2012 SACRAMENTO MOUNTAINS
FIELD SAMPLING PLAN

March 2012

Prepared by
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APPROVAL PAGE

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4.2.12
Date

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ACRONYMS

AU	Assessment Unit
BMP	Best Management Practice
FSP	Field Sampling Plan
HP	Hydrology Protocol
IR	State of New Mexico Clean Water Act §303(d)/305(b) Integrated Report
MAS	Monitoring and Assessment Section
MOA	Memorandum of Agreement
NMDOH	New Mexico Department of Health
NMED	New Mexico Environment Department
NMEDAS	New Mexico Environmental Data Analysis System
NMWQS	New Mexico Water Quality Standards
NPDES	National Pollutant Discharge Elimination System
NPS	Non-Point Source
PSRS	Point Source Regulation Section
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
SLD	Scientific Laboratory Division
SOP	Standard Operating Procedures
SVOC	Semi-Volatile Organic Carbon
SWQB	Surface Water Quality Bureau
TKN	Total Kjeldahl Nitrogen
TM	Total Metals
TMDL	Total Maximum Daily Load
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
USEPA	United States Environmental Protection Agency
WPS	Watershed Protection Section
WQS	Water Quality Segment
WTU	Work Time Unit
WWTP	Wastewater Treatment Plant

INTRODUCTION

The purpose of this field sampling plan is to provide a detailed description of the Sacramento Mountains Water Quality Survey to be conducted in 2012 by the New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB). It has been prepared in accordance with SOP 2.1, Field Sampling Plans (FSP). It describes project objectives and decision criteria, and includes the sampling plan with sampling locations, parameters and sampling frequencies for physical, chemical and biological data. It may be amended as the need arises. Amendments will be documented and justified in the survey report.

This plan is a companion document to the Surface Water Quality Bureau Quality Assurance Project Plan (QAPP) for Water Quality Management Programs (NMED/SWQB 2012).

1.0 PROJECT PERSONNEL

1.1 Personnel Roles and Responsibilities

The survey is primarily conducted by the SWQB Monitoring and Assessment Section (MAS). Staff from other sections within the SWQB are involved with planning, carrying out the work and using the data. Individual roles and responsibilities are described below (Table 1).

Table 1. Personnel roles and responsibilities

Name	Role	Responsibilities
Doug Eib 505-827-0106 Greg Huey 505-827-0596	Monitoring Staff	• Plan survey • Collect and document chemical, biological, and habitat samples • Write survey report
Chris Canavan 575-647-7926	Watershed Protection Section (WPS) Liaison	• Provides information and data needs pertaining to nonpoint sources of pollution and best management practices (BMPs) located within the study area • Collects and documents chemical, biological, and habitat samples
Steve Baumgarn 575-647-7981	Point Source Regulation Section (PSRS) Liaison	• Provides information and data needs pertaining to point source discharges located within the study area • Assists with development of final survey report, as needed
Heidi Henderson 505-827-2814	TMDL Liaison	• Provides information and data needs pertaining to TMDL development to be conducted in the study area • Assists with development of final survey report, as needed; and develop TMDLs as needed

Each team member is responsible for their assigned responsibilities. If an individual is unable to fulfill their duties it is that individual's responsibility, or that of their supervisor's, to find assistance and/or a replacement.

1.2 Organization

The monitoring staff and TMDL (total maximum daily load) Liaison report to the MAS Program Manager. The Point Source Regulation Section (PSRS) liaison reports to the PSRS program manager. The Watershed Protection Section (WPS) Liaison reports to the WPS program manager.

2.0 PROJECT DESCRIPTION

2.1 Background

The 2003 and 2004 SWQB water quality surveys of this area, and in some cases newer data collection efforts, identified waters that are impaired and also waters that are meeting New Mexico Water Quality Standards (NMWQS). A list of impaired assessment units (AUs) within the survey area, the identified impairments, and TMDL status are listed below (Table 2).

Table 2. Impairment and TMDL status of survey AUs

Assessment Unit	AU- ID	WQS Number	Impairments	IR Category[*A]	TMDL Status
Rio Bonito (Rio Ruidoso to NM 48 near Angus)	NM-2208_10	20.6.4.208	low flow alterations	4C	none
Rio Bonito (NM 48 near Angus to headwaters)	NM-2209.A_10	20.6.4.209[B]	benthic-macroinvertebrates (streams); fecal coliform; low flow alterations	5/5C	fecal coliform only
Rio Ruidoso (Rio Bonito to US Hwy 70 Bridge)	NM-2208_20	20.6.4.208	nutrient/eutrophication biological indicators	4A	nutrient/ eutrophication biological indicators
Rio Hondo (Perennial reaches Bonney Canyon to Rio Ruidoso)	NM-2208_30	20.6.4.208	fecal coliform	4A	fecal coliform
S. Fork Eagle Creek (Eagle Creek to Mescalero Apache bnd)	NM-2209.A_00	20.6.4.209[B]	low flow alterations	4C	none
Rio Ruidoso (US Hwy 70 Bridge to Mescalero Apache bnd)	NM-2209.A_20	20.6.4.209	temperature, water; turbidity	4A	temperature and turbidity
Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd)	NM-2209.A_22	20.6.4.209	fecal coliform; turbidity	5/5C	fecal coliform and turbidity
Alto Lake	NM-2209.B_30	20.6.4.98[C]	copper	5/5A	none
Rio Peñasco (Pecos River to HWY 24)	NM-2206.A_10	20.6.4.206[B]	sedimentation/siltation	5/5A	none
Rio Peñasco (HWY 24 to headwaters)	NM-2208_00	20.6.4.208	sedimentation/siltation	5/5A	none

Assessment Unit	AU- ID	WQS Number	Impairments	IR Category*[A]	TMDL Status
Agua Chiquita (perennial portions Rio Peñasco to headwaters)	NM-2208_01	20.6.4.208[B]	benthic-macroinvertebrates (streams)	5/5C	none
Dog Canyon Creek (perennial portions)	NM-2801_20	20.6.4.801	temperature, water	5/5B	none
Three Rivers (Perennial prt HWY 54 to USFS exc Mescalero)	NM-2802_00	20.6.4.802	low flow alterations	4C	none
Three Rivers (USFS bnd to headwaters)	NM-2802_01	20.6.4.802	E. coli	5/5A	none

[A] IR Category refers to the New Mexico Integrated Report (IR) categories – see Appendix A.

[B] This AU may have both perennial and non-perennial reaches. Classification and AU split, if appropriate, are dependent on results of hydrologic survey using the SWQB *Hydrology Protocol* (HP).

[C] Interim classification. Work is in progress to classify lakes individually and separately from stream WQSs.

2.2 Objectives

This survey has several objectives because the data it generates must serve the needs of every section within the SWQB. These objectives are outlined below (Table 3). Data needs for the present survey have been determined based on impairments from the previous study, and consultation with SWQB, MAS, PSRS, WPS staff, as well as other state and federal agencies, pueblos, local watershed groups, and interested parties.

