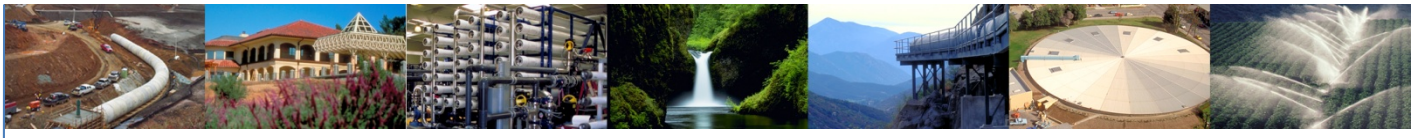

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Truckee River Coordinated Monitoring Program

A Compendium of Monitoring Activities of the Resource Management Organizations

December 1, 2010

Prepared for

The Truckee River Memorandum of Understanding Group

K/J Project Number 1095001.00

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List of Acronyms

BMI	Benthic Macroinvertebrates
CMP	Coordinated Monitoring Program
CSBP	California Stream Bioassessment Procedure
CWA	Clean Water Act
DOC	Dissolved Organic Carbon
DRI	Desert Research Institute
EPA	Environmental Protection Agency (US)
EPT	*Ephemeroptera, Plecoptera, + Trichoptera*
IBI	Index of Biological Integrity
LA	Load Allocation
LRWQCB	Lahontan Regional Water Quality Control Board
MOU	Memorandum of Understanding
MS4	Municipal Separate Storm Sewer System
NDEP	Nevada Division of Environmental Protection
NDOW	Nevada Department of Wildlife
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
PLPT	Pyramid Lake Paiute Tribe
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RBS	Relative Bed Stability
SAFIT	Southwest Association of Freshwater Invertebrate Taxonomists
SAP	Sampling and Analysis Plan
SODA	Semantic Online Data Access SODA is a web software component that manages data and metadata, providing utilities to both upload data to a relational database and download data to a format conducive for statistical analysis
SOP	Standard Operating Procedure
SWAMP	Surface Water Ambient Monitoring Program
SWPCC	Storm Water Permit Coordinating Committee
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load (Defined as the sum total of the WLA and LA)
TMWA	Truckee Meadows Water Authority
TMWC	Truckee Meadows Watershed Committee
TMWRF	Truckee Meadows Water Reclamation Facility
TNC	The Nature Conservancy
TOC	Total Organic Carbon
TRFMP	Truckee River Flood Management Project

TRIG	Truckee River Info Gateway
TRWC	Truckee River Watershed Council
UNR	University of Nevada, Reno
TRWQMP	Truckee River Water Quality Management Program
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
USGS	United States Geological Survey
WLA	Waste Load Allocation

Acknowledgements

This Coordinated Monitoring Program is the result of the contributions of staff members from City, District, County, State, Federal, and Tribal resource agencies engaged in the management and restoration of the Truckee River from its headwaters at Lake Tahoe to its terminus at Pyramid Lake. This document could not have been completed without the many hours each agency contributed gathering and submitting information, responding to surveys, attending workshop meetings, and reviewing work products. Much of the information exchange for the documents included took place during a series of six meetings that brought regulators, dischargers, and non-profit organizations to the table to realize a common goal of assuring the health of one of Nevada's most precious resources. These meetings helped build lasting bridges necessary for successful, coordinated management of the Truckee River.

Individual group members associated with preparation of the document are listed in the Memorandum of Understanding (MOU) Group contact information in Section 1.2. All MOU Group members made significant contributions to this document; however, it took a core group of dedicated proponents of the Coordinated Monitoring Program to initiate and sustain the process. In particular, the authors wish to acknowledge the energy and commitment of ***Lynell Garfield*** and ***Terri Svetich*** with the City of Reno who helped form the group, managed the contract, and have sustained its momentum; ***John Buzzone*** and ***Christian Kropf*** with Washoe County for their vision to start this process and the resources they committed to back that vision; ***Toby Ebens*** with the City of Sparks, and ***Birgit Widegren*** with Nevada Division of Environmental Protection for keeping the process on track. ***Dan Mosley*** of the Pyramid Lake Paiute Tribe deserves recognition because he has done so much work on the Truckee River and had much information and insight to convey. Finally, many thanks to ***Candice Siwarga*** of Kennedy/Jenks Consultants for organizing the flood of documents and information from the group, keeping the meetings on track, and following up on action items documented in her attentive meeting notes.

