WATER QUALITY SURVEY SUMMARY
FOR THE
RED RIVER AND TRIBUTARIES

1999

Prepared by

Surface Water Quality Bureau
New Mexico Environment Department

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1.0 EXECUTIVE SUMMARY

Water quality surveys and assessments are completed in fulfillment of Section 106 of the Clean Water Act (CWA), *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 *Integrated CWA §303(d)/305(b) Water Quality Monitoring and Assessment Report*.

The Red River is subjected to environmental insults from the time its headwater tributaries leave the National Forest to the lower box below Questa. These impacts range from minor forest road crossings to inputs of metals associated with the developed mineralized area of the Molycorp mine, road construction, dredge and fill projects associated with development to the movement of massive amounts of material into the active channel through mass wasting from hydrothermal alteration scars. The effects of these influences can often be seen in the Rio Grande during runoff events for miles below the confluence with the Red River.

While minor exceedences of different parameters were observed at various sampling stations throughout the Red River watershed, the only exceedences significant enough to be classified as actual water quality impairments were aluminum along the mainstem of the Red River and Placer and Bitter Creeks; turbidity on Pioneer Creek; and stream bottom deposits on Bitter Creek. The lower portion of the Red River from Rio Grande to Placer Creek showed chronic toxicity when sediment and water bioassays tests were conducted.

The Red River, while far from pristine, seems to have undergone considerable improvement in the last decade. This is demonstrated by significant increases in both fisheries and aquatic macroinvertebrate community quality and the absence, over the course of the survey, of the white aluminum deposits that have been seen to cover the bottom of the channel in years past. Nevertheless, aluminum levels in the Red River continue to exceed standards on a regular basis and impacts from inputs of sediments from the hydrothermal alteration and dredge and fill operations continue to disrupt channel function.

2.0 INTRODUCTION

During the spring, summer, and fall of 1999 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 Red River watershed and selected tributary streams. The study was designed to address several broad issues: 1) the sources of metals loading to the river; 2) monitor nutrient loading, 3) determine the effects, if any, of hydromodification on instream habitat and 4) provide data to support the development of total maximum daily loads (TMDLs) for the Red River system.

The Red River rises on the Carson National Forest in the vicinity of Wheeler Peak, flowing north to its confluence with Goose Creek where it turns in a westerly direction, which it maintains until its confluence with the Rio Grande west of the village of Questa.

Known and potential impacts to the Red River include intensive development in and upstream of the village of Red River, natural and anthropogenic metals loading, nutrient loading associated with development, two wastewater treatment plants and one major fish hatchery, and extensive hydromodification associated with highway construction, municipal and residential development, and minerals extraction. A number of hydrothermal alteration scars periodically produce massive debris flows that overload the river with metals – principally aluminum – and sediment.

In years past, and to a lesser extent during this survey, thick accumulations of amorphous aluminum hydroxide $Al(OH)_3$ were found on the bed of the river. These deposits fill the interstitial spaces in the substrate, resulting in a loss of habitat with subsequent degradation of aquatic life uses.

3.0 NM WATER QUALITY STANDARDS

General standards and standards applicable to attainable or designated uses for portions of the upper Rio Grande watershed that were surveyed in this study are set forth in sections 20.6.4.12 and 20.6.4.900, of *Standards for Interstate and Intrastate Surface Waters* (20.6.4 NMAC, October 11, 2002). Segment specific standards for the Red River watershed are set forth in Sections 20.6.4.122, and 20.6.4.123 and read as follows:

20.6.4.122 RIO GRANDE BASIN - The main stem of the Rio Grande from Taos Junction bridge upstream to the New Mexico-Colorado line, the Red river from its mouth on the Rio Grande upstream to the mouth of Placer creek, and the Rio Pueblo de Taos from its mouth on the Rio Grande upstream to the mouth of the Rio Grande del Rancho.

A. Designated Uses: coldwater fishery, fish culture, irrigation, livestock watering, wildlife habitat, and primary contact.

B. Standards:

(1) In any single sample: pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20°C (68°F), and turbidity shall not exceed 50 NTU. The use-

specific numeric standards 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 fecal coliform bacteria shall not exceed 100/100 mL; no single sample shall exceed 200/100 mL (see Subsection B of 20.6.4.13 NMAC).