2.3 Schedule

This survey is made up of many components and begins with planning and ends with generation of the integrated report (IR) and TMDLs if necessary. The tentative schedule (Table 4) illustrates that completion of all aspects of the survey will take between two and three years.

As part of the survey planning process a public meeting will be held to answer questions and solicit input on the survey. This meeting will be held March 21, 2012, from 5:30 PM to 7:30 PM in the Ruidoso Village Council Chambers, Ruidoso Village Hall, 333 Cree Meadows Drive, Ruidoso, NM.

Once all data have been received, validated and verified, they will be assessed according to the most recent version of the assessment protocols (http://www.nmenv.state.nm.us/swqb/protocols). The assessment conclusions will be incorporated into the 2014-2016 IR. Any TMDLs resulting from the survey are tentatively scheduled for completion in the summer of 2014.

Table 3. Survey Objectives

	Intended use of data	Question to be answered	Products	Decision Criteria
Primary Objective	Assess designated use attainment for the IR and provide information to the public on the condition of surface water	Are sampled waterbodies meeting WQS criteria?	Survey Report; IR	NMWQS as interpreted by the Assessment Protocols
Secondary Objectives	Develop load- and waste-load allocations for TMDLs	What is the maximum pollutant load a waterbody can receive and meet the requirements of NMWQS?	TMDL loading calculations and NPDES permit limits	NMWQS as interpreted by the Assessment Protocols
	Evaluate restoration and mitigation measures implemented to control NPS pollution	Have watershed restoration activities and mitigation measures improved water quality?	Project Summary Reports, NPS Annual Report, IR	NMWQS as interpreted by the Assessment Protocols
	Develop or refine surface NMWQS	Are the existing uses appropriate for the waterbody?	Use Attainability Analyses (UAA); Amendments to NMWQS	Data sufficient to support a petition to the WQCC to revise NMWQS

2.4 Location

The study area consists of drainages originating on both fronts of the Sacramento Mountains. The eastern slopes drain to the Pecos River and include the Rio Hondo watershed, comprised of the Rio Hondo, Rio Ruidoso, Rio Bonito, Eagle Creek, Grindstone Creek, and Carrizo Creek, and the Rio Peñasco watershed, made up of the Rio and the Aqua Chiquita. The western slopes of the project area drain into the Tularosa Basin and include Tularosa Creek and its tributaries, Fresnal Creek and its tributaries, the Sacramento River, Dog Canyon and Alameda Canyon. The project area and planned sampling stations are shown below (Figures 1-3).

Table 4. Project Schedule

Activity	Winter '11-12	Spring '12	Sum '12	Fall '12	Winter '12-13	Spring '13	Sum '13	Fall '13	Winter '13	Spring /Sum '14
Survey planning, site reconnaissance; public input period	=========►									
Data collection		==========►								
Data verification, validation and assessment*				==========►						
Preparation of survey report; TMDL development							==========►			

* SWQB will complete data verification/validation for the Rio Ruidoso by January 1, 2013, and provide other data as requested for informational purposes to the Joint Use Board (Village of Ruidoso and City of Ruidoso Downs) and their contractor Parametrix for their use as part of an on-going study of the Rio Ruidoso.

3.0 DOCUMENTATION

Project documents include this field sampling plan, calibration records, data validation and verification records, field and lab data, records of analytical data in hard copy or in electronic form and QC records. Documents will be maintained according to the SWQB QAPP (NMED/SWQB, 2012).

Monitoring will be documented in field sheets. Data from field sheets is entered into the New Mexico Environmental Data Analysis System (NMEDAS) database and the field sheets are archived in a survey file at the conclusion of the project. Analytical results are electronically transferred into the NMEDAS database from the New Mexico Scientific Laboratory Division (SLD). The project will be summarized in a survey report.

4.0 SAMPLING PLAN

The survey includes chemical samples, usually collected between March and October, biological sampling, conducted within an index period (August 15 - November 30) to standardize life stages at the time of sampling, and habitat measurements that are taken during periods of baseflow. Data will be collected according to SWQB standard operating procedures (SOPs; NMED/SWQB, 2012). The survey area and sampling stations are shown in Figures 1-3.

SWQB Rio Ruidoso monitoring is designed to complement ongoing data collection conducted by Parametrix for the Village of Ruidoso. Parametrix sampling stations are shown in Figure 2. One station is co-located with an SWQB station whereas two others are near SWQB stations but at slightly different locations. This sampling design should allow a combination of both duplicate and replicate data collection efforts to provide a robust analysis of the nutrient impairment status of this AU, Rio Ruidoso (Rio Bonito to Hwy 70).

Monitoring is not planned for the effluent of two NPDES facilities within the study area: Rancho Ruidoso Valley Estates WWTP, located northeast of Ruidoso (Figure 1) or Sacramento Methodist Assembly WWTP (Figure 3). These facilities have low-volume, intermittent (batch) effluent discharges that are unlikely to reach perennial waters via surface flows. Information on the effluent characteristics from these facilities does not appear needed for TMDL development at this time.

Figure 1. North half of 2012 Sacramento Mountains survey area.