The Nevada Division of Environmental Protection (NDEP) provided funding for the facilitation and preparation of this Coordinated Monitoring Program through a NV Clean Water Act Section 319(h) grant from the EPA.

Section 1: Introduction

1.1 Purpose and Goals of the Coordinated Monitoring Program

Purpose: The purpose of the Coordinated Monitoring Program (CMP) is to compile data on the various types of monitoring activities that are being conducted on the Truckee River, the frequency at which the monitoring is conducted, and identify the agencies conducting the monitoring. The CMP will also serve to establish common definitions that can be used to clarify procedures, and to serve as a basis of metadata in the Truckee River Info Gateway (TRIG) database.

Goals: The goals of the CMP are to find efficiencies in sampling efforts and share data more easily, leading to a better understanding of health and processes in the Truckee River and its tributaries.

This CMP compendium was prepared in response to the need for better data sharing and efficiencies amongst the resource management agencies and non-profit organizations responsible for management of the Truckee River. These resource agencies and organizations united and developed a memorandum of understanding (MOU) that sets goals for improving the exchange of information pertaining to their respective river monitoring activities. The MOU outlines specific goals for the development and maintenance of a CMP:

1. Increasing efficiency and minimizing duplication of effort among the Parties;

2. Encouraging the Parties to utilize a central clearinghouse of technical and water-related information;

3. Encouraging the Parties to develop robust data that may facilitate timely identification of potential problems with water quality or environmental degradation of the Truckee River, to the extent they have the authority and funding to do so;

4. Promoting the future protection of the Truckee River; and

5. Encouraging the Parties to share this information with each other, the public, and other interested parties.

In short, this CMP compiles and shares information on what monitoring data is being conducted, by whom, and the frequency at which data is collected. The CMP provides common monitoring site location information and sampling and analysis definitions that can be used to clarify procedures, and to serve as a basis of metadata and resources in TRIG.

These goals were met through a process of information requests (three surveys) followed up with a series of half-day meetings focused on goal setting, sample locations and site naming conventions, field protocols, laboratory methods, the TRIG database, and CMP document review and comments. A focus group also met by telephone to discuss biological monitoring methods. Each of these efforts resulted in specific work products that have been compiled into the following sections of the CMP. It is expected that this document will be updated as new

information is developed and shared, and when more work is done to implement recommendations and ideas from this CMP in the TRIG website.

1.2 Memorandum of Understanding Group Members

Table 1-1. MOU Group Members and Contacts.

Agency	MOU Oversight Working Group Representative	Monitoring Coordination Working Group Representative	Signatory	Contact Information
Board of Regents of the Nevada System of Higher Education on behalf of the University of Nevada, Reno (UNR)	Laurel Saito, PhD, PE	Laurel Saito, PhD, PE	Dr. Ron Pardini, Acting Dean, Leah Gorbet, Controller	lsaito@cabnr.unr.edu
City of Reno (Reno)	Terri Svetich, PE – Engineering Manager, Environmental Division	Lynell Garfield, Hydrologist	Robert Cashell, Mayor	sveticht@reno.gov GarfieldL@reno.gov
City of Sparks (Sparks)	Toby Ebens, Environmental Control Supervisor	Toby Ebens	Geno Martini, Mayor	tebens@cityofsparks.us
Desert Research Institute (DRI)	John Warwick, Ph.D., P.E., D.WRE, Acting Vice President for Academic Affairs Executive Director, Division of Hydrologic Sciences	Alan McKay, Associate Research Hydrogeologist	John Warwick	John.Warwick@dri.edu alan@dri.edu
Lahontan Regional Water Quality Control Board (LRWQCB)	Lauri Kemper, Assistant Executive Officer	Lauri Kemper, Assistant Executive Officer	Harold Singer, Executive Officer	lkemper@waterboards.ca.gov
Nevada Division of Environmental Protection (NDEP)	Birgit Widegren, Environmental Scientist IV, Nonpoint Source Branch Supervisor	John Heggeness, Bureau of Water Quality Planning	Colleen Cripps, Acting Administrator	bwidegren@ndep.nv.gov jheggeness@ndep.nv.gov
Nevada Department of Wildlife (NDOW)	Kim Tisdale, Supervising Fisheries Biologist	Matt Maples, Fisheries Biologist	Kenneth E. Mayer, Director, Nevada Dept. of Wildlife	ktisdale@ndow.org mmaples@ndow.org