[20.6.4.122 NMAC – Rp 20 NMAC 6.1.2119, 10-12-00]

20.6.4.123 RIO GRANDE BASIN - The Red river upstream of the mouth of Placer creek, all tributaries to the Red river, and all other perennial reaches of tributaries to the Rio Grande in Taos and Rio Arriba counties unless included in other segments.

A. Designated Uses: domestic water supply, fish culture, high quality coldwater fishery, irrigation, livestock watering, wildlife habitat, and secondary contact.

B. Standards:

(1) In any single sample: conductivity shall not exceed 400 µmhos (500 µmhos for the Rio Fernando de Taos), pH shall be within the range of 6.6 to 8.8, temperature shall not exceed 20°C (68°F), and turbidity shall not exceed 25 NTU. The use-specific numeric standards 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 fecal coliform bacteria shall not exceed 100/100 mL; no single sample shall exceed 200/100 mL (see Subsection B of 20.6.4.13 NMAC).

[20.6.4.123 NMAC – Rp 20 NMAC 6.1.2120, 10-12-00]

4.0 METHODS

Water quality sampling methods were in accordance with the approved *Quality Assurance Project Plan for Water Pollution Control Programs* (QAPP) (NMED, 1999). Fluvial geomorphological surveys were conducted using the methods of Rosgen (Rosgen, 1996). Benthic macroinvertebrate and fisheries surveys were conducted by Chadwick Ecological Consultants, Inc. using their method of a quantitative Hess sample with five replicates. SWQB staff observed and participated in these sampling efforts.

5.0 SAMPLING SUMMARY

The station numbers, STORET identification codes (where available), and location descriptions of sampling stations selected for this survey are provided in Table 1.

Table 1. Sampling Stations

Station	STORET Code	Location Description
1		East Fork Red River at Ditch cabin
2	HRG21	Middle Fork Red River
3		Red River below confluence of East and Middle forks

Station	STORET Code	Location Description
4		Black Copper Canyon
5		Bear Creek – visual assessment only
6	HRG22	Red River at Zwergle Dam
6a		Red River at upper recreation crossing (QA duplicate)
7		Red River below Goose Creek
8		Bobcat Creek
9		Placer Creek
10	URG120.028070	Bitter Creek
11		Red River below Bitter Creek
12		Mallette Creek
13	URG120.028065	Pioneer Creek
14		Haut-N-Taut Creek (ephemeral)
15	RRS068	Red River at Junebug Campground
15a		Red River at fishing access (QA duplicate)
16		Straight Creek (ephemeral)
17		Red River above Red River WWTP
18		Red River below Red River WWTP
19		Hansen Creek (ephemeral)
20		Red River below Hansen Creek
21	URG120.028045	Red River at upper Molycorp boundary
22		Red River above Molycorp mine seep #2
23	URG120.028040	Red River at Columbine Creek
24	URG120.028035	Columbine Creek
25	RRS074	Red River above Molycorp mine seep #3
26		Red River between seeps #3 and #4
27	URG120.028030	Red River at Goat Hill Gulch campground
28		Red River above Capulin Creek
29		Red River below Capulin Creek
29a		Red River at picnic area (QA duplicate)
30		Not used – merged with 29
31	HRG24	Red River at Questa USGS gage
32	URG120.028017	Cabresto Creek at Hwy 38
33	RRS072	Red River at Hwy 522 bridge
34	HRG25.5	Red River below Questa WWTP
35		Red River below Molycorp outfall 002
36		Red River above hatchery (biology and geomorphology)
37	HRG24	Red River below hatchery
37a		Red River above canyon mouth (QA duplicate)

6.0 WATER QUALITY ASSESSMENT (RESULTS AND DISCUSSION)

6.1 Assessment Units (Stream Reach)

The following water quality assessment summary is divided into Assessment Units (also known as waterbody or stream reaches). Assessment Units and their associated sampling stations are given in Table 3.