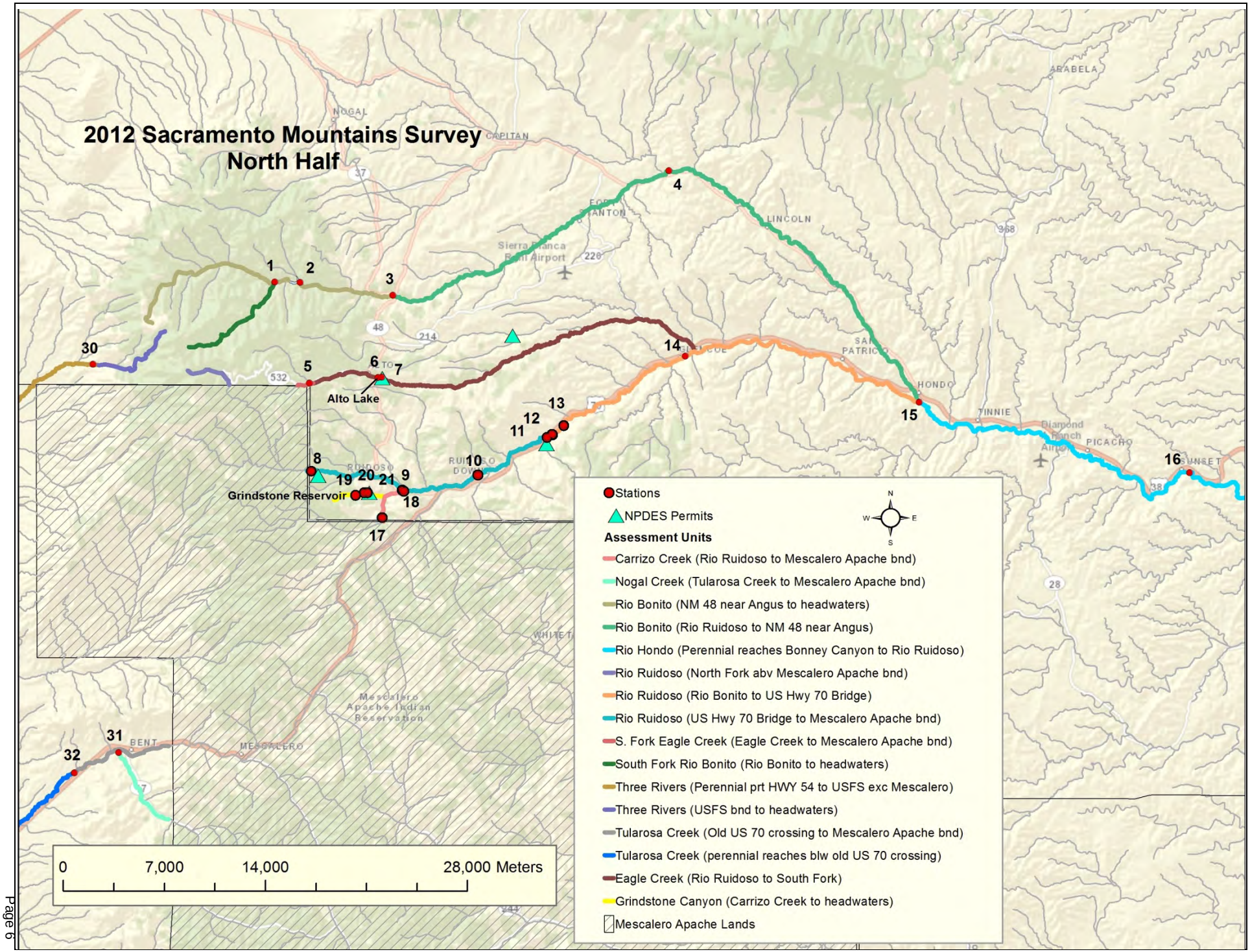


Figure 2. Expanded view of 2012 Sacramento Mountains survey in the vicinity of

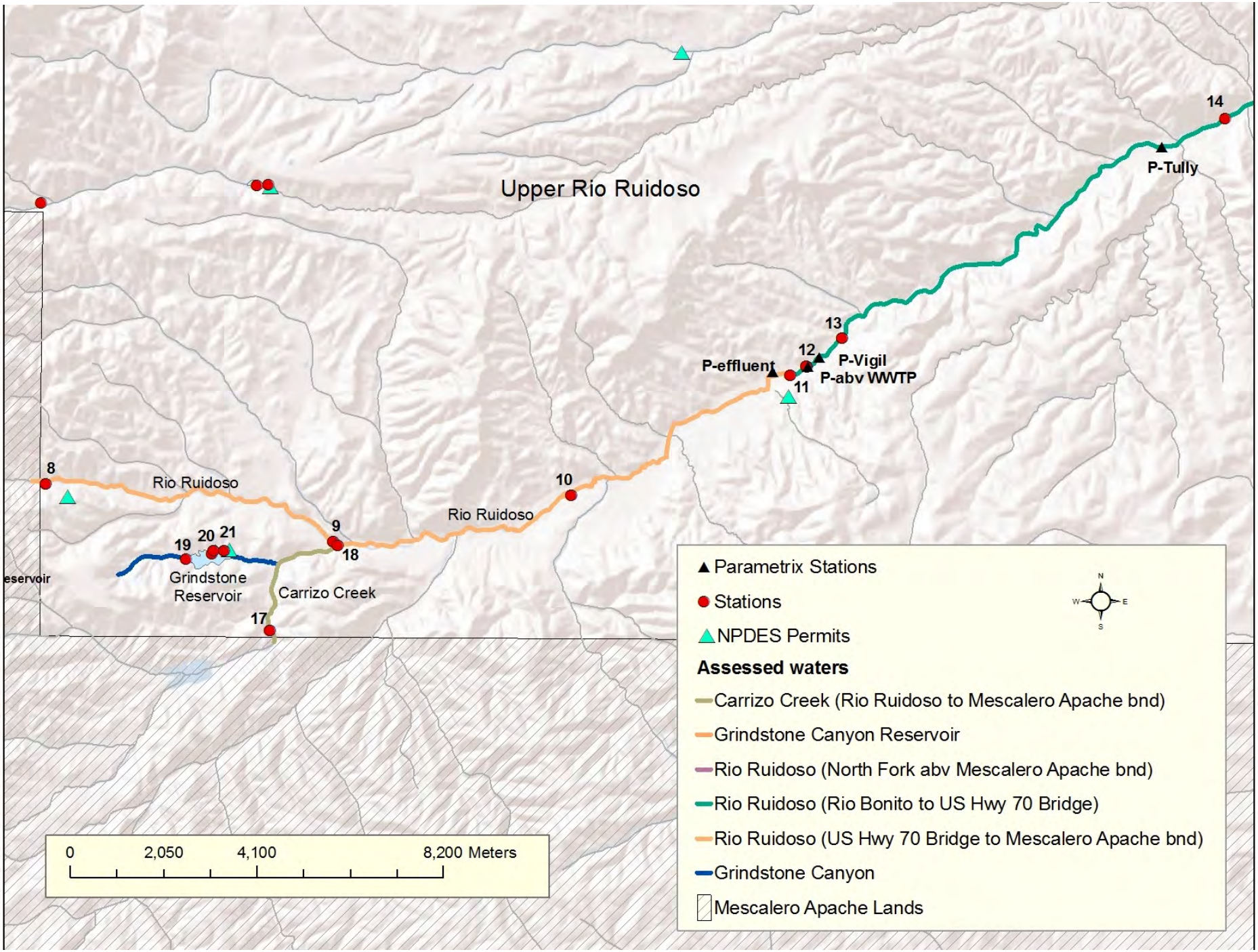
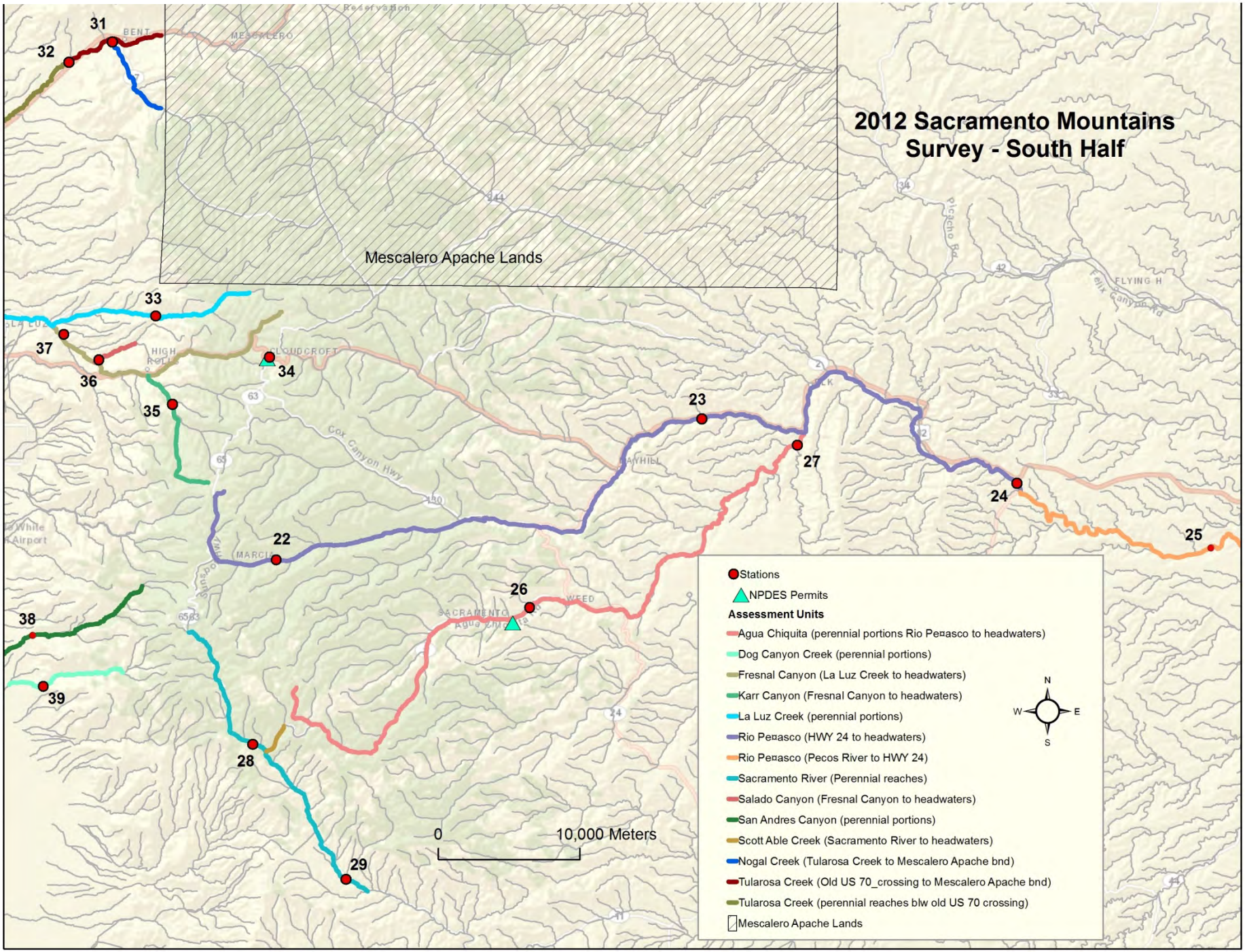


