

2008 Taos Water Quality Sampling Report – Rio Hondo, Rio Fernando and Rio Pueblo de Taos

Lead: Sentinels-Rios de Taos

Support: Amigos Bravos and Rivers and Birds

Abstract: Surface water quality sampling was conducted in the Taos NM area between September 2007 and September 2008. Samples were collected at least once from 12 sites in the Rio Hondo, 6 sites in the Rio Pueblo de Taos, and 5 sites in the Rio Fernando de Taos. In September 2007, one site in the lower Rio Fernando and one site in the lower Rio Pueblo had conductivity readings above standards. In December 2007 one site in the Rio Pueblo had *E. coli* levels above the water quality standard. In June 2008 one site in the Lower Rio Hondo had *E. coli* levels above the water quality standard. In June 2008 all 4 sites that were tested in the Rio Fernando had *E. coli* levels above water quality standards. In July 2008 two sites in the Rio Fernando and one site in the Rio Pueblo de Taos had *E. coli* levels above the water quality standard. All other samples met water quality standards for all tested constituents. Based on these results, where all three streams that were monitored had *E. coli* levels above the water quality standard for at least one sample event and in some cases multiple sample events during the one year sampling period, it is recommended that all streams be listed as impaired for *E. coli*.

Introduction: This sampling project was initiated by Sentinels – Rios de Taos due to a concern that inadequate data were available to accurately assess the health of the Rio Hondo, Rio Fernando, and Rio Pueblo de Taos watersheds. Sentinels- Rios de Taos contacted Amigos Bravos in 2005 with concerns about water quality in local watersheds. Specifically, there was some concern about nutrient loading in the upper Rio Hondo. With Amigos Bravos' assistance Sentinels-Rios de Taos identified sampling locations and developed a monitoring plan. Sentinels-Rios de Taos contacted Rivers and Birds in Arroyo Seco to invite them and the youth that they work with to participate in the project. National representatives from Sierra Club's Water Sentinels program traveled to Taos and gave several trainings to the Sentinels-Rios de Taos' volunteers. Sampling was initiated first in February of 2007 by Sentinels- Rios de Taos with assistance from Amigos Bravos and Rivers and Birds. This report covers the sampling that occurred between September 2007 and September 2008.

Methods: Surface water quality samples were collected from 12 sites in the Rio Hondo, 6 sites in the Rio Pueblo de Taos and 5 sites in the Rio Fernando de Taos (Appendix A and Appendix C). For all samples except for the 12/3/07 and 3/10/08 sampling events, samples were kept on ice until they were processed by Sangre de Cristo labs in Alamosa Colorado. On 12/3/07 and 3/10/08 Abraham Franklin with the New Mexico Environment Department (NMED) assisted in the collection of samples and took the samples back to the NMED lab and analyzed the samples for *E. coli* at the NMED facility.

Laboratory samples (those collected on all dates except 12/3/07 and 3/10/08) were collected for nitrates, biological oxygen demand, total dissolved solids, and *E. coli*. All

laboratory samples were collected and processed with a 24hr holding time limit. EPA approved methods and holding times were used to analyze the samples (Appendix B). Field measurements for pH, temperature, dissolved oxygen and conductivity were conducted (Appendix B).

Samples collected with NMED assistance (on 12/3/07 and 3/10/08) for *E. coli* analysis only were kept on ice for less than six hours before they were processed using the IDEXX bacteria enumeration system. The system uses a most probable number method to estimate numbers of *E. coli* per 100 mL of sample. The maximum estimate the system can provide (without dilution, when all but one well is positive) is 2419.6 colony forming units per 100 mL. When all wells are positive, the resulting estimate is greater than 2419.6 CFU/100mL, or too numerous to count.

Results:

Rio Hondo:

September 19, 2007: Six laboratory samples were collected in the Rio Hondo and analyzed for *E. coli*, nitrate, BOD, and TDS. Field readings for temperature, pH, conductivity, and dissolved oxygen were also taken. (Appendix C)

December 3, 2007: Nine samples were collected (one was a duplicate) in the Rio Hondo and analyzed for *E. coli* by the New Mexico Environment Department. Samples indicated the water quality standard for *E.coli* was being met at all locations. (Appendix C).

