Sampling Summary

GILA AND SAN FRANCISCO WATERSHEDS

Water Quality Survey

Survey Conducted
March-November, 2011

Summary Prepared
October, 2014

Monitoring, Assessment and Standards Section
Surface Water Quality Bureau
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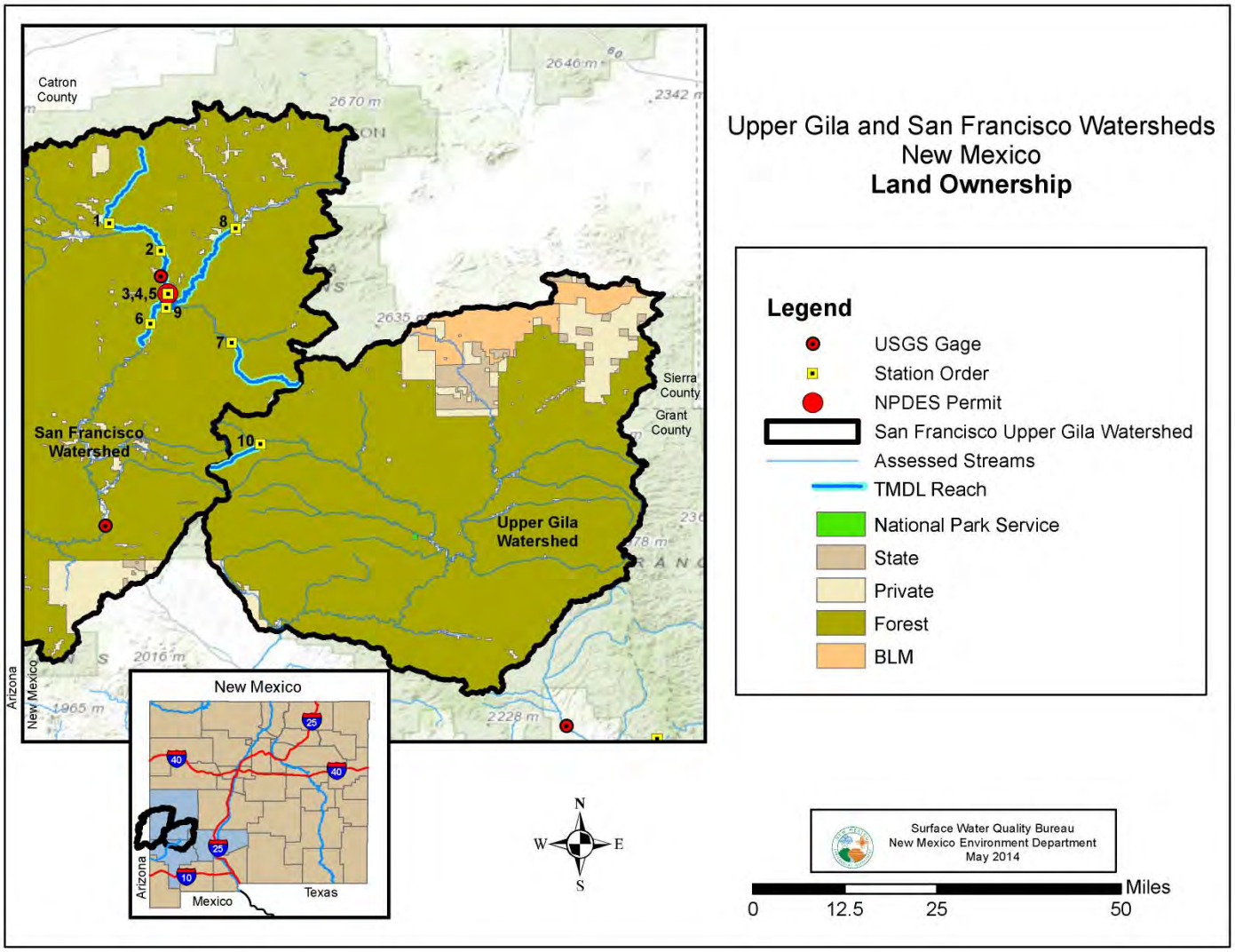
Abbreviations

AP	Assessment Protocol
AU	Assessment Unit
BMP	Best Management Practice
BNSF	Burlington Northern – Santa Fe
CWA	Clean Water Act
FR	Forest Road
FSP	Field Sampling Plan
HP	Hydrology Protocol
IR	State of New Mexico Clean Water Act §303(d)/305(b) Integrated Report
km	kilometer
m	meter
MASS	Monitoring, Assessment and Standards Section
NMED	New Mexico Environment Department
NMEDAS	New Mexico Environmental Data Analysis System
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint 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 Compounds
SWQB	Surface Water Quality Bureau
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
THM	Total Heavy Metals
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
UAA	Use Attainability Analysis
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
WQCC	Water Quality Control Commission
WPS	Watershed Protection Section
WQS	Water Quality Standard
WWTP	Wastewater Treatment Plant