Figure 3. South half of 2012 Sacramento Mountains



4.1 Chemical Sampling

Chemistry sampling sites are allocated one per assessment unit (AU) and are usually positioned near the lower end of the AU, access permitting. Additional stations may be located to document the condition of AUs below potential pollution sources. Stations from previous surveys are used whenever possible to allow the evaluation of trends. Chemical samples will be submitted to the SLD. *E. coli* samples may be processed in the SWQB laboratory, with mobile equipment or by the SLD.

Planned sampling frequencies for chemical analytes are specified below (Table 5). In addition to the variables listed, field parameters (temperature, specific conductance, dissolved oxygen concentration, and saturation, pH, and turbidity) will be measured at each site using a multi-parameter sonde, either for discrete samples, or during deployments of 3-21 days. Temperature data is also collected with data loggers (thermographs), deployed after spring runoff. Discharge will be measured or estimated at stream stations according to SWQB SOPs (NMED/SWQB, 2012) during each sampling event. Total residual chlorine (TRC) measurements will be conducted when sampling WWTP effluent at facilities using chlorine disinfection.

Table 5. Water chemistry sampling summary. Numbers refer to number of samples planned for each parameter.

Station Number	Station Name	Assessment Unit (AU)	AU ID	WQS	TDS/TSS	Nutrients[1]	Dissolved Metals[2]	Total Metals[3]	E. coli	SVOC[4]	VOC[5]	Radionuclides[6]	Station Rationale
1	Rio Bonito abv Bonito Lake @ FR 107	Rio Bonito (NM 48 near Angus to headwaters)	NM-2209.A_10	20.6.4.209	0	6	3	4	6	0	0	0	Only station in AU
2	Bonito Lake	Bonito Lake	NM-2209.B_10	20.6.4.209*	4	4	4	4	4	2	2	2	Monitor Lake
3	Rio Bonito at Angus Bridge	Rio Bonito (NM 48 near Angus to headwaters	NM-2209.A_10	20.6.4.98*	0	3	3	3	3	0	0	0	Lowest station in AU
4	Rio Bonito @ BLM Apple Orchard Site	Rio Bonito (Rio Ruidoso to NM 48 near Angus)	NM-2208_10	20.6.4.208	6	6	3	4	6	0	2	2	Reference site; only perennial reach
5	South Fork Eagle Creek @ USGS gage	S. Fork Eagle Creek (Eagle Creek to Mescalero Apache bnd)	NM-2209.A_00	20.6.4.98*	0	3	3	3	3	0	0	0	Only station in AU

Station Number	Station Name	Assessment Unit (AU)	AU ID	WQS	TDS/TSS	Nutrients[1]	Dissolved Metals[2]	Total Metals[3]	E. coli	SVOC[4]	VOC[5]	Radionuclides[6]	Station Rationale
6	Alto Lake	Alto Lake	NM-2209.B_30	20.6.4.98**	4	4	4	4	4	2	2	2	Monitor Lake
7	Eagle Creek below Alto Lake	Eagle Creek (Rio Ruidoso to Alto Lake))	NM-98.A_007	20.6.4.98*	0	3	3	3	3	0	0	0	Only station in AU
8	Rio Ruidoso @ Mescalero boundary @ gage	Rio Ruidoso (US Hwy 70 Bridge to Mescalero Apache bnd)	NM-2209.A_20	20.6.4.209	6	6	3	4	6	0	0	0	Monitor above village
9	Rio Ruidoso above Carrizo Creek @ Two Rivers Park	Rio Ruidoso (US Hwy 70 Bridge to Mescalero Apache bnd)	NM-2209.A_20	20.6.4.209	6	6	3	4	6	0	0	0	Monitor below upper village
10	Rio Ruidoso below Ruidoso Downs Racetrack Property	Rio Ruidoso (US Hwy 70 Bridge to Mescalero Apache bnd)	NM-2209.A_20	20.6.4.209	6	6	0	0	6	0	0	0	Monitor impacts of racetrack
11	Rio Ruidoso above Hwy 70 bridge	Rio Ruidoso (US Hwy 70 Bridge to Mescalero Apache bnd)	NM-2209.A_20	20.6.4.209	6	6[7]	3	4	6	2	2	2	Bottom of AU
12	Ruidoso New WWTP Outfall	Rio Ruidoso (Rio Bonito to US Hwy 70 Bridge)	NM-2208_20	NPDES Permit NM0029165 and 20.6.4.208	6	6[7]	0	0	6	0	0	0	Determine contribut-ion from WWTP
13	Rio Ruidoso at CR E002	Rio Ruidoso (Rio Bonito to US Hwy 70 Bridge)	NM-2208_20	20.6.2.208	6	6[7]	3	4	6	2	2	2	Monitor stream below input from WWTP
14	Rio Ruidoso @ Glencoe-FR 443	Rio Ruidoso (Rio Bonito to US Hwy 70 Bridge)	NM-2208_20	20.6.4.208	6	6[7]	3	4	6	0	0	0	Down-stream end of perennial each