Table 2. Assessment Units and Associated Sampling Stations

Assessment Unit	Sampling Stations
Red River (Rio Grande to Placer Creek)	11, 14, 15, 15a, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 29a, 31, 33, 34, 35, 36, 37, 37a
Red River (Placer Creek to headwaters)	3, 6, 6a, 7
Red River (Middle Fork)	2
Red River (East Fork)	1
Cabresto Creek (Red River to headwaters)	32
Columbine Creek (Red River to headwaters)	24
Straight Creek (NOT FORMAL ASSESSMENT UNIT)	16
Mallette Creek (Red River to headwaters)	12
Pioneer Creek (Red River to headwaters)	13
Bitter Creek (Red River to headwaters)	10
Placer Creek (Red River to headwaters)	9
Bobcat Creek (NOT FORMAL ASSESSMENT UNIT)	8
Black Copper Canyon (NOT FORMAL ASSESSMENT UNIT)	4

Note: Stations 5 and 30 were eliminated from study before sampling began.

6.2 Discussion of Exceedences of Water Quality Standards

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 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 *Appendix B* of the *Integrated Clean Water Act §303(d)/ §305(b) Report* (NMED/SWQB, 2004b).

6.2.1 Red River (Rio Grande to Placer Creek)

The chronic aluminum criterion was exceeded at all sampling stations in this assessment unit. The criterion for zinc and pH was also exceeded in this reach at station 19 during sampling events when water was present. Nine stations were evaluated along this reach for stream bottom deposits and although minor impacts were observed at some of the stations, this reach is considered to be meeting its designated uses.

Ambient toxicity tests were conducted with fathead minnows (*Pimephales promelas*) and the water flea (*Ceriodaphnia dubia)* using water and sediments collected in 1997 near station 3, and in 1999 and 2000 at station 6. The sediment elutriate tests run in 1997 resulted in 40% mortality in *C. dubia*, the more sensitive organism, but no significant toxicity in water. *P. promelas* experienced no significant toxicity in either water or sediment tests. As in the 1997 toxicity tests, significant toxicity was seen for *C. dubia* in the 1999 and 2000 sediment elutriate tests using sediment collected at station 6. To date, the toxicity in *C. dubia* at station 6 remains unexplained.

6.2.2 Red River (Placer Creek to headwaters)

With the exception of aluminum, which exceeded the chronic criterion in spring, water quality in this reach of the Red River mainstem was good. As there are no known anthropogenic sources for this aluminum it can be assumed that it is naturally occurring, with high spring concentrations attributable to leaching by snow melt. Summer and fall aluminum concentrations in the mainstem of the Red River were an order of magnitude lower than those seen in the spring.

6.2.3 Red River (Middle Fork)

Nitrates were elevated in this reach compared to the East Fork of the Red River, but not significantly enough to be considered impaired due to nutrients.

6.2.4 Red River (East Fork)

No exceedences of water quality criteria were detected during this study.

6.2.5 ***Cabresto Creek (Red River to headwaters)***

The chronic aluminum criterion was exceeded in this assessment unit during the study period, however, Molycorp submitted monitoring data for various stations on Red River and Cabresto Creek. Nine stations were sampled along Cabresto Creek Oct 6-7, 2002 and Mar 23, 2003. There were 0 of 17 exceedences of the dissolved aluminum chronic screening criterion 0.1305 ug/L (= 1.5 x 0.087 ug/L). Combining the most recent 5 years of available data (1999-2003), there were 4 of 21 (19%) total exceedences of the chronic screening criterion. The Assessment Protocol states that when consecutive day data is available, means will first be calculated and then compared to the chronic criterion. The 1999 spring data used to develop the existing aluminum data was re-assessed in this fashion because it was collected on consecutive days, leading to one exceedence of the chronic criteria for aluminum. According to this re-assessment, Cabresto Creek should not have been listed for aluminum. More recent multi-season data submitted by Molycorp for multiple stations along Cabresto Creek did not show any exceedences (0 of 17). Due to this new data and the incorrect assessment of the 1999 data, the listing for aluminum was removed from the list. There were no exceedences of the hardness-dependent criteria for chromium, cadmium, copper, nickel, or zinc.

6.2.6 ***Columbine Creek (Red River to headwaters)***

The acute aluminum criterion was exceeded during the spring sampling effort, however no exceedences occurred following the completion of snow-melt runoff.