Agency	MOU Oversight Working Group Representative	Monitoring Coordination Working Group Representative	Signatory	Contact Information
Nevada Fish and Wildlife Office, U.S. Fish and Wildlife Service (USFWS)	Selena J. Werdon, Assistant Field Supervisor	Michael Cotter, Fish Biologist	Robert D. Williams, Field Supervisor	Selena_Werdon@fws.gov michael_cotter@fws.gov
Pyramid Lake Paiute Tribe (PLPT)	Dan Mosley, Executive Director	Chris Katopothis, Water Quality Standards Specialist	Mervin Wright, Jr., Tribal Chairman	ckatopothis@plpt.nsn.us dmosley@plpt.nsn.us
The Nature Conservancy (TNC)	Mickey Hazelwood, Truckee River Project Director	Patti Bakker, Truckee River Project Manager	Kathryn Landreth, Nevada State Director	pbakker@tnc.org mhazelwood@tnc.org
Truckee Meadows Water Authority (TMWA)	Paul Miller, Manager of Operations and Water Quality	Chris Erickson, Microbiologist	Mark Foree, General Manager	cerickson@tmwa.net
Truckee Meadows Water Reclamation Facility (TMWRF)	David Bruketta, Support Services Manager	Bill Lutsch, Laboratory Superivisor	Wayne Seidel, Director of Public Works, Sparks	dbruketta@cityofsparks.us blutsch@cityofsparks.us
Truckee River Flood Management Project (TRFMP)	Danielle Henderson, Natural Resource Manager	Melissa Faigeles, Natural Resource Planner	Naomi Duerr, Director	DHenderson@washoecounty.us MFaigeles@washoecounty.us
Washoe County (Washoe)	John Buzzone, Senior Civil Engineer	Christian Kropf,	David E. Humke, Commissioner	JBuzzone@washoecounty.us CKropf@washoecounty.us

Section 2: Document Control and Revision Process

This document is designed and intended to be updated as new information on Truckee River monitoring procedures becomes available. However, there is not a specific owner or gatekeeper of the document. Each MOU Group agency/organization is charged with providing updates when monitoring locations are added or deleted, when new protocols are adopted, and when individual sampling and analysis plans and quality assurance plans are modified.

This document serves as the backbone to organize and provide electronic links to agency and organization documents described herein. When posted on TRIG (refer to section 5.1 for more information on TRIG), individual agencies can access their documents and data and update them as necessary. The links in this document will continue to point to the location of the updated documents in TRIG, enabling the CMP to be kept up-to-date. To help track changes over time, MOU members are requested to log updates in Table 2-1 below. TRIG will also keep track of document histories; this is an automatic feature of TRIG. If the body of the document is updated, the revisions should be noted in the footers with the revision number and date of the revision. The updated CMP will be maintained in TRIG; when authorized MOU Group members make changes to the CMP and upload a new version or when revised supporting documents (e.g., sampling plans) are uploaded to TRIG.

Table 2-1. Summary of Document Revisions

Revision #	Date	Revised by	Summary of Changes

Revision #	Date	Revised by	Summary of Changes

Section 3: Monitoring Locations and Naming Conventions

3.1 Currently Active Locations

The focus of this CMP is to document the monitoring currently conducted on the Truckee River and its tributaries between Lake Tahoe and Pyramid Lake. The emphasis of this document is on in-stream monitoring. As of September 2010, there are ten (10) organizations actively collecting data. Table 3-1 lists these organizations, the general type of data collected and number of collection sites. At this time, there are over 80 active data collection sites. In the event collection sites are added to or removed from this list, the "revision" sheet included herein will be updated accordingly. These monitoring sites have also been distinguished on maps that were created by Washoe County Department of Water Resources staff. The current monitoring and historical monitoring site maps are shown on Figure 1 and Figure 2 in Appendix A.

Table 3-1. Organizations Actively Collecting Data from the Truckee River and Tributaries.

Agency	Number of Sites	Primary Data Collected
DRI	9	Water quality
NDEP	10 (tributaries)	Water quality
NDOW	10	Fish
PLPT	15	Water quality, macroinvertebrate, riverine habitat
TMWA	2	Water quality
TMWRF	14	Water quality, macroinvertebrate
TMWC	12 (creeks)	Water quality
TNC	Varies	Annual Bird Survey
TOT	3	Water quality
TTSA	4	Water quality
UNR	Up to 14 (varies)	Water quality/bacteria
USFWS	25	Fish
USGS	14	Flow

Data is collected by the different organizations for various reasons including scientific research, federal mandates, or permit requirements. Regulatory permits that require monitoring on the Truckee River are part of the National Pollutant Discharge Elimination System (NPDES). There are individual NPDES permits for direct discharges to the watershed, Municipal Separate Storm Sewer System (MS4) permits for municipal stormwater discharges, and a general construction stormwater permit issued for Nevada construction projects that could impact surface water quality. Industrial stormwater permits are issued if facilities will discharge to a waterbody. In addition, the U.S. Army Corps of Engineers issues removal/fill (Clean Water Act [CWA] Section 404) permits which, along with other in-water work permits, may require CWA Section 401 water

quality certification. In addition, there are various other State and local temporary construction site permits.