Station Number	Station Name	Assessment Unit (AU)	AU ID	WQS	TDS/TSS	Nutrients[1]	Dissolved Metals[2]	Total Metals[3]	E. coli	SVOC[4]	VOC[5]	Radionuclides[6]	Station Rationale
15/16*	Rio Hondo 100 yds below confluence Rio Hondo @ Riverside	Rio Hondo (perennial reaches Bonney Canyon to Rio Ruidoso)	NM-2208_30	20.6.4.208	6	6	3	4	6	2	2	2	Lowest accessible site on AU; NMWQS refinement
17	Carrizo Creek @ Mescalero Boundary	Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd)	NM-2209.A_22	20.6.4.209	6	6	3	4	6	0	0	0	Monitor water leaving Tribal lands
18	Carrizo Creek @ Two Rivers Park	Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd)	NM-2209.A_22	20.6.4.209	6	6	3	4	6	2	2	2	Bottom of AU
19	Grindstone Creek above Grindstone Reservoir	Grindstone Canyon abv Grindstone Reservoir	NM-98.A_009	20.6.4.98*	0	3	3	3	3	0	0	0	No previous data
20	Grindstone Canyon Reservoir	Grindstone Canyon Reservoir	NM-2209.B_20	20.6.4.208*	0	4	4	4	4	2	2	2	Monitor Reservoir
21	Grindstone Creek below Grindstone Reservoir	Grindstone Canyon blw Grindstone Reservoir	NM-98.A_008	20.6.4.98*	0	3	3	3	3	0	0	0	Monitor receiving water for NPDES permit
22	Rio Peñasco @ Bluff Springs	Rio Peñasco (HWY 24 to headwaters)	NM-2208_00	20.6.4.208	6	6	3	4	6	0	0	2	Monitor upper perennial reach
23	Rio Peñasco on USFS (below Mayhill)	Rio Peñasco (HWY 24 to headwaters)	NM-2208_00	20.6.4.208	0	3	3	3	3	0	0	0	Below Mayhill; determine flow status
24	Rio Peñasco @ Hwy 24 Bridge	Rio Peñasco (HWY 24 to headwaters)	NM-2208_00	20.6.4.208	6	6	3	4	6	0	0	2	Bottom of AU

Station Number	Station Name	Assessment Unit (AU)	AU ID	WQS	TDS/TSS	Nutrients[1]	Dissolved Metals[2]	Total Metals[3]	E. coli	SVOC[4]	VOC[5]	Radionuclides[6]	Station Rationale
25	Rio Penasco near Helena Road	Rio Peñasco (Pecos River to Hwy 24)	NM-2206.A_10	20.6.4.206*	3	3	3	3	3	0	0	2	Only station in AU
26	Agua Chiquita between Weed and Sacramento	Agua Chiquita (perennial portions Rio Peñasco to headwaters)	NM-2208_01	20.6.4.208	6	6	3	4	6	0	0	2	Only station in perennial reach
27	Agua Chiquita near mouth on Rio Peñasco	Agua Chiquita (perennial portions Rio Peñasco to headwaters)	NM-2208_01	20.6.4.206*	0	3	3	3	3	0	0	0	Bottom of AU
28	Sacramento River @ USGS Gage	Sacramento River (Perennial reaches)	NM-2805_00	20.6.4.208	6	6	3	4	6	0	0	2	Only station in perennial reach
29	Sacramento River below Tiberon	Sacramento River (Perennial reaches)	NM-2805_00	20.6.4.98*	0	3	3	3	3	0	0	0	Bottom of AU
30	3 Rivers @ USFS Camp-ground	Three Rivers (USFS bnd to headwaters)	NM-2802_01	20.6.4.802	6	6	3	4	6	0	0	2	Only station in perennial reach
31	Nogal Creek @ CR B-17	Nogal Creek (Tularosa Creek to Mescalero Apache bnd)	NM-2801_10	20.6.4.801	0	3	3	3	3	0	0	0	Only station in AU
32	Tularosa Creek @ USGS Gage 08481500	Tularosa Creek (Old US 70 crossing to Mescalero Apache bnd)	NM-2801_01	20.6.4.801	6	6	3	4	6	0	0	2	Only station in AU
33	La Luz Creek @ CR A-70	La Luz Creek (perennial	NM-2801_40	20.6.4.801	0	3	3	3	3	0	0	0	Only station in AU

Station Number	Station Name	Assessment Unit (AU)	AU ID	WQS	TDS/TSS	Nutrients[1]	Dissolved Metals[2]	Total Metals[3]	E. coli	SVOC[4]	VOC[5]	Radionuclides[6]	Station Rationale
		portions)											
34	Cloudcroft WWTP effluent	Fresnal Canyon (La Luz Creek to headwaters)	NM-2801_41	NPDES Permit NM0023370 and 20.6.4.801	3	3	0	0	3	0	0	0	Monitor effluent
35	Karr Canyon above Raven Road	Karr Canyon (Fresnal Canyon to headwaters)	NM-2801_42	20.6.4.801	6	6	3	4	6	0	0	2	Only station in AU
36	Rio Salado above Fresnal Canyon	Salado Canyon (Fresnal Canyon to headwaters)	NM-2801_43	20.6.4.801	6	6	3	4	6	0	0	2	Only station in AU
37	Fresnal Creek @ Alamogordo Water intake	Fresnal Canyon (La Luz Creek to headwaters)	NM-2801_41	20.6.4.801	3	3	3	3	3	0	0	0	Only station in AU
38	San Andreas Canyon	San Andreas Canyon (perennial portions)	NM-2801_30	20.6.4.99	0	4	3	4	4	0	0	2	Only station in AU
39	Dog Canyon @ nature trail	Dog Canyon Creek (perennial portions)	NM-2801_20	20.6.4.801	6	6	3	4	6	0	0	2	Only station in AU
Quality Control Samples					0	18	11		18	2	2	0	
Totals					137	198	116	128	198	16	16	38	

* Samples will be collected at either station 15 or 16 depending on status of flow and access.

1 Suite includes total Kjeldahl nitrogen (TKN), nitrate+nitrite, ammonia and total phosphorus.

2 Suite includes aluminum, antimony, arsenic, barium, boron, cadmium, calcium, chromium,cobalt, copper, iron, magnesium, manganese, molybdenum, nickel, silicon, silver, tin,vanadium, zinc and hardness.

3 aluminum, selenium and mercury only.