March 10, 2008: Five samples were collected in the Rio Hondo and analyzed for *E. coli* by the New Mexico Environment Department. Samples indicated the water quality standard for *E.coli* was being met at all locations. (Appendix C).

June 10, 2008: Eight laboratory samples were collected in the Rio Hondo and analyzed for *E. coli*, nitrate, BOD, and TDS. Field readings for temperature, pH, conductivity, and dissolved oxygen were also taken. At H5 (on the north bank about 20 yards upstream from bridge in Lower Arroyo Hondo, just before the road crosses the Rio Hondo and goes uphill towards New Buffalo) *E. coli* levels were above the water quality standard that is protective of swimming (Appendix C). No other tested parameters, either in the laboratory samples or field samples, were above water quality standards (Appendix C).

July 22, 2008: Four laboratory samples were collected in the Rio Hondo and analyzed for *E. coli*, nitrate, BOD, and TDS. No water quality standard exceedences were recorded during this period (Appendix C).

September 15, 2008: Four laboratory samples were collected in the Rio Hondo and analyzed for *E. coli*, nitrate, BOD, and TDS. Field readings for temperature, pH, DO, and conductivity were also taken. No water quality standard exceedences were recorded during this period (Appendix C).

Rio Pueblo:

September 19, 2007: Three laboratory samples were collected in the Rio Pueblo de Taos and analyzed for *E. coli*, nitrate, BOD, and TDS. Field readings for temperature, pH, DO, and conductivity were also taken. The conductivity field reading taken at P3 (Rio Pueblo near the confluence with Rio Grande) showed conductivity levels of 430 microsiemens/cm which is above the applicable water quality standard of ≤ 400 . No other tested parameters, either in the laboratory samples or field samples, were above water quality standards (Appendix C).

December 3, 2007 - Six laboratory samples were collected (one was a duplicate) from the Rio Pueblo de Taos and analyzed for *E. coli* by the New Mexico Environment Department. At P2 (About 15 yards downstream from bridge at Ranchitos Road and Culebra Road. On the north side of stream by survey sign) *E. coli* was recorded at 435 cfu/100ml which is almost twice the water quality standard that is protective of swimming (235 cfu/100ml) (Appendix C).

March 10, 2008: Seven samples were collected (one was a duplicate) in the Rio Pueblo and analyzed for *E. coli* by the New Mexico Environment Department. Samples indicated the water quality standard for *E. coli* was being met at all locations (Appendix C).

June 10, 2008- Seven laboratory samples were collected from the Rio Pueblo de Taos and analyzed for *E. coli*, nitrate, BOD, and TDS. Field readings for temperature, pH, DO, and conductivity were also taken. No water quality standard exceedences were recorded during this period (Appendix C).

July 22, 2008- Four laboratory samples were collected from the Rio Pueblo de Taos and analyzed for *E. coli*, nitrate, BOD, and TDS. At P2 (about 15 yards downstream from bridge at Ranchitos Road and Culebra Road, on the north side of stream by survey sign) *E. coli* was recorded at 260 cfu/100ml which is above the applicable the water quality standard that is protective of swimming (235 cfu/100ml) (Appendix C).

September 15, 2008 - Four laboratory samples were collected from the Rio Pueblo de Taos and analyzed for *E. coli*, nitrate, BOD, and TDS. Field readings for temperature, pH, DO, and conductivity were also taken. No water quality standard exceedences were recorded during this period (Appendix C).

Rio Fernando:

September 19, 2007- Two laboratory samples were collected in the Rio Fernando and analyzed for *E. coli*, nitrate, BOD, and TDS. Field readings for temperature, pH, DO, and conductivity were also taken. Dissolved oxygen (DO) levels at both sites sampled, F1 (near Divisidero Trail in Taos Canyon) and F4 (at Fred Baca Park), were not meeting standards. F1 had a DO level of 5.5ppm and F4 had a DO level of 3ppm. The applicable water quality standard for DO for these sites is ≥ 6 . The conductivity level at F4 (690

microsiemens/cm) also exceeded the applicable water quality standard of ≤ 500 (Appendix C).

December 3, 2007: Three samples were collected in the Rio Fernando and analyzed for *E. coli* by the New Mexico Environment Department. Samples indicated the water quality standard for *E. coli* was being met at all locations (Appendix C).

