations within the study area. The devices were programmed to record temperature once per hour. **Table 4** summarizes temperature data from thermographs in degrees Celsius (C). Sondes were also deployed at selected stations to examine pH and dissolved oxygen (DO). **Tables 5a** and **5b** summarize sonde data collected from the lower Pecos River watershed.



**Figure 5. Thermograph deployment location on Lower Pecos River.**

Large data sets generated from data loggers (i.e., sondes and thermographs) are assessed according to protocols developed specifically for such data sets (with few exceptions). This is because, unlike grab sample data, it is not reasonable to list as not supporting on the basis of one or a few exceedences out of several hundred or thousand data points.

Temperature (given in °C) and pH assessment criteria are tied to the criteria in the *New Mexico Standards for Interstate and Intrastate Surface Waters* (20.6.4 NMAC, effective July 17, 2005). Dissolved oxygen assessment criteria are based on season (i.e., if early life stages of fish are likely present) and designated use (coldwater or warmwater aquatic life use). Details of assessment procedures are available in the *Assessment Protocol* (NMED/SWQB 2004a).

Large data set assessment procedures for temperature for marginal coldwater, warmwater, and limited warmwater designated uses are under development. In the interim, thermograph data from waters with these designated uses are assessed according to grab sample protocols (see Table 3.2 in the *Assessment Protocol* (NMED/SWQB 2004a) which state that if there are exceedences in  $\geq 15\%$  of data points, non-support status shall apply.



**Table 4. Summary of Thermograph Data**

Station	Data Collection Interval	WQS Temperature Criterion (°C)	Maximum Recorded Temperature (°C)	Total # of data points (n)	# / % Exceedences
<i>Pecos River near Red Bluff at County Road 725</i>	7 May - 15 Sep	32.2	33.3	3155	3 / 0.095%
<i>Pecos River below Black River at Harroun Crossing</i>	7 May - 15 Sep	32.2	30.0*	3157	0 / 0%
<i>Pecos River at Bitter Lake Refuge at Hwy 70/RR crossing</i>	15 May - 15 Sep	32.2	36.3	2975	64 / 2.15%
<i>Pecos River below Sumner Dam at USGS Gage</i>	15 May - 15 Sep	32.2	26.8	2945	0 / 0%
<i>Black River at Higby Hole</i>	7 May - 16 Sep	34.0	30.6	3170	0 / 0%
<i>Black River at Black River Village</i>	15 May - 8 Oct	34	30.7	3498	0 / 0%

\* Data suggest that this thermograph became buried in sediment. The maximum recorded temperature from grab data was 31.72 on 11 August at 18:40, which is still below the criterion.

**Table 5a Summary of pH Data Collected from Sondes**

Station	Data Collection Interval	WQS pH Criteria	Min / Max Recorded pH	Total # of data points (n)	# / % Exceedences
<i>Pecos River at Pierce Canyon Crossing</i>	11 Sep - 17 Sept	6.6-9.0	7.01 / 8.59	144	0 / 0%
<i>Pecos River below Fort Sumner WWTP</i>	19 Aug - 21 Aug	6.6-9.0	7.6 / 8.12	49	0 / 0%

**Table 5b Summary of DO Data Collected from Sondes**

Station	Data Collection Interval	WQS DO Criteria (mg/L); % Saturation	Min Recorded DO; % Saturation	Total # of data points (n)	# / % Exceedences
<i>Pecos River at Pierce Canyon Crossing</i>	11 Sep - 17 Sept	5.0; 90% or 75%	3.71; 53.8%	144	27 / 18%
<i>Pecos River below Fort Sumner WWTP</i>	19 Aug - 21 Aug	5.0; 90% or 75%	5.23 / 73.6%	49	7 / 14.3%

## 6.2 Biological Data

### 6.2.1 Benthic Macroinvertebrate Data

Benthic macroinvertebrate data were collected from the sites identified in **Table 2**. These data are currently unavailable due to a backlog of sample processing and identification. The data are expected to become available in the Spring of 2006 and incorporated into an update of this report.