4 Semi-volatile organic compounds. See Appendix B for a list of analytes included in this suite

5 Volatile organic compounds. See Apendix IB for a list of analytes included in this suite.

6 A radionuclide sample will initially be analyzed for gross alpha and gross beta radiation and, depending on results of the gross alpha and gross beta screen, may include uranium mass and radium 226 + 228.

7 At the request of the Joint Use Board and their contractor Parametrix, SWQB will collect dissolved nutrient data at these stations; WTUs for analysis not included in the budget

4.2 Nutrient, Biological and Habitat Sampling

Stations are selected for biological and habitat monitoring based on their current IR status and results of level 1 nutrient assessments. Resources such as staff and budgets, and access issues do not allow for the collection of biological and habitat data in all AUs.

Biological indicators and habitat measurements give an overall indication of the integrity of the AU. The SWQB collects fish, periphyton, and physical habitat data at select sites to assess waterbodies for potential impairment from sediment deposition and nutrient enrichment, and to obtain data to support water quality standards development. A summary of planned biological and habitat monitoring appears below (Table 6).

5.0 RESOURCE REQUIREMENTS

Water chemistry samples submitted to SLD are paid for with an internal currency, work-time units (WTUs), supplied by means of a memorandum of agreement (MOA) between NMED and the New Mexico Department of Health (NMDOH). Nutrient samples (periphyton chlorophyll *a*) and *E. coli* samples analyzed by SWQB are paid for with United States Environmental Protection Agency (USEPA) funding. These expenditures are summarized below (Table 7).

Table 6. Nutrient and habitat sampling summary. Numbers refer to total samples or deployments for each parameter.

Station Number	Station Name	Assessment Unit (AU)	Ecoregion	Sedimentation[1] Habitat[2]	Thermograph	Sonde[3]	Nutrient Survey[4]	Chlorophyll	Phytoplankton	Macroinvertebrates	Hydrology Protocol
1	Rio Bonito above Bonito Lake @ FR 107	Rio Bonito (NM 48 near Angus to headwaters)	23f	1	1	2	1	1	1	1	1
2	Bonito Reservoir	Rio Bonito (NM 48 near Angus to headwaters)	23f	0	0	0	0	4	4	0	0
3	Rio Bonito@ Angus Bridge	Rio Bonito (NM 48 near Angus to headwaters	23c	0	0	0	0	0	0	0	1
4	Rio Bonito @ BLM Apple Orchard Site	Rio Bonito (Rio Ruidoso to NM 48 near Angus)	23b	1	1	1	1	0	0	0	0
5	South Fork Eagle Creek @ USGS gage	S. Fork Eagle Creek (Eagle Creek to Mescalero Apache bnd)	23c	0	0	0	0	0	0	0	1
6	Alto Lake	Alto Lake	23c	0	0	0	0	4	4	0	0
7	South Fork Eagle Creek below Alto Lake	S. Fork Eagle Creek (Eagle Creek to Mescalero Apache bnd)	23c	1	1	0	1	0	0	0	1

Station Number	Station Name	Assessment Unit (AU)	Ecoregion	Sedimentation[1] Habitat[2]	Thermograph	Sonde[3]	Nutrient Survey[4]	Chlorophyll	Phytoplankton	Macroinvertebrates	Hydrology Protocol
9	Rio Ruidoso above Carrizo Creek @ Two Rivers Park	Rio Ruidoso (US Hwy 70 Bridge to Mescalero Apache bnd)	23f	1	1	2	1	1	0	0	0
11	Rio Ruidoso above Hwy 70 bridge	Rio Ruidoso (US Hwy 70 Bridge to Mescalero Apache bnd)	23b	1	1	2	3	3	0	3	0
13	Rio Ruidoso at CR E002	Rio Ruidoso (Rio Bonito to US Hwy 70 Bridge)	23b	1	1	2	3	3	1	3	0
14	Rio Ruidoso @ Glencoe-FR 443	Rio Ruidoso (Rio Bonito to US Hwy 70 Bridge)	23b	1	1	2	1	1	0	0	1
15/16*	Rio Hondo @ Riverside/100 yds below confluence	Rio Hondo (perennial reaches Bonney Canyon to Rio Ruidoso)	26q	1	1	2	1	1		1	0
18	Carrizo Creek @ Two Rivers Park	Carrizo Creek (Rio Ruidoso to Mescalero Apache bnd)	23f	1	1	2	1	1	0	0	0
19	Grindstone Creek above Grindstone Reservoir	Grindstone Canyon abv Grindstone Reservoir	23b	0	0	0	0	0	0	0	1

Station Number	Station Name	Assessment Unit (AU)	Ecoregion	Sedimentation[1] Habitat[2]	Thermograph	Sonde[3]	Nutrient Survey[4]	Chlorophyll	Phytoplankton	Macroinvertebrates	Hydrology Protocol
20	Grindstone Reservoir	Grindstone Canyon Reservoir	23b	0	0	0	0	4	4	0	0
21	Grindstone Creek below Grindstone Reservoir	Grindstone Canyon blw Grindstone Reservoir	23b	0	0	0	0	0	0	0	1
22	Rio Peñasco @ Bluff Springs	Rio Peñasco (HWY 24 to headwaters)	23c	1	1	1	1	1	0	0	0
23	Rio Peñasco on USFS (below Mayhill)	Rio Peñasco (HWY 24 to headwaters)	26o	0	0	0	0	0	0	0	1
24	Rio Peñasco at Hwy 24 Bridge	Rio Peñasco (HWY 24 to headwaters)	23b	1	1	2	1	1	0	0	0
25	Rio Penasco near Helena Road	Rio Peñasco (Pecos River to Hwy 24)	24a	1	1	1	1	1	0	0	1
27	Aqua Chiquita near mouth on Rio Peñasco	Agua Chiquita (perennial portions Rio Peñasco to headwaters)	23c	1	1	1	1	1	0	1	1

Station Number	Station Name	Assessment Unit (AU)	Ecoregion	Sedimentation[1] Habitat[2]	Thermograph	Sonde[3]	Nutrient Survey[4]	Chlorophyll	Phytoplankton	Macroinvertebrates	Hydrology Protocol
28	Sacramento River @ USGS Gage	Sacramento River (Perennial reaches)	23f	1	1	1	1	0	0	0	0
29	Sacramento River blw Timberon	Sacramento River (Perennial reaches)	23f	0	0	0	0	0	0	0	1
30	Three Rivers @ USFS Campground	Three Rivers (USFS bnd to headwaters)	23b	1	1	1	1	1	0	0	0
31	Nogal Creek @ CR B-17	Nogal Creek (Tularosa Creek to Mescalero Apache bnd)	23b	1	1	1	1	1	0	0	1
32	Tularosa Creek @ USGS Gage 08481500	Tularosa Creek (Old US 70 crossing to Mescalero Apache bnd)	23a	1	1	1	1	1	0	0	0
33	La Luz Creek @ CR A-70	La Luz Creek (perennial portions)	23b	1	1	1	1	1	0	0	1
35	Karr Canyon above Raven Road	Karr Canyon (FresnalCanyon to headwaters)	23f	1	1	1	1	1	0	0	1

Station Number	Station Name	Assessment Unit (AU)	Ecoregion	Sedimentation[1] Habitat[2]	Thermograph	Sonde[3]	Nutrient Survey[4]	Chlorophyll	Phytoplankton	Macroinvertebrates	Hydrology Protocol
36	Rio Salado above Fresnal Canyon	Salado Canyon (Fresnal Canyon to headwaters)	23a	1	1	1	1	0	0	0	1
37	Fresnal Creek @ Alamogordo Water intake	Fresnal Canyon (La Luz Creek to headwaters)	23a	1	1	1	1	1	0	0	1
38	San Andreas Canyon	San Andres Canyon (perennial portions)	23a	1	1	1	1	0	0	0	1
39	Dog Canyon @ nature trail	Dog Canyon Creek (perennial portions)	23a	1	1	1	1	0	0	0	0
	Quality Control Samples			1	0	0	6	6	0	0	1
Totals				24	23	33	27	39	12	9	17

* Samples will be collected at either station 15 or 16 depending on status of flow and access.