March 10, 2008: Five samples were collected (one was a duplicate) in the Rio Fernando and analyzed for *E. coli* by the New Mexico Environment Department. Samples indicated the water quality standard for *E. coli* was being met at all locations (Appendix C).

June 10, 2008 – Four laboratory samples were collected in the Rio Fernando and analyzed for *E. coli*, nitrate, BOD, and TDS. Field readings for temperature, pH, DO, and conductivity were also taken. All samples showed exceedences of the applicable *E. coli* standard that is protective of swimming. F1 (across the street from Divisidero Trailhead in Taos Canyon) had *E. coli* levels of 310 cfu/100ml, F1B (immediately downstream of shadybrook) had *E. coli* levels 269 cfu/100ml, F3 (about 25 yards down from Paseo del Pueblo Sur, near ABC Lock) had *E. coli* levels of 290 cfu/100ml and F4 (at Fred Baca Park) had *E. coli* levels of 288 cfu/100ml. The applicable water quality standard is 235 cfu/100ml.

July 22, 2008 – Three laboratory samples were collected in the Rio Fernando and analyzed for *E. coli*, nitrate, BOD, and TDS. Two samples showed considerable exceedences of the applicable *E. coli* standard that is protective of swimming. F1 (near Divisidero Trail in Taos Canyon) had *E. coli* levels of 596 cfu/100ml, and F4 (at Fred Baca Park) had *E. coli* levels of 610 cfu/100ml. The applicable water quality standard is 235 cfu/100ml.

September 15, 2008- Three laboratory samples were collected in the Rio Fernando and analyzed for *E. coli*, nitrate, BOD, and TDS. Field readings for temperature, pH, DO, and conductivity were also taken. No water quality standard exceedences were recorded during this period (Appendix C).

Discussion:

All three streams that were monitored had *E. coli* levels above the water quality standard for a single sample event at least once and in some cases multiple times during the one year sampling period. These results indicate that all streams should be listed on the state's 303d list as impaired for *E. coli*.

The levels and consistency of *E. coli* found in the Rio Fernando during the summer months (6 of the 7 samples taken during June and July exceeded the *E. coli* standard) are of concern. While there were only two sampling events during this period (one on June 10th and one on July 22nd), and sampling in the previous year during July does not show exceedences, the high levels in the summer 2008 are a cause for concern and may indicate an addition of new source of contamination.

It is interesting to note that in the Rio Pueblo de Taos and the Rio Hondo no water quality standards exceedences were observed at the sites in the upper parts of the watersheds. At no point during the five sampling events in the Rio Hondo were *E. coli* exceedences observed above Valdez. Also of note is the fact that when the Taos Ski Valley Discharge pipe was tested no *E. coli* was detected at all. A point on the Rio Fernando that was monitored (F1B- below the Shadybrook development) did show *E. coli* levels slightly above standards during the June sampling event.

In September 2007, one site in the lower Rio Fernando and one site in the lower Rio Pueblo had conductivity readings above standards. Also in September of 2007 both sites tested on the Rio Fernando (F1 and F4) showed low levels of dissolved oxygen (DO) that were not meeting the water quality standard. In both June 2008 and September 2008 the lower Rio Fernando site F4 (at Fred Baca Park) had conductivity readings that were well above standards. High conductivity readings seem to correspond to low flow times of the year. Another factor that may have contributed to the low DO level at the upstream location (F1) is the presence of a substantial amount of green algae growth in the river. Low DO levels can be harmful to fish and other aquatic life.

Conclusion:

- All three streams that were monitored had *E. coli* levels above the water quality standard for a single sample event at least once and in some cases multiple times during the one year sampling period. These results indicate that all streams should be listed on the state's 303d list as impaired for *E. coli*.
- Conductivity and DO levels in the Rio Fernando and conductivity levels in the lower Rio Pueblo are cause for concern and should be continued to be monitored.
- With the exception of the Rio Fernando, the water quality exceedences were detected in the lower segments of the watersheds, perhaps indicating a connection between increased human presence and water quality exceedences.
- Field data were not collected in July or August when water temperatures would be expected to be the highest, therefore we don't have a complete picture on how high water temperature went in the three streams studied.