6.2.7 ***Straight Creek (NOT FORMAL ASSESSMENT UNIT)***

The turbidity criterion was exceeded at this station on May 10 and 11. The criterion for zinc and pH were also exceeded in this reach during sampling events when water was present.

6.2.8 ***Mallette Creek (Red River to headwaters)***

The turbidity criterion was exceeded at this station on May 10 and 11. This reach also produced an exceedence of the acute aluminum criterion during the spring sampling effort, however no exceedences occurred following the completion of snow-melt runoff.

6.2.9 ***Pioneer Creek (Red River to headwaters)***

The turbidity criterion was exceeded at this station in the spring. This reach is also impaired due to stream bottom deposits. Excessive bedload was observed during all visits. Pioneer Creek has been channelized. Its mouth has been moved 1/2 to 1/4 miles downstream (personal communication with local residents in October 1999). This channelization has reduced the gradient and has greatly increased the amount of sediment deposition in this part of the creek.

6.2.10 Bitter Creek (Red River to headwaters)

The turbidity criterion was exceeded at this station on May 10 and 11. The exceedence ratio for aluminum was 3/4 with an acute level of 750ug/L. Sand and gravel operation plus land development above the gravel operations have lead to very high levels of sediment transport and deposition throughout this reach causing this reach to be impaired due to stream bottom deposits. An ongoing 319(h) program is attempting to stabilize this area.

6.2.11 Placer Creek (Red River to headwaters)

The bottom 1/2 mile of this runs parallel to a National Forest Service road and eventually runs down the middle of the road delivering high sediment loads to the Red River causing this reach to be considered impaired due to stream bottom deposits. The chronic aluminum criterion was also exceeded in this reach with an exceedence ratio of 4/4 with an acute level of 1075ug/L.

6.2.12 Bobcat Creek (NOT FORMAL ASSESSMENT UNIT)

An exceedence of the acute aluminum criterion was observed during the spring and fall.

6.2.13 Black Copper Canyon (NOT FORMAL ASSESSMENT UNIT)

The turbidity criterion was exceeded at this station on May 10.

Sampling at the eight stations above Placer Creek as well Columbine and Cabresto Creeks was designed to define background for both metals loading as well as nutrient loading possibly attributable to development in the upper watershed. Significant seasonal variation was noted in both parameter suites, with concentrations of both metals and nutrients being higher during the spring sampling effort, though nitrate remained elevated in the east fork (station 1) relative to the Middle Fork (station 2) throughout the year. These seasonal differences are attributable to the acidic nature of the spring snow melt, which was determined to have pHs of about 5 Standard Units (SU) by the National Atmospheric Deposition Project (NADP). Melt water in this pH range is capable of bringing both metals and nutrients into solution. Station 1, Red River at Ditch Cabin, could not be accessed during the spring run because of snow. Spring data for this station were generated during an auxiliary sampling effort later in May.

There is an apparent dichotomy in the relationship between the low precipitation pH, the circumneutral stream pH and high aluminum concentrations during the spring sampling effort, and the low aluminum concentrations and unchanged instream pH during the summer and fall sampling efforts. During the spring of 1999 the Red River snow melt occurred earlier than usual, peaking at least twice before the sampling effort began. This would have had the effect of flushing acidic anions (SO_4 and NO_3), present in the snow pack, through the soil, mobilizing aluminum and to a lesser extent nutrients. One of the predominant forms of aluminum at circum-neutral pH is $Al(OH)_3$, which reacts as a weak base and buffers river pH. With the passing of spring snow melt and attendant reduction in aluminum concentration, the buffering action of the $Al(OH)_3$ would be attenuated.

Due to the much higher aluminum concentrations found in tributaries to the Red River during the spring sampling effort, concentrations of dissolved aluminum in the mainstem rose from 30 ug/L at station station 3 to a high of 420 ug/L at station 6 before declining to 210 ug/L at station 7. The drop in dissolved aluminum concentration between station 6 and station 7 is attributable to dilution from Goose Creek, and to a greater degree to flocculation and subsequent removal during filtration. During the summer and fall sampling efforts dissolved aluminum levels were near or below the detection limit (10 ug/L) throughout this reach.