Introduction

The New Mexico Environment Department (NMED), Surface Water Quality Bureau (SWQB) conducted a water quality survey of the Gila and San Francisco watersheds between March and October of 2011. These watersheds are located mostly in the Mogollon-Datil volcanic field in southwestern New Mexico with the lower reaches of the Gila River extending into the semi-arid Basin and Range physiographic province. During middle Cenozoic volcanism, lavas and tuffs erupted from andesitic to silicic volcanoes, domes, and calderas to form the Mogollon-Datil volcanic field. Extension of the Earth's crust in this region created normal faults and distinct mountain blocks with intervening sediment filled valleys. The Chino (Santa Rita) and Tyrone mines on the southwest side of the volcanic field are in mineralized, older bodies of intrusive igneous rock. The semi-arid Basin and Range is characterized by northerly to northwesterly-trending narrow, rugged mountain ranges separated by broad basins (NMBG&MR 2014).

Figure 1. Location of the Gila and San Francisco watersheds in New Mexico.



In the Gila River basin, average annual precipitation varies between 203 millimeters (8 inches) per year in the lower Basin and Range section of the watershed to more than 635 millimeters (25 inches) per year in the higher elevations. Mean maximum July temperatures range from 30.2°C (Pinos Altos) to 34.9°C (Red

Rock) and 29.8°C at Mogollon while the average January minimum temperatures range from -8.3°C (Pinos Altos) to -4.1°C (Red Rock) and -6.9°C at Mogollon (WRCC 2012). In New Mexico, the entire San Francisco watershed is located in Omernick Level III Ecoregion 23 (Arizona/New Mexico Mountains). Most of the Gila watershed is also in Ecoregion 23 (Arizona/New Mexico Mountains) with the downstream reach extending into Ecoregion 22 (Arizona/New Mexico Plateau) (Omernick, 2008). The Gila River watershed reaches its highest elevation of approximately 3,320 meters (10,892 feet) at Whitewater Baldy Peak in the sub-watersheds of the West Fork and Middle Fork of the Gila River. The lowest elevation of approximately 1,131 meters (3,710 feet) occurs at the NM-AZ border. The San Francisco River enters New Mexico from Arizona at 2,313 meters (7,585 feet) near Luna, NM and leaves the state at 1,283 meters (4,210 feet) downstream of Glenwood, NM. Whitewater Baldy is also the highest part of the San Francisco watershed in New Mexico at the headwaters of Whitewater Creek.

Several species within these watersheds are listed as either threatened or endangered by both state and federal agencies. Federally threatened and endangered species in the Gila and San Francisco watersheds that are reliant on aquatic and riparian habitat include Gila trout, spikedace, loach minnow, Chiricahua leopard frog, and southwestern willow flycatcher (NHNM 2011).

The Gila River watershed contains approximately 8,288 square kilometers (3,200 square miles) at the furthest downstream U.S. Geological Survey (USGS) gage within New Mexico (Gila below Blue Creek near Virden). The San Francisco River watershed contains approximately 4,273 square kilometers (1,650 square miles) of watershed at the furthest downstream USGS gage within New Mexico (San Francisco River near Glenwood). Land management in the Gila River watershed is approximately 56% US Forest Service, 15% US Bureau of Land Management, 7% State of NM, 21% private lands, and <1% National Park Service (Figure 1). Land management in the San Francisco River watershed is approximately 92% US Forest Service, <1% US Bureau of Land Management, <1% State of NM, and 7% private lands.

Between May 30 and June 20, 2011, the Wallow Fire burned 210,161 hectares (519,319 acres), mostly in Arizona near the NM Arizona border. The fire crossed into New Mexico near the town of Luna on June 11 and prevented access to sites in the area and impacted water quality in the San Francisco River. Fire debris was later observed at all San Francisco sites during and after monsoonal flows in August and September. The Miller Fire burnt 35,612 hectares (88,000 acres) between April 28 and July 27, 2011 near the Gila Cliff Dwelling, limiting access to some sites in the area and impacting water quality in the Middle Fork, West Fork, and mainstem Gila River.

Personnel Roles and Responsibilities

This survey was primarily conducted by the SWQB Monitoring, Assessment and Standards Section (MASS), but staff from other sections within SWQB were involved with planning, carrying out the work and using the data. Individual roles and responsibilities are described in Table 1.

Table 1. Personnel roles and responsibilities.

Name	Position / Role	Responsibilities
Seva Joseph 505-827-0573 Gary Schiffmiller 505-827-2470	Monitoring Staff	• Planned survey • Collected and documented chemical, physical, and biological data • Provided results for watershed assessment • Wrote survey report
Matthew Schultz 575-956-1550	Watershed Protection Section (WPS) Liaison	• Provided information and data needs pertaining to nonpoint sources of pollution and best management practices (BMPs) located within the study area
Erin Trujillo 505-827-0418	Point Source Regulation Section (PSRS) Liaison	• Provided information and data needs pertaining to point source discharges located within the study area • Assisted with development of final survey report
Heidi Henderson 505-827-2901	Total Maximum Daily Load (TMDL) Liaison	• Provided information and data needs pertaining to TMDL development to be conducted in the study area • Assisted with development of final survey report; will develop TMDLs as needed

Objectives

This survey had several objectives because the data it generates must serve the needs of all sections within the SWQB. These objectives are outlined in Table 2.