APPENDIX A

SENTINELS-RIOS de TAOS WATER SAMPLING SITES

ON THE RIO FERNANDO

- F1A Above Shadybrook Development, about 5 miles east of Taos, by bridge on road to Valle Escondido
- F1B About 200 meters downstream from Shadybrook, by NF La Sombra campground.
- F 1 About 10 yards downstream from the west bridge by the USFS parking lot at the Divisidero/South Boundarytrailhead. On the north bank.
- F2 About 10 yards upstream from Paseo del Pueblo Sur, across street from ABC Lock.
On the north bank. We'll usually use this site only when a storm is in progress.
- F3 About 25 yards downstream for Paseo del Pueblo Sur, by ABC Lock. On the south bank, by a concrete bar.
- F4 Fred Baca Park, about 50 yards downstream from the footbridge at the bend. On northwest side. of stream.
N36 23' 56.8"
W105 35' 23.2"

ON THE RIO PUEBLO

- P 1 About 27 yards downstream from the stop sign on Upper Ranchitos Road at Paseo del Pueblo Norte. On north side of stream by the car wash.
N36 25' 13"
W105 34' 23"
- P1A N36 25' 08.4"
W 105 34' 45.7"
- P1B Ranchitos Rd. Near bridge by Callegon Rd and SR 240 (near Hacienda de los Martinez). Mile Marker 4.
- P1C Ranchitos Rd near mile marker 13 go down dirt road to the left by road to Blackstone Ranch.
N36 23' 34.6"
W 105 37' 26.4"
- P 2 About 15 yards downstream from bridge at Ranchitos Road and Culebra Road.
On
north side of stream by survey sign.

P 3 About 10 yards upstream from the road barrier from the parking lot on the northeast corner of Taos Junction Bridge area. On east bank of stream.

ON THE RIO HONDO

H 1 Above Phoenix Restaurant, which is upstream from the Bavarian Inn

H 2A Rio Hondo just upstream from where the branch coming from Bavarian Inn (after going through the culvert under the trail) empties into the Rio Hondo.

H2B Branch coming from Bavarian Inn just before it empties into the main Rio Hondo.

H 2C About 10 yards upstream from the bridge near the day care center in the Ski Village. On the north bank.

H2C2 Directly above Taos Ski Valley Effluent Pipe

H2D Just above the Riverside property, about 175 yards downstream from the stop sign at the intersection of the Village of TSV maintenance road and Route 150. North bank.

H2E Rio Hondo directly downstream of effluent pipe
N36 35' 47"
W105 27' 43"

H2F Taos Ski Valley effluent pipe

H 3 Cuchilla Campground, just downstream from entrance road. North bank.

H 4 Kaufman Property. About 20 yards downstream from footbridge. South bank.
N 36 32' 14.8"
W 105 38' 43.4"

H4A Just downstream from Route 522 Bridge, north bank.
N 36 32' 07.1"
W 105 40' 02.7"

H 5 About 20 yards upstream from bridge in Lower Arroyo Hondo, just before the road crosses the Rio Hondo and goes uphill towards New Buffalo. North bank.
N 36 32' 59.1"
W 105 40' 55.3

H 6 About 10 yards upstream from confluence with Rio Grande.

HVB N 36 31' 58.5"
W 105 35' 04.0"

HVG 5 M downstream from bridge on lane to Jackie Garcia property
N 36 32' 07.6"
W 105 34' 12.2".

APPENDIX B

SENTINELS--RIOS de TAOS

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Project Description

The goal of the Sentinels--Rios de Taos water monitoring project is to provide additional water quality data to local, state, and federal decision makers, as well as the public at large. This project was initiated due to a concern that inadequate data was available to accurately assess the health of the Rio Hondo, Rio Fernando, and Rio Pueblo de Taos watersheds. The cumulative impact of point and nonpoint sources of pollution will be characterized by collecting data on those parameters that are basic indicators of water quality and watershed health. Surface water samples collected by volunteer monitors will be analyzed for some or all of the following constituents:

- Nitrates
- Phosphorous
- Total Dissolved Solids
- E. Coli
- pH
- Conductivity
- Dissolved Oxygen
- Temperature
- Biological Oxygen Demand (BOD)