1 If sedimentation data (pebble counts) exceed the threshold value for percent fines at a site, more extensive habitat data are collected during a subsequent visit.

2 Habitat data collection is triggered by sedimentation data (pebble counts) that show excessive values of percent fines as determined by exceedences of threshold values established for mountain, plains and foothills regions.

3 Sondes are deployed to collect turbidity data and as part of level 2 nutrient surveys.

4 Nutrient screening is a two-step process. A preliminary visual assessment of periphyton (level 1 screening) is used to determine if level 2 sampling, consisting of periphyton collection, chlorophyll determinations, water samples for nitrogen and phosphorus, and a sonde deployment to record diurnal variations in pH and dissolved oxygen concentrations, is warranted.

Table 7. Estimated analytical charges

Analyte / Analysis	Number of Samples	Cost per Sample	Totals
TDS/TSS	137	24	3,288
Nutrients	198	76	15,048
Dissolved Metals	116	207	24,012
Total Metals	141	100	14,100
Volatile Organic Compounds (VOCs)	16	150	2,400
Semi-Volatiles (SVOCs)	16	220	3,250
Radionuclides	38	120	4,560
Total (WTUs)			**66,658**
E. *coli* (SWQB)	198	$5.08	$1,006
Benthic Macroinvertebrates	10	$175	$1,750
Chlorophyll *a* (SWQB)	39	$45	$1,755
Phytoplankton	12	$165	$1,980
Total (USD)			**$6,491**

The estimated WTUs exceed the 60,865 budgeted for this survey. However, the likelihood of collecting the projected number of samples shown in Table 5 is small due to the low snow pack and predicted precipitation below normal levels throughout the survey period.

A round trip for this survey is approximately 750 miles. A lake sampling trip is estimated at 500 miles. Gasoline costs are estimated at $3.76 per gallon. Vehicles typically used for surveys average 15 miles per gallon. Four water chemistry sampling trips are planned for streams for this survey and four trips combining lakes and streams. An additional four trips are planned for biological, habitat and nutrient surveys, and conducting the hydrology protocol.

Water chemistry sampling trips will require three nights of per diem for two staff. Lake sampling trips will require two nights of per diem for two staff. Habitat and nutrient monitoring require two staff to complete one to two sites per day. Per diem costs and staff time estimates necessary for the survey are shown below (Table 9).

Table 8. Transportation Costs.

Type of Work	Approximate miles per trip	Number of Trips	Fuel Costs
Water Chemistry Sampling – Streams	750	4	$752
Water Chemistry Sampling – Lakes	500	4	$501
Nutrient/Habitat/ Surveys + Hydrology Protocol	750	4	$752
Total			**$ 2005***

* Estimated cost per gallon was based from average gas prices for 2/9/12 for Santa Fe at 3.16 from NewMexcioGasPrices.com (2012). 60 cents per gallon, which is the estimated increase per gallon for Summer 2012 (Strauss, 2012), was added to the average price.

Table 9. Per diem and staff time estimates

	Water Chemistry Sampling	Biological/Habitat Sampling + Hydrology Protocol	Total	Cost
Per Diem (number of nights)	40	24	64	$5,440[1]
Staff Days	56	24	80[2]	

[1] Per Diem estimates do not include partial days and are based on $85/night.

[2] Time for preparation, loading and unloading vehicles, maintenance, cleaning of equipment, and lab work is not included.

A summary of the estimated resources needed for the entire project are summarized in Table 10, but exclude items such as sample containers, preservatives, parts, calibration standards and maintenance for multi-parameter sondes, and vehicle maintenance.

Table 10. Total Cost Estimates

WTUs	Analyses	Fuel	Per Diem	Staff Days
66,658	$ 6,491	$ 2,005	$ 5,440	80

6.0 REFERENCES

NMED/SWQB. 2012. *Standard Operating Procedures for Sample Collection and Handling.* New Mexico Environment Department Surface Water Quality Bureau. (www.nmenv.state.nm.us/swqb/SOP)

NMED/SWQB. 2012. *Quality Assurance Project Plan for Water Quality Management Programs*, New Mexico Environment Department Surface Water Quality Bureau. (www.nmenv.state.nm.us/swqb/QAPP)

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APPENDIX A IR (Integrated Report) Category

Overall water quality standards attainment category for each assessment unit as determined by combining individual designated use support decisions. The unique assessment categories for New Mexico are described as follows as follows:

IR Category 1	Attaining the water quality standards for all designated and existing uses. AUs are listed in this category if there are data and information that meet all requirements of the assessment and listing methodology and support a determination that the water quality criteria are attained.
IR Category 2	Attaining some of the designated or existing uses based on numeric and narrative parameters that were tested, and no reliable monitored data is available to determine if the remaining uses are attained or threatened. AUs are listed in this category if there are data and information that meet requirements of the assessment and listing methodology to support a determination that some, but not all, uses are attained based on numeric and narrative water quality criteria that were tested. Attainment status of the remaining uses is unknown because there is no reliable monitored data with which to make a determination.
IR Category 3	No reliable monitored data and/or information to determine if any designated or existing use is attained. AUs are listed in this category where data to support an attainment determination for any use are not available, consistent with requirements of the assessment and listing methodology.
IR Category 4A	Impaired for one or more designated uses, but does not require development of a TMDL because TMDL has been completed. AUs are listed in this subcategory once all TMDL(s) have been developed and approved by USEPA that, when implemented, are expected to result in full attainment of the standard. Where more than one pollutant is associated with the impairment of an AU, the AU remains in Category 5A (see below) until all TMDLs for each pollutant have been completed and approved by USEPA.
IR Category 4B	Impaired for one or more designated uses, but does not require development of a TMDL because other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future. Consistent with the regulation under 40 CFR 130.7(b)(i),(ii), and (iii), AUs are listed in this subcategory where other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard (WQS) applicable to such waters.
IR Category 4C	Impaired for one or more designated uses, but does not require development of a TMDL because impairment is not caused by a pollutant. AUs are listed in this subcategory if a pollutant does not cause the impairment. For example, USEPA considers flow alteration to be “pollution” vs. a “pollutant.”