Table 2. Survey Objectives.

	Intended use of data	Question to be answered	Products/ Outcomes	Decision Criteria
Primary Objective	Assess designated use attainment for the New Mexico Clean Water Act (CWA) §303(d)/305(b) *Integrated Report (IR)* and provide information to the public on the condition of surface water	Are sampled waterbodies meeting water quality standards (WQS) criteria?	Survey Report, IR	WQS as interpreted by the Assessment Protocols (APs)
Secondary Objectives	Develop load and waste load allocations for TMDLs	What is the maximum pollutant load a waterbody can receive and still meet the requirements of the WQS?	TMDL loading calculations and National Pollutant Discharge Elimination System (NPDES) permit limits	WQS as interpreted by the APs
	Evaluate restoration and mitigation measures implemented to control NPS pollution	Have watershed restoration activities and mitigation measures improved water quality?	Project Summary Reports, Nonpoint Source (NPS) Annual Report, *IR (De-Listing)*	WQS as interpreted by the APs
	Develop or refine surface WQS	Are the existing uses appropriate for the waterbody?	Use Attainability Analyses (UAA), Amendments to WQS	Are data sufficient to support a petition to the Water Quality Control Commission (WQCC) to revise WQS?

Schedule

This survey was made up of many components beginning with planning and ending with the generation of the State of New Mexico Clean Water Act (CWA) Section 303(d)/305(b) Integrated Report (IR). Total Maximum Daily Loads (TMDLs), if necessary, will be written in the winter of 2014-2015. A tentative schedule (Table 3) shows that completion of the entire project took four years. As part of the survey planning process a public meeting was held to answer questions and solicit input for the survey. This meeting took place February 10, 2011 in Reserve, NM.

Table 3. Project Schedule.

Activity	Win '10-11	Spri '11	Sum '11	Fall '11	Win '11-'12	Spr '12	Sum '12	Fall '12	Winter '12	Spr '13	Sum '13	Fall '13	Win '13-14	Win '15
Survey planning, site reconnaissance, public input period	=========►													
Data collection, sample submittal to SLD		==========►												
Data verification & validation, data assessment				==========►										
Preparation of survey report, TMDL development								==========►						

Sampling plan

The survey included collection of chemical water quality samples, which were collected monthly between March and October 2011, biological sampling, conducted within the index period (August 15 - November 15, 2011), and physical measurements that were taken during periods of base flow. Data were collected according to SWQB standard operating procedures (SOPs; NMED/SWQB 2007-2011) and the field sampling plan (FSP; NMED/SWQB 2011).

Chemical Sampling

Chemical sampling sites were generally allocated one per assessment unit (AU) and were usually positioned near the lower end of the AU, access permitting. Additional stations were located to document the condition of AUs below potential pollution sources and where AU/temperature criterion revisions are recommended. Stations from previous surveys were used whenever possible to evaluate trends. Select stations in the Gila and San Francisco watersheds were monitored in 2007 as part of a special water quality survey focusing on the mainstems (NMED/SWQB. 2010). These stations were not monitored as part of the 2011 survey. Water samples for chemical analyses were submitted to the New Mexico Scientific Laboratory Division (SLD). *E.coli* samples were processed in the SWQB laboratory or with mobile equipment. Water quality analytes and their sampling frequencies are outlined in Table 4 and the locations of sampling stations are shown in Figure 2. In addition to the analytes listed, field measurements (temperature, specific conductance, dissolved oxygen concentration and percent saturation, pH, and turbidity) were taken during each sampling visit and during deployments of 3-21 days with a multi-parameter sonde at select sites.

Table 4. Summary of completed / planned chemical samples. Site numbers refer to locations in Figure 2.