### 6.2.2 Fish Data

In recent years the repeated occurrence of fish kills has caused concern among residents of the lower Pecos in New Mexico and west Texas. It has been determined that the cause of these fish kills is a microscopic organism popularly known as golden algae (*Prymnesium parvum*). *P. parvum* is increasing its range from its historical habitat in estuaries and other coastal areas world-wide into fresh water environments.



**Figure 6. Fish Kill in the Lower Pecos River.**

Inset Photo of *Prymnesium parvum* by Dr. Carmelo Tomas, UNC Wilmington

This organism is not, in fact, an alga but rather somewhere in between the algae and the protozoans. It is capable of photosynthesis like an alga but is also very mobile and capable of attacking and engulfing other micro-organisms and secreting poisons capable of killing large gill-breathing animals. It is not known to harm terrestrial organisms.

Research from around the world has shown that *P. parvum* becomes toxic when the ratio of nitrogen (N) to phosphorus (P) goes above or below its range of tolerance. Nitrogen is very soluble and hence bio-available; phosphorus is relatively insoluble, and so is not readily bio-available. Nutrient rich stormwater runoff can upset the N/P ratio, triggering a toxic bloom. This being the case, it is unclear how this organism might be controlled (Johansson 2000).

### 6.3 **Pesticides, Pharmaceuticals, and Xenobiotics**

Analyses for a broad spectrum of hydrocarbons, chlorinated hydrocarbons, insecticides, herbicides and pharmaceuticals were conducted at various stations in the study reach including four waste water treatment plants. No target analytes were detected at any station at detection limits in the low parts per billion range.

In addition to the above, samples of effluent from the four major waste water treatment plants (WWTP) were sent to USEPA's Molecular Ecology Research Branch in Cincinnati, Ohio for analysis of vitellogenin gene expression. This is a test that measures the capacity of a water sample to cause the activation of the gene responsible for the production of vitellogenin, a protein associated with the formation of egg yolk, in male fathead minnows. The intent of the test is to determine the degree to which an effluent may be interfering with the hormonal health of the receiving water biota, and ultimately of humans. Only the Roswell WWTP produced a significant positive effect. Subsequent sampling to look for a causative agent produced no results above the method detection limit of 10 parts per trillion (ng/l), indicating that hormonally active compounds are transitory in WWTP effluent streams.

## 7.0 CONCLUSIONS

The overall water quality of the lower Pecos River surveyed as part of this study is somewhat degraded, particularly in the lower portions of the study area. Numerous water quality standards criteria exceedences were observed throughout the Pecos River watershed; however, few of these exceedences were significant enough to conclude that the waterbody was impaired for those parameters where exceedences were detected [refer to **Table 3** for specific waterbodies and associated parameters and to the *Assessment Protocol* (NMED/SWQB 2004a) for information on impairment determinations]. Three stream reaches, or assessment units, were determined to be impaired. The Black River from Pecos River to the headwaters is considered impaired based on toxicological data and does not support the designated aquatic life use. The Pecos River from Tansil Lake to Avalon Reservoir is impaired due to dissolved Aluminum exceedences which are likely the result of very localized conditions based on the lack of significant exceedences above and below this assessment unit. The Pecos River from the Texas border to Black River is impaired based on dissolved Boron exceedences which could be attributed to inputs from brine springs in the surrounding area.

Additionally, one exceedence of a dissolved oxygen criteria of 5.0 mg/L was observed at Rattlesnakes Springs; however, this site was sampled as a screening survey only because New Mexico has not developed water quality standards specific to springs. Fish kills observed in the lower portion of the Pecos River watershed could not be attributed to violations of the water quality standards for parameters collected as part of this survey, but rather are attributable to golden algae (*Prymnesium parvum*).



**Figure 7. Rattlesnake Spring.**

## 8.0 REFERENCES

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