IR Category 5/5A	Impaired for one or more designated or existing uses and a TMDL is underway or scheduled. AUs are listed in this category if the AU is impaired for one or more designated uses by a pollutant. Where more than one pollutant is associated with the impairment of a single AU, the AU remains in Category 5A until TMDLs for all pollutants have been completed and approved by USEPA.
IR Category 5/5B	Impaired for one or more designated or existing uses and a review of the water quality standard will be conducted. AUs are listed in this category when it is possible that water quality standards are not being met because one or more current designated use is inappropriate. After a review of the water quality standard is conducted, a Use Attainability Analysis (UAA) will be developed and submitted to USEPA for consideration, or the AU will be moved to Category 5A and a TMDL will be scheduled.
IR Category5/5C	Impaired for one or more designated or existing uses and Additional data will be collected before a TMDL is scheduled. AUs are listed in this category if there is not enough data to determine the pollutant of concern or there is not adequate data to develop a TMDL. For example, AUs with biological impairment will be listed in this category until further research can determine the particular pollutant(s) of concern. When the pollutant(s) are determined, the AU will be moved to Category 5A and a TMDL will be scheduled. If it is determined that the current designated uses are inappropriate, it will be moved to Category 5B and a UAA will be developed. If it is determined that “pollution” is causing the impairment (vs. a “pollutant”), the AU will be moved to Category 4C.

APPENDIX B Organic Analytical Suite Parameters

Organics (semi-volatiles)	Organics (volatiles)
1,2,4-Trichlorobenzene	1,1,1,2-Tetrachloroethane
1,2-Dichlorobenzene	1,1,1-Trichloroethane
1,2-Dinitrobenzene	1,1,2,2-Tetrachloroethane
1,2-Diphenylhydrazine	1,1,2-Trichloroethane
1,3-Dichlorobenzene	1,1-Dichloroethane
1,3-Dinitrobenzene	1,1-Dichloroethene
1,4-Dichlorobenzene	1,1-Dichloropropene
1,4-Dinitrobenzene	1,2,3-Trichlorobenzene
1-Methylnaphthalene	1,2,3-Trichloropropane
2,3,4,6-Tetrachlorophenol	1,2,4-Trichlorobenzene
2,3,5,6-Tetrachlorophenol	1,2,4-Trimethylbenzene
2,4,5-Trichlorophenol	1,2-Dibromo-3-chloropropane (DBCP)
2,4,6-Trichlorophenol	1,2-Dibromoethane (Ethylene dibromide (EDB))
2,4-Dichlorophenol	1,2-Dichlorobenzene
2,4-Dimethylphenol	1,2-Dichloroethane
2,4-Dinitrophenol	1,2-Dichloropropane
2,4-Dinitrotoluene	1,3,5-Trimethylbenzene
2,6-Dinitrotoluene	1,3-Dichlorobenzene
2-Chloronaphthalene	1,3-Dichloropropane
2-Chlorophenol	1,4-Dichlorobenzene
2-Methylnaphthalene	1,4-Dioxane
2-Methylphenol	2,2-Dichloropropane
2-Nitroaniline	2-Butanone (MEK)
2-Nitrophenol	2-Chloroethyl Vinyl Ether
3,3'-Dichlorobenzidine	2-Chlorotoluene
3-Methylphenol & 4-Methylphenol	2-Hexanone
3-Nitroaniline	4-Chlorotoluene
4,4'-DDD	4-Isopropyltoluene
4,4'-DDE	4-Methyl-2-pentanone
4,4'-DDT	Acetone
4,6-Dinitro-2-methylphenol	Acetonitrile
4-Bromophenyl Phenyl Ether	Acrolein
4-Chloro-3-methylphenol	Acrylonitrile
4-Chloroaniline	Allyl Chloride
4-Chlorophenyl Phenyl Ether	Benzene
4-Nitroaniline	Bromobenzene
4-Nitrophenol	Bromochloromethane
Acenaphthene	Bromodichloromethane
Acenaphthylene	Bromoform
Alachlor	Bromomethane
Aldrin	Carbon Disulfide
alpha-BHC	Carbon Tetrachloride
Aniline	Chlorobenzene
Anthracene	Chloroethane
Atrazine	Chloroform
Azobenzene	Chloromethane
Benzidine	Chloroprene
Benzo(a)anthracene	cis-1,2-Dichloroethene
Benzo(a)pyrene	cis-1,3-Dichloropropene
Benzo(b)fluoranthene	cis-1,4-Dichloro-2-butene
Benzo(g,h,i)perylene	Dibromochloromethane
Benzo(k)fluoranthene	Dibromomethane
Benzyl alcohol	Dichlorodifluoromethane

Organics (semi-volatiles)	Organics (volatiles)
beta-BHC	Ethyl Methacrylate
bis(2-Chloroethoxy)methane	Ethylbenzene
bis(2-Chloroethyl)ether	Hexachlorobutadiene
bis(2-Chloroisopropyl)ether	Iodomethane
bis(2-Ethylhexyl)adipate	Isobutyl Alcohol
bis(2-Ethylhexyl)phthalate	Isopropylbenzene
Butyl Benzyl Phthalate	meta para Xylene mix
Carbazole	Methacrylonitrile
Chrysene	Methyl Methacrylate
cis-Chlordane	Methylene Chloride (Dichloromethane)
Cyanazine	Naphthalene
delta-BHC	n-Butylbenzene
Dibenz(a,h)anthracene	Nitrobenzene
Dibenzofuran	ortho-Xylene
Dieldrin	Pentachloroethane
Diethylphthalate	Propionitrile
Dimethylphthalate	Propylbenzene
Di-n-butyl Phthalate	sec-Butylbenzene
Di-n-octyl phthalate	Styrene
Endosulfan I	tert-Butyl Methyl Ether (MTBE)
Endosulfan II	tert-Butylbenzene
Endosulfan sulfate	Tetrachloroethene
Endrin	Tetrahydrofuran (THF)
Endrin aldehyde	Toluene
Endrin ketone	trans-1,2-Dichloroethene
Fluoranthene	trans-1,3-Dichloropropene
Fluorene	trans-1,4-Dichloro-2-butene
gamma-BHC (lindane)	Trichloroethene
Heptachlor	Trichlorofluoromethane
Heptachlor epoxide	Trihalomethanes
Hexachlorobenzene	Vinyl Acetate
Hexachlorobutadiene	Vinyl Chloride
Hexachlorocyclopentadiene	Xylene
Hexachloroethane	
Indeno(1,2,3-cd)pyrene	
Isophorone	
Methoxychlor	
Metolachlor	
Metribuzin	
Naphthalene	
Nitrobenzene	
N-nitrosodimethylamine	
N-nitroso-di-n-propylamine	
N-nitrosodiphenylamine	
Pentachlorophenol	
Phenanthrene	
Phenol	
Prometryne	
Pyrene	
Pyridine	
Simazine	
trans-Chlordane	
1,2,4-Trichlorobenzene	