Site #	Station Name Station ID	Assessment Unit	Nutrients[1]	TDS/TSS	Bacteria	Dissolved metals[2]	Total metals (Al, Hg, Se)	Total Al + hardness	Organics[3]	Radionuclides[4]	Station Rationale
12	Beaver Creek above Taylor 77Beaver000.1	Beaver Creek (Perennial reaches Taylor Ck to headwaters)	4/4	4/4	3/4	1/0		4/4			Bottom of AU; never previously assessed
9	Black Canyon Creek @ lower Black Canyon campground 77BlackC016.5	Black Canyon Creek (East Fork Gila River to headwaters)	4/4	4/4	0/4	2/0	2/0	2/4			Listed for temperature; associated with 319 project
10	Main Diamond Creek @ Trail 42 77Diamon033.2	Diamond Creek (East Fork Gila River to headwaters)	4/4	4/4	3/4						Reference site; important Gila trout location
8	East Fork Gila above West Fork 77EFkGil000.2	East Fork Gila River (Gila River to headwaters)	1/0	1/0		1/0	1/0	4/4			Bottom of AU; listed for Al; sampled in 2007
5	Gila River 300 meters above Turkey Creek 77GilaRi088.0	Gila River (Mogollon Creek to Gila Hot Springs)	3/4	3/4	1/4	2/0	2/0				Listed for temperature; inaccessible during 2007 survey
17	Gilita Creek above Snow Canyon Creek 77Gilita000.2	Gilita Creek (Middle Fork Gila R to Willow Creek)	4/4	4/4	3/4	1/0	1/0	3/4			Bottom of AU; listed for aluminum and temperature
16	Iron Creek above Middle Fork Gila 77IronCr000.1	Iron Creek (Middle Fork Gila R to headwaters)	3/4	3/4	2/4						Bottom of AU
14	Middle Fork abv West Fork 77MFkGil000.1	Middle Fork Gila River (Gila River to headwaters)	1/0	2/0			1/0	4/4			Listed for Al, temperature, turbidity; ALU/temperature criterion revision
15	Middle Fork Gila above Iron Creek 77MFkGil049.0		3/4	3/4	3/4			3/4			
11	Taylor Creek above Beaver Creek 77Taylor000.1	Taylor Creek (Beaver Creek to headwaters)	4/4	4/4	3/4	1/0	1/0	3/4			Bottom of AU; listed for Al, temperature, turbidity
6	Turkey Creek (at Wilderness Boundary Forest Trail 155) 77Turkey001.8	Turkey Creek (Gila River to headwaters)	3/4	3/4	1/4	2/0	2/0	0/4			Bottom of AU; listed for dissolved oxygen, temperature; ALU/temperature criterion revision
7	West Fork Gila above East Fork 77WFkGil000.1	West Fork Gila R (East Fork to Middle Fork)	6/4	5/4	0/2	2/0	2/0	4/4			Listed for temperature; ALU/temperature criterion revision;
18	Willow Creek abv Gilita Creek 77Willow000.1	Willow Creek (Gilita Creek to headwaters)	7/8	7/8	6/8	7/8	7/8				Bottom of AU
33	Centerfire Creek abv San Francisco River 80Center002.1	Centerfire Creek (San Francisco R to headwaters)	7/8	7/8	7/8						Bottom of AU; listed for nutrients, pH, specific conductance, temperature
	Mule Creek @ NM 78 80MuleCr015.5	Mule Creek (San Francisco R to Mule Springs)	7/4	7/4	5/4						No known impairments; only available access point