Results of nutrient analyses conducted in the upper reaches of the Red River did not indicate significantly elevated levels of nitrogen species, ammonia or phosphorus, although relative concentrations did change with season and location.

Nitrogen species (nitrate + nitrite), while still relatively low, were slightly elevated at station 1 compared to downstream stations during the spring sampling effort. This indicates probable snowmelt associated nutrient inputs from the East Fork watershed. This tendency was reversed during the summer and fall sampling efforts, reflecting dryer conditions with less shallow, acidic ground water entering the channel. Total phosphorus followed a similar trend.

The reaches of the Red River between Placer Creek and Cabresto Creek (stations 9 through 32) are impacted by more potentially deleterious influences than any other part of the river. The development associated with the Village of Red River has filled an historic wetland, led to the channelization of the mainstem, Pioneer and Mallette Creeks, and the production of urban storm water runoff. Nutrient levels, while still relatively low, were increased below the Red River and Questa wastewater treatment plants in summer and fall. Aluminum, manganese and, to a lesser extent, zinc were elevated in the mainstem below Bitter Creek. Flows from Bitter, Straight, Hot-n-Tot and Hansen Creeks, as well as numerous other drainages rising in the many hydrothermal scars in the area, periodically contribute low pH waters carrying sediments, debris and high levels of aluminum. One debris flow in July of 1999, issuing from an unnamed drainage just west of Red River, is estimated to have delivered 900 cubic yards of material to the river channel (Greg Miller, USFS, pers. com.). The large inputs of sediment disrupt the natural functioning of the channel, increasing embeddedness and channel migration. Construction of State Road 38 adjacent to the river required moving portions of the channel, destabilizing both the channel and the canyon wall, causing rejuvenation of some old erosional areas and initiating the formation of new ones. The Molycorp molybdenum mine has further channelized some parts of the river and withdraws a significant portion of the surface flow for process water during those times when the mill is in operation. The net effect of these hydromodifications, inputs of sediments and hydraulic withdrawals is a reduction in fish and invertebrate habitat quality. Historically, breaks in the tailings pipeline that parallels the highway for several miles spilled large quantities of highly acidic, metalliferous waste into the river channel, producing further reductions in water and habitat quality. These spills were stopped with the completion of a new, rubber lined, pipeline in 1996.

Aluminum and zinc concentrations tended to increase in a downstream direction in the mainstem until the vicinity of Capulin Canyon. At Capulin there is a marked increase in the total aluminum fraction with a corresponding decrease in the dissolved fraction of both elements. Manganese increased sharply in the Capulin area, staying elevated until removed by sorption with aluminum colloids and dilution by groundwater inputs in the vicinity of the Red River Fish Hatchery. Even with the significant decreases seen at the lowest mainstem station, dissolved aluminum concentrations still exceeded the chronic criterion.

Average nitrate/nitrite levels declined to near or below the detection limit in a downstream direction in the spring due to dilution by snowmelt. This trend was reversed during summer and fall sampling, with nitrate/nitrite reaching highest concentrations below the Red River and Questa wastewater treatment plants and the Red River Fish Hatchery. Phosphorus was seen above the detection limit only rarely during the spring effort above the Village of Red River. Summer and fall phosphorus concentrations were elevated below the Red River wastewater treatment plant and the fish hatchery. Significant algal growth was noted along the right bank below the Red River Fish Hatchery for some distance below the outfall.

6.3 Biological Assessment

Fisheries and aquatic macro-invertebrate surveys were conducted at two stations above Placer Creek by Chadwick Ecological Consultants, Inc., a contractor in the employ of Molycorp (Chadwick Ecological Consultants, Inc., 2000). Staff of SWQB observed, and participated in, these investigations.

The Middle Fork Red River (comparable to SWQB station 2), upstream of Red River (station 6), Columbine Creek (station 24) and Cabresto Creek above the USGS gage (no SWQB equivalent) stations were selected to represent unimpacted comparisons to the Red River. Of these, the upstream of Red River station (station 6) best represents conditions in the Red River.