Sampling Locations

Sampling sites may change in attempt to identify sources of pollution. Some identified sampling sites include:

SENTINELS-RIOS de TAOS WATER SAMPLING SITES

ON THE RIO FERNANDO

- | | |
|-----|--|
| F1A | Above Shadybrook Development, about 5 miles east of Taos, by bridge on road to Valle Escondido |
| F1B | About 200 meters downstream from Shadybrook, by NF La Sombra campground. |

- F 1 About 10 yards downstream from the west bridge by the USFS parking lot at the Divisidero/South Boundary trailhead. On the north bank.
- F2 About 10 yards upstream from Paseo del Pueblo Sur, across street from ABC Lock.
On the north bank. We'll usually use this site only when a storm is in progress.
- F3 About 25 yards downstream for Paseo del Pueblo Sur, by ABC Lock. On the south bank, by a concrete bar.
- F4 Fred Baca Park, about 50 yards downstream from the footbridge at the bend. On northwest side. of stream.
N36 23' 56.8"
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ON THE RIO PUEBLO

- P 1 About 27 yards downstream from the stop sign on Upper Ranchitos Road at Paseo del Pueblo Norte. On north side of stream by the car wash.
N36 25' 13"
W105 34' 23"
- P1A N36 25' 08.4"
W 105 34' 45.7"
- P1B Ranchitos Rd. Near bridge by Callegon Rd and SR 240 (near Hacienda de los Martinez). Mile Marker 4.
- P1C Ranchitos Rd near mile marker 13 go down dirt road to the left by road to Blackstone Ranch.
N36 23' 34.6"
W 105 37' 26.4"
- P 2 About 15 yards downstream from bridge at Ranchitos Road and Culebra Road.
On
north side of stream by survey sign.
- P 3 About 10 yards upstream from the road barrier from the parking lot on the northeast corner of Taos Junction Bridge area. On east bank of stream.

ON THE RIO HONDO

- H 1 Above Phoenix Restaurant, which is upstream from the Bavarian Inn
- H 2A Rio Hondo just upstream from where the branch coming from Bavarian Inn (after going through the culvert under the trail) empties into the Rio Hondo.
- H2B Branch coming from Bavarian Inn just before it empties into the main Rio Hondo.

H 2C	About 10 yards upstream from the bridge near the day care center in the Ski Village. On the north bank.
H2C2	Directly above Taos Ski Valley Effluent Pipe
H2D	Just above the Riverside property, about 175 yards downstream from the stop sign at the intersection of the Village of TSV maintenance road and Route 150. North bank.
H2E	Rio Hondo directly downstream of effluent pipe N36 35' 47" W105 27' 43"
H2F	Taos Ski Valley effluent pipe
H 3	Cuchilla Campground, just downstream from entrance road. North bank.
H 4	Kaufman Property. About 20 yards downstream from footbridge. South bank. N 36 32' 14.8" W 105 38' 43.4"
H4A	Just downstream from Route 522 Bridge, north bank. N 36 32' 07.1" W 105 40' 02.7"
H 5	About 20 yards upstream from bridge in Lower Arroyo Hondo, just before the road crosses the Rio Hondo and goes uphill towards New Buffalo. North bank. N 36 32' 59.1" W 105 40' 55.3
H 6	About 10 yards upstream from confluence with Rio Grande.
HVB	N 36 31' 58.5" W 105 35' 04.0"
HVG	5 M downstream from bridge on lane to Jackie Garcia property N 36 32' 07.6" W 105 34' 12.2".

Testing results will be sent to Region 6 of the Environmental Protection Agency (EPA), the State of New Mexico Environmental Department's Surface Water Quality Bureau, Amigos Bravos, and local newspapers and publications. Sampling results will be stored in the Sierra Club Sentinels--Rios de Taos data base.

Project Organization

Project Coordinator Contact information:

Eric E. Patterson
Box 334
Valdez, NM 87580
505-776-2833
eepatt@gmail.com

The project coordinator ensures all components of the project identified by this QAPP are completed in an efficient and timely manner. This includes oversight on sample collection, delivery, analysis, and reporting.