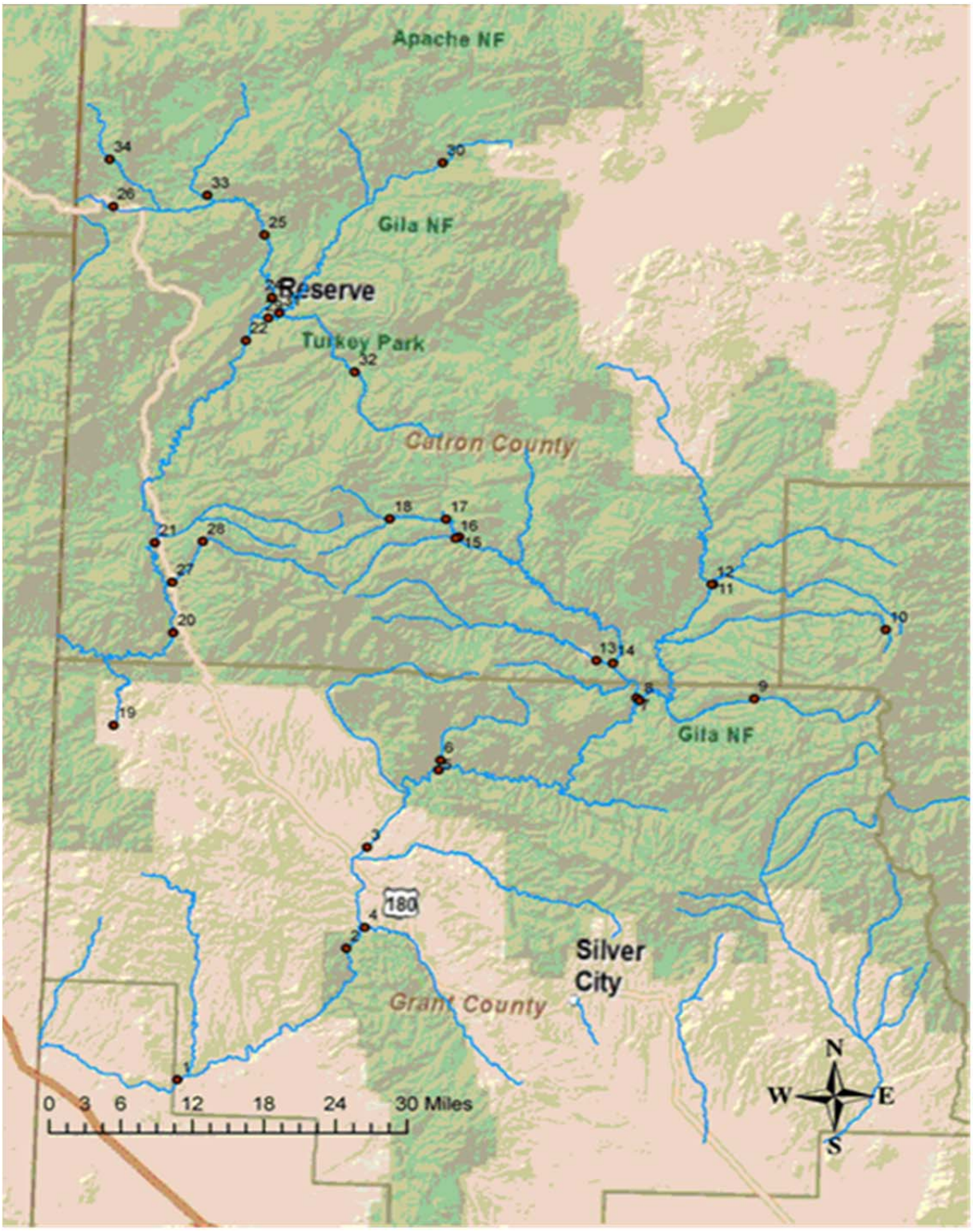
31	Negrito Creek above Tularosa River 80Negrit000.1	Negrito Creek (Tularosa River to confl of N and S forks)	3/4	3/4	3/4						Bottom of AU; listed for temperature
25	San Francisco River at Upper Box 80SanFra124.2	San Francisco River (NM 12 at Reserve to Centerfire Creek)	8/8	8/8	7/8	8/8	8/8		2/4	2/4	No known impairments; closest public access to bottom of AU
24	San Francisco River above WWTP 80SanFra109.7	San Francisco River (Whitewater Creek to NM 12 at Reserve)	7/8	7/8	7/8						Bracket Reserve WWTP
	Village of Reserve Waste Water Treatment Plant NM0024163		8/8	8/8	8/8						Effluent monitoring
23	San Francisco River below WWTP 80SanFra109.6		8/8	8/8	8/8						Bracket Reserve WWTP
22	San Francisco River below Reserve 80SanFra105.7		8/8	8/8	8/8	8/8	8/8		2/4	2/4	No known impairments; immediately below major population center
21	San Francisco River at Alma Bridge 80SanFra048.8		7/8	7/8	6/8	7/8	7/8		2/4	2/4	No known impairments; lowest access point in AU
32	South Negrito Creek abv Negrito Creek 80SNegri000.1	South Fork Negrito Creek (Negrito Creek to headwaters)	4/4	4/4	4/4	3/4	3/4				Bottom of AU; listed for temperature
34	Trout Creek near FR 220 80Trout009.4	Trout Creek (San Francisco R to headwaters)	7/8	7/8	5/8						No known impairments; ALU/temperature criterion revision
30	Tularosa River abv Apache Creek 80Tularo035.8	Tularosa River (Apache Creek to headwaters)	7/8	7/8	7/8	2/0	2/0	4/4			Bottom of AU; no known impairments
29	Tularosa River above San Francisco River 80Tularo001.3	Tularosa River (San Francisco R to Apache Creek)	8/8	8/8	8/8	8/8	8/8		2/4	2/4	Bottom of AU; listed for specific conductance; ALU/temperature criterion revision
27	Whitewater Creek at Glenwood above San Francisco River 80Whitew000.5	Whitewater Creek (San Francisco R to Whitewater Campgrd)	7/8	8/8	7/8	8/8	8/8				Bottom of AU; listed for turbidity
28	Whitewater Creek abv campground 80WhiteW008.8	Whitewater Creek (Whitewater Campgrd to headwaters)	7/8	7/8	6/8	1/0	1/0	6/4			Bottom of AU; listed for aluminum

[1] Suite includes total Kjeldahl nitrogen, 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, and zinc.
[3]Refer to SLD for a complete list of analytes.
[4]A radionuclide sample will include gross alpha and gross beta and, depending on detections, may include Uranium mass and Radium 226 + 228.

Table 5. Stations Legend

Map #	Station Name/ID
1	Gila River below Blue Creek @USGS Gauge - 78GilaRi025.5
2	Gila River below Mangas Creek - 78GilaRi069.2
3	Gila River @ NM Hwy 211 Bridge - 78GilaR087.7
4	Mangas Creek above Gila River (Forest Road 809) - 78Mangas000.7
5	Gila River 300 meters above Turkey Creek - 77GilaRi113.2
6	Turkey Creek (at Wilderness Boundary Forest Trail 155) - 77Turkey001.8
7	West Fork Gila above East Fork - 77WFkGil000.1
8	East Fork Gila above West Fork - 77EFkGil000.2
9	Black Canyon Creek @ lower Black Canyon CG - 77BlackC016.5
10	Main Diamond Creek @ Trail 42 - 77Diamon033.2
11	Taylor Creek above Beaver Creek - 77Taylor000.1
12	Beaver Creek above Taylor Creek - 77Beaver000.1
13	West Fork Gila abv Cliff Dwelling Cyn - 77WFkGil010.0
14	Middle Fork Gila above West Fork - 77MFkGil000.1
15	Middle Fork Gila above Iron Creek- 77MFkGil049.0
16	Iron Creek above Middle Fork Gila - 77IronCr000.1
17	Gilita Creek above Snow Canyon Creek - 77Gilita000.2
18	Willow Creek above Gilita Creek - 77Willow000.1
19	Mule Creek - 80MuleCr015.5
20	San Francisco River below Glenwood at Hot Springs - 80SanFra028.6
21	San Francisco River at Alma Bridge - 80SanFra048.8
22	San Francisco River below Reserve - 80SanFra105.7
23	San Francisco River below Reserve WWTP - 80SanFra109.6
24	San Francisco River above Reserve WWTP - 80SanFra109.7
25	San Francisco River at Upper Box - 80SanFra124.2
26	San Francisco River above Luna - 80SanFra154.1
27	Whitewater Creek at Glenwood above San Francisco River - 80Whitew000.5
28	Whitewater Creek abv campground - 80WhiteW008.8
29	Tularosa River above San Francisco River - 80Tularo001.3
30	Tularosa River abv Aragon @ gage # 9442692 - 80Tularo050.8
31	Negrito Creek above Tularosa River - 80Negrit000.1
32	South Negrito Creek - 80SNegri000.1
33	Centerfire Creek abv San Francisco River - 80Center002.1
34	Trout Creek near FR 220 - 80Trout009.4