A summary of biological data for the period prior to commencement of open pit operations, (1960-1965), during open pit operations, (1974-1988) and post open pit operations, (1997-2001) shows a clear and substantial improvement in both the fish and macroinvertebrate communities in the reach of the Red River above the Village of Red River in the 1997-2001 time period (Chadwick Ecological Consultants, Inc., 2002). As open pit mining activities would have had no impact on the river so far upstream of the mine, this improvement is attributable to cessation or completion of road building and dredge and fill operations in the area. Improvement in fisheries stocks continues over time to the present. The most recent available data for fish density indicate a sharp decline in numbers from above the Village of Red River to the reach below Hansen Creek. After a moderate rebound in the reach from the

Molycorp boundary to Capulin Canyon, fish density again declines sharply before recovering in the reach from Questa to the Rio Grande (Chadwick Ecological Consultants, Inc., 2002).

The trend for both macroinvertebrate density and taxa richness is similar to the fisheries data. Both metrics show significant improvement for the most recent time period (1995-2001). Both metrics decline from above the Village of Red River to the reach below Capulin Canyon and recover below Questa (Chadwick Ecological Consultants, Inc., 2002). For a more complete discussion of the biology of the Red River see Chadwick Ecological Consultants, Inc., 2000, 2001, and 2002.

6.4 Geomorphology

Stations 2 and 6 were selected for level II geomorphological evaluation (Rosgen, 1996). Station 2 (Middle Fork) was determined to be a C4b channel type with low to moderate embeddedness and a high (178/200) Rapid Bio-assessment Protocol (RBP) habitat rating. Station 6 (Zwergle Dam) was determined to be a C4 channel with low to moderate embeddedness and an RBP habitat rating of 158/200, indicating slight deterioration from conditions upstream. This loss of habitat value at station 6 is attributable to impacts from road building and maintenance and recreational uses. Overall, impacts and threats to this reach, other than aluminum, arise from recreation, development, and channelization/sedimentation attendant to highway construction and maintenance.

Two additional stations, 24 and 32, were also selected for Level II evaluation using Rosgen's (1996) methods. Station 24 (Columbine Creek) was surveyed at the Columbine campground and was found to have a B3 channel. Evaluation of habitat at the survey site using the EPA rapid bio-assessment protocol yielded a moderately low score of 120/200. The score was depressed by low sub-scores for bank stability, vegetative bank protection and riparian width. Station 32 (Cabresto Creek) was evaluated near the site of the biological assessment above the USGS gage at State Road 563. Channel type was determined to be a C3b and the RBP was scored at 140/200. This site, like Columbine Creek, scored low on bank stability, bank cover and riparian width. It should be noted that in this case the low scores were all on the right bank, the side adjacent to the road. It is also worthy of note that in this reach Cabresto Creek has significant flow, calculated at 7.40 cubic feet per second (CFS), whereas at the sampling station below the Questa diversion flows were reduced below measurable levels.

Seven stations in the lower portion of the Red River received level II geomorphological evaluation. All were found to be B or C channel types with moderate to good RBP habitat scores.

7.0 CONCLUSIONS

The Red River is subjected to environmental insults from the time its headwater tributaries leave the National Forest to the lower box below Questa. These impacts range from minor forest road crossings to inputs of metals associated with the developed mineralized area of the Molycorp mine, road construction, dredge and fill projects associated with development to the movement of massive amounts of material into the active channel through mass wasting from hydrothermal alteration scars. The effects of these influences can often be seen in the Rio Grande during runoff events for miles below the confluence with the Red River.

While minor exceedences of different parameters were observed at various sampling stations throughout the Red River watershed, the only exceedences significant enough to be classified as actual water quality impairments were aluminum along the mainstem of the Red River and Placer and Bitter Creeks; turbidity on Pioneer Creek; and stream bottom deposits on Bitter Creek. The lower portion of the Red River from Rio Grande to Placer Creek showed chronic toxicity when sediment and water bioassays tests were conducted.

The Red River, while far from pristine, seems to have undergone considerable improvement in the last decade. This is demonstrated by significant increases in both fisheries and aquatic macroinvertebrate community quality and the absence, over the course of the survey, of the white aluminum deposits that have been seen to cover the bottom of the channel in years past. Nevertheless, aluminum levels in the Red River continue to exceed standards on a regular basis and impacts from inputs of sediments from the hydrothermal alteration and dredge and fill operations continue to disrupt channel function.

8.0 REFERENCES

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