Sample Collector Contact Information

Eric E. Patterson, contact person (see above)

Mary Pickett	Nora Patterson	Rachel Conn
Gary Grief	Dorothy Wells	
Annouk Ellis	Jeanne Green	
Roberta Salazar	Flowers Espinosa	

Sample collectors will conduct sample collection activities according to the methods identified by this QAPP. Responsibilities include:

- Calibration, maintenance and utilization of field equipment for analysis of dissolved oxygen (DO), temperature, pH, and conductivity.
- Obtaining needed sample containers and preservatives for sampling events.
- Following quality assurance procedures for sample collection identified by this QAPP.
- Filling out chain of custody (COC) forms.

Sample Transport Contact Information

Eric E. Patterson (see above)

Sample Transport will ensure that water samples are delivered to Sangre de Cristo Laboratory, Inc., Alamosa, CO, or another EPA certified laboratory, in a secure and timely manner. Responsibilities include:

- Keeping samples secure between sampling site and the laboratory.

- Maintaining COC document according to procedures identified.
- Delivering samples within specified holding times.

Sample Analysis/Laboratory Contact Information:

Sangre de Cristo Laboratory, Inc., an EPA certified laboratory
Tierra del Sol Industrial Park
2329 Lava Lane
Alamosa, CO 81101

Sample Analysis Staff will ensure that samples are analyzed in a manner that provides the most accurate data possible. Responsibilities include:

- Analyzing samples according the methods identified in Standard Operating Procedures(SOPs).
- Analyzing samples within established holding times.
- Reporting results to Project Coordinator

Data Reporting Contact Information

Rachel Conn, Amigos Bravos Clean Water Circuit Rider and Policy Analyst
Box 238
Taos, NM 87571
505-758-3874
rconn@amigosbravos.org

Data reporting will ensure the data collected by the project is stored appropriately and disseminated to interested parties. Responsibilities include:

- Organization of final report on data collected by the project.
- Dissemination of report to specified local, state and federal agencies.
- Dissemination of report to newspapers and other local news media and presentation of project information to the public upon request.
- Entering data into Sierra Club's Water Sentinel data base.

Quality Assurance of Field Analysis

Measurements will be made using the following equipment:

- CHEMets Dissolved Oxygen Kit, Model K-7512
- Fisher Alcohol Thermometer, Model 15021B
- Oakton Conductivity ECTester Meter, Model 5-0082
- LaMotte Wide Range pH Test Kit Model P-5985 Code 2119

PARAMETER	DETECTION LIMIT	ACCURACY
Dissolved Oxygen	1 to 12 mg/L	+/- 1 ppm
Temperature	-10° to 110° C	+/- 1° C
Conductivity	0 to 1990 µS/cm	+/-10 µS/cm
pH	5.0 to 8.5 ph units	+/-0.3 pH units

Field instruments will be calibrated according to manufacturers' instructions <24 hours prior to each sampling event. The conductivity meter will be calibrated using a known standard solution. Chemicals used for dissolved oxygen and pH analysis will be replaced according to expiration dates provided by the manufacturer. Samples will be collected using the containers, preservatives, volumes and holding times identified in Appendix A

Field Sample Collection Procedures

Samples will be collected:

- Midstream just below the water's surface.
- Facing upstream to avoid disturbances caused by the sample collector.
- Upstream of minor temporal or spatial impacts, such as bridges and campsites.
- Free of floating debris.
- Using appropriate sample containers and preservatives specified in Appendix A.

Samples will be tagged appropriately with identifying number/information and delivered to appropriate laboratory personnel accompanied by appropriately completed and signed Chain of Custody(COC) forms.

Quality Assurance of Laboratory Analysis

Quality assurance of laboratory methods is the sole responsibility of the sample analysis/laboratory coordinator previously identified. Samples will be analyzed using methods contained in the laboratory's Standard Operating Procedures. These are located at Sangre de Cristo Laboratory, Inc. and can be obtained from the sample analysis coordinator upon request.

METHODS FOR LABORATORY ANALYSIS		
MATRIX	PARAMETER	METHOD
Nonpotable water	Total Dissolved Solids	EPA 160.1
Nonpotable water	Nitrates	EPA 300.0
Nonpotable water	Total Phosphorus	EPA 365.2
Nonpotable water	E. Coli	EPA 10029
Nonpotable water	BOD	SM 5210B