Figure 2. Location of sampling stations in Gila and San Francisco watersheds.



Nutrient/Physical Habitat Sampling

Biological indicators and physical habitat measurements give an overall indication of the integrity of the AU. Stations were selected for biological and habitat monitoring based on their current IR status and results of level 1 nutrient assessments. Resources and access issues did not allow for the collection of biological and habitat data in all AUs.

The SWQB collected benthic macroinvertebrate, 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 biological and habitat monitoring appears below (Table 6).

Table 6. Summary of completed/planned biological and physical habitat sampling.

Station Name Station ID	Assessment Unit	Benthic macroinvertebrates	Pebble Count – Physical Habitat	Thermograph	SSTEMP[1,2]	Sonde	Nutrients Level 2[3]	Fish	Comments
Beaver Creek above Taylor 77Beaver000.1	Beaver Creek (Taylor Creek to headwaters)	1/1	1/1	1/1	1/0	1/1	1/0	1	Added due to nutrient and temperature screening
Black Canyon Creek @ lower Black Canyon campground 77BlackC016.5	Black Canyon Creek (East Fork Gila River to headwaters)	1/1	1/1	[5]	1/1	1/1			
Main Diamond Creek @ Trail 42 77Diamon033.2	Diamond Creek (East Fork Gila River to headwaters)	1/1	1/1	1/1					
East Fork Gila above West Fork 77EFkGil000.2	East Fork Gila River (Gila River to headwaters)	1/1		[4]	[4]				
Gila River 300 meters above Turkey Creek 77GilaRi088.0	Gila River (Mogollon Creek to Gila Hot Springs)	1/1	0/1	1/1	0/1	1/1			did not have time on site to complete
Gilita Creek above Snow Canyon Creek 77Gilita000.2	Gilita Creek (Middle Fork Gila R to Willow Creek)		1/1	1/1	0/1	1/1			did not have time on site to complete
Iron Creek above Middle Fork Gila 77IronCr000.1	Iron Creek (Middle Fork Gila R to headwaters)		1/1	1/1		1/1			
Middle Fork Gila above Iron Creek 77MFkGil049.0	Middle Fork Gila River (Gila River to headwaters)		0/1	1/1	0/1	1/1		1	did not have time on site to complete
Middle Fork abv West Fork 77MFkGil000.1		1/1	1/1		0/1	1/2			Will be part of ALU UAA
Taylor Creek above Beaver Creek 77Taylor000.1	Taylor Creek (Beaver Creek to headwaters)	1/1	1/1	1/1	1/0	1/2	1/1	1	Added due to temperature screening
Turkey Creek (at Wilderness Boundary Forest Trail 155) 77Turkey001.8	Turkey Creek (Gila River to headwaters)	1/1	1/1	1/1	1/1	1/1	1/0		Added due to nutrient screening
West Fork Gila above East Fork 77WFkGil000.1	West Fork Gila R (East Fork to Middle Fork)	1/1		1/1	1/1				
New station to be established near Hell's Hole	West Fork Gila R (Middle Fork to headwaters)			0/1				1	Needed for ALU UAA
West Fork Gila abv Cliff Dweller Cyn 77WFkGil010.0				[4]	[4]				
Willow Creek abv Gilita Creek 77Willow000.1	Willow Creek (Gilita Creek to headwaters)		1/1	1/1	0/1	1/1			
Gila River @ NM 211 bridge 78GilaR087.7	Gila River (Mangas Creek to Mogollon Creek)			[4]	[4]				

Station Name Station ID	Assessment Unit	Benthic macroinvertebrates	Pebble Count – Physical Habitat	Thermograph	SSTEMP[1,2]	Sonde	Nutrients Level 2[3]	Fish	Comments
Gila River below Mangas Creek 78GilaRi069.2	Gila River (Red Rock to Mangas Creek)			[4]	[4]	1/1	1/1		
Mangas Creek above Gila River 78Mangas000.7	Mangas Creek (Gila River to Mangas Springs)				[4]	1/1	1/1		
Centerfire Creek abv San Francisco River 80Center002.1	Centerfire Creek (San Francisco R to headwaters)	1/1	1/1	1/1	1/1	1/1	1/1	1	
Mule Creek @ NM 78 80MuleCr015.5	Mule Creek (San Francisco R to Mule Springs)		0/1	1/1		0/1			Did not have access
Negrito Creek above Tularosa River 80Negrit000.1	Negrito Creek (Tularosa River to confl of N and S forks)		1/1	1/1	1/1			1	
San Francisco River above Luna 80SanFra154.1	San Francisco River (Centerfire Creek to AZ border)			[4]	[4]				
San Francisco River below Glenwood abv Hot Springs 80SanFra028.6	San Francisco River (Dry Creek to Whitewater Creek)	1/1		[4]					
San Francisco River at Upper Box 80SanFra124.2	San Francisco River (NM 12 at Reserve to Centerfire Creek)	1/1	1/1	0/1		1/1		1	Thermograph lost
San Francisco River at Alma Bridge 80SanFra048.8	San Francisco River (Whitewater Creek to NM 12 at Reserve)	0/1	1/1	1/1		1/1		1	scouring flows
South Negrito Creek abv Negrito Creek 80SNegri000.1	South Fork Negrito Creek (Negrito Creek to headwaters)		1/1	1/1				1	
Trout Creek near FR 220 80Trout009.4	Trout Creek (San Francisco R to headwaters)		1/1	1/1		1/1	1/1	1	
Tularosa River abv Apache Creek 80Tularo035.8	Tularosa River (Apache Creek to headwaters)		0/1	1/1	0/1	1/1			wetlands and beaver ponds
Tularosa River above San Francisco River 80Tularo001.3	Tularosa River (San Francisco R to Apache Creek)	1/1	1/1	1/1	1/0	1/1		1	
Whitewater Creek abv campground 80WhiteW008.8	Whitewater Creek (Whitewater Campgrd to headwaters)		1/1	1/1		0/1			

[1]Refers to cross-section, flow, canopy cover, and slope data required to use SSTEMP temperature modeling software for streams with temperature impairments.
[2]Additonal stations may be added as indicated by preliminary data.
[3]Level 2 Nutrient Assessments are scheduled at these sites because they are currently listed as impaired for nutrients. Additional stations will be added as indicated by preliminary data. Nutrient screening is a two-step process where a preliminary assessment nutrient variables is used to determine if level 2 sampling, consisting of chlorophyll determinations and a sonde deployment to record diurnal variations in pH and dissolved oxygen concentrations, is warranted.
[4] Data collected in 2007.
[5] Thermographs currently in place as part of ongoing 319 project
Highlighted cells represent incomplete planned sampling activities

Deviations from the FSP were caused by five main factors:

1. Lack of water during some sampling visits to a given site resulted in collection of fewer samples than planned. This occurred at stations 21 and 31.

2. Lack of access to sites due to fire closures at stations 8, 13, 14, 33, and 34.

3. Lack of safe access to sites due to heavy rains and associated high waters or poor road conditions at stations 5, 6, and 32.

4. Some bacteria samples were lost as the field incubators occasionally would not hold the correct temperature.

5. More funding became available for analysis of water quality samples, so some additional samples were collected and analyzed for dissolved and total metals.

Summary

A detailed FSP (FSP; NMED/SWQB 2011) was prepared prior to beginning sampling; however a number of deviations occurred over the course of the survey (Table 6). These deviations were primarily caused by minimal of precipitation resulting in the absence of water in streams during the survey year and the lack of access to sites due to fire or rains. The Hydro-protocol should be conducted at sites that went dry during this survey to determine if the appropriate WQSs are in place and to aid in future survey design.

The data from this survey have been validated and verified according to SWQB standard operating procedures (SOPs; NMED/SWQB 2011). The assessments were conducted in accordance with the Procedures for Assessing Water Quality Standards Attainment for the State of New Mexico Integrated Clean Water Act §303(d)/§305(b) Integrated Report (Integrated Report) which are available at http://www.nmenv.state.nm.us/swqb/protocols/2014/. The assessment conclusions were incorporated into the 2014-2016 Integrated Report, which was completed in 2014 (http://www.nmenv.state.nm.us/swqb/303d-305b/2014-2016/index.html). In cases where impairments to water and habitat quality are found, data from this survey will be used to calculate TMDLs, depending on the outcome of assessments and listing.

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Appendix A. Analytes included in Volatile (VOC) and Semi-volatile (SVOC) organic compound suites.

Semi-Volatile Organic Compounds	Volatile Organic Compounds
1,2,4-Trichlorobenzene	1,1,1,2-Tetrachloroethane
1,2-Dichlorobenzene	1,1,1-Trichloroethane
1,2-Dinitrobenzene	1,1,2,2-Tetrachloroethane
1,3-Dichlorobenzene	1,1,2-Trichloroethane
1,3-Dinitrobenzene	1,1-Dichloroethane
1,4-Dichlorobenzene	1,1-Dichloroethene
1,4-Dinitrobenzene	1,1-Dichloropropene
1-Methylnaphthalene	1,2,3-Trichlorobenzene
2,3,4,6-Tetrachlorophenol	1,2,3-Trichloropropane
2,3,5,6-Tetrachlorophenol	1,2,4-Trichlorobenzene
2,4,5-Trichlorophenol	1,2,4-Trimethylbenzene
2,4,6-Trichlorophenol	1,2-Dibromo-3-chloropropane (DBCP)
2,4-Dichlorophenol	1,2-Dibromoethane (EDB)
2,4-Dimethylphenol	1,2-Dichlorobenzene
2,4-Dinitrophenol	1,2-Dichloroethane
2,4-Dinitrotoluene	1,2-Dichloropropane
2,6-Dinitrotoluene	1,3,5-Trimethylbenzene
2-Chloronaphthalene	1,3-Dichlorobenzene
2-Chlorophenol	1,3-Dichloropropane
2-Methylnaphthalene	1,4-Dichlorobenzene
2-Methylphenol	1,4-Dioxane
2-Nitroaniline	2,2-Dichloropropane
2-Nitrophenol	2-Butanone (MEK)
3,3'-Dichlorobenzidine	2-Chloroethyl vinyl ether
3-Methylphenol & 4-Methylphenol	2-Chlorotoluene
3-Nitroaniline	2-Hexanone
4,4'-DDD	4-Chlorotoluene
4,4'-DDE	4-Isopropyltoluene
4,4'-DDT	4-Methyl-2-pentanone
4,6-Dinitro-2-methylphenol	Acetone
4-Bromophenyl Phenyl Ether	Acetonitrile
4-Chloro-3-methylphenol	Acrolein
4-Chloroaniline	Acrylonitrile
4-Chlorophenyl Phenyl Ether	Allyl chloride
4-Nitroaniline	Benzene
4-Nitrophenol	Bromobenzene
Acenaphthene	Bromochloromethane
Acenaphthylene	Bromodichloromethane
Alachlor	Bromoform
Aldrin	Bromomethane
alpha-BHC	Carbon disulfide
Aniline	Carbon tetrachloride
Anthracene	Chlorobenzene
Atrazine	Chloroethane
Azobenzene	Chloroform

Semi-Volatile Organic Compounds	Volatile Organic Compounds
Benzidine	Chloromethane
Benzo(a)anthracene	Chloroprene
Benzo(a)pyrene	cis-1,2-Dichloroethene
Benzo(b)fluoranthene	cis-1,3-Dichloropropene
Benzo(g,h,i)perylene	cis-1,4-Dichloro-2-butene
Benzo(k)fluoranthene	Dibromochloromethane
Benzyl alcohol	Dibromomethane
beta-BHC	Dichlorodifluoromethane
bis(2-Chloroethoxy)methane	Ethyl methacrylate
bis(2-Chloroethyl)ether	Ethylbenzene
bis(2-Chloroisopropyl)ether	Hexachlorobutadiene
bis(2-Ethylhexyl)adipate	Iodomethane
bis(2-Ethylhexyl)phthalate	Isobutyl alcohol
Butyl Benzyl Phthalate	Isopropylbenzene
Carbazole	m- & p-Xylenes
Chrysene	Methyl methacrylate
cis-Chlordane	Methylacrylonitrile
Cyanazine	Methylene chloride (Dichloromethane)
delta-BHC	Naphthalene
Dibenz(a,h)anthracene	n-Butylbenzene
Dibenzofuran	Nitrobenzene
Dieldrin	o-Xylene
Diethylphthalate	Pentachloroethane
Dimethylphthalate	Propionitrile
Di-n-butyl Phthalate	Propylbenzene
Di-n-octyl phthalate	sec-Butylbenzene
Endosulfan I	Styrene
Endosulfan II	tert-Butyl methyl ether (MTBE)
Endosulfan sulfate	tert-Butylbenzene
Endrin	Tetrachloroethene
Endrin aldehyde	Tetrahydrofuran (THF)
Endrin ketone	Toluene
Fluoranthene	Total trihalomethanes
Fluorene	Total xylenes
gamma-BHC (lindane)	trans-1,2-Dichloroethene
Heptachlor	trans-1,3-Dichloropropene
Heptachlor epoxide	trans-1,4-Dichloro-2-butene
Hexachlorobenzene	Trichloroethene
Hexachlorobutadiene	Trichlorofluoromethane
Hexachlorocyclopentadiene	Vinyl acetate
Hexachloroethane	Vinyl chloride
Indeno(1,2,3-cd)pyrene	
Isophorone	
Methoxychlor	
Metolachlor	
Metribuzin	
Naphthalene	

Semi-Volatile Organic Compounds	Volatile Organic Compounds
Nitrobenzene	
N-nitrosodimethylamine	
N-nitroso-di-n-propylamine	
N-nitrosodiphenylamine	
Pentachlorophenol	
Phenanthrene	
Phenol	
Prometryne	
Pyrene	
Pyridine	
Simazine	
trans-Chlordane	