The NPDES program is a nationally authorized permit program designed to regulate point source pollution discharges to waterbodies. In Nevada, the NDEP has primacy over the permit program. NDEP issued Permit No. NVS000001 to the Cities of Reno and Sparks and Washoe County on May 26, 2010. These jurisdictions own and operate the MS4s in the Truckee Meadows. The 5-year NPDES permit authorizes these permittees to discharge municipal storm water runoff into the receiving waters of the Truckee River and various tributaries. The permit includes storm water discharge monitoring and reporting requirements, which is described in the Sample Analysis Plan (October 1, 2010). The Sample Analysis Plan is subject to annual updates.

The Truckee Meadows Water Reclamation Facility (TMWRF) is regulated by a separate NPDES Permit (NEV0020150) to discharge treated effluent to Steamboat Creek, a tributary to the Truckee River. This Permit (NV0020150) expired on 10/14/2008, but has been administratively extended. New permit requirements may be included, but currently TMWRF monitors water quality at East McCarran Bridge, North Truckee Drain, upstream and downstream in Steamboat Creek, Lockwood, Tracy/Clark, Derby Dam, Painted Rock, Wadsworth, and Nixon. TMWRF also conducts quarterly biological monitoring (macroinvertebrate census on the Truckee River at Dead Ox, McCarran, Lockwood, and Clark. (see monitoring summary in Appendix A)

Under Section 303(d) of the Clean Water Act, Nevada Division of Environmental Protection (NDEP) is required to establish water quality standards based upon beneficial uses of each waterway. NDEP maintains a list of impaired water bodies known as the NV303(d) list, which identifies impaired water bodies in the state of Nevada. These are waters that do not meet water quality standards, and thus are impaired relative to the designated issues. The law requires that NDEP develop a priority ranking for each waterbody, and for high priority waters, develop a Total Maximum Daily Load (TMDL) for these waters. A TMDL is a calculation of the maximum amount of a pollutant or pollution that a water body can receive and still safely meet water quality standards.

In 1988, NDEP identified the Truckee River as water quality impaired and listed it on the 303(d) list. The Truckee River was identified as having many beneficial uses: Municipal or domestic supply, cold water fishery, propagation of wildlife, irrigation, watering of livestock, and contact and noncontact recreation. TMDLs were developed for the Truckee River in 1994 for total nitrogen (TN), total phosphorus (TP), and total dissolved solids (TDS). The TMDLs set forth numeric Waste Load Allocations (WLA) and Load Allocations (LA). A TMDL is a sum total of the LA and WLAs, for each of these constituents.

Construction site activity occurring in or near the Truckee River must follow the permitting regulations set forth by the NDEP, USACE, USFWS, NDOW, PLPT (over reservation waters), and other various local and federal agencies depending on the specific area of the River the project is impacting. For more information on permitting in and around the Truckee River, see the *Truckee River Restoration and Construction Site Permitting Handbook* (Kennedy/Jenks 2008).

3.1.1 Site Location Numbers

Site numbers have been assigned to all current sampling locations on the main stem of the Truckee River. Data points begin at Pyramid Lake (point number 1) and end at Tahoe City (point number 86). Although there are multiple agencies conducting sampling at the same or nearly the same sites, each entity is assigned a unique site number at each site. In the future, an effort may be made to correlate these points with river miles, where Marble Bluff Dam is considered river mile 0, and ending at Lake Tahoe (river mile 115). Figures 1 and 2 are maps that have been developed to supplement this CMP. These maps provide an overall view of all current monitoring locations. Monitoring locations on the Truckee River and its tributaries upstream of Vista (east of Sparks) are included in Figure 1, while the Truckee River and tributaries downstream of Vista are found in Figure 2. The locations indicated numerically on these maps can be directly associated with the site names, numbers and geographic information presented in Appendix A. Appendix A also includes a cross reference table to historically used names for the same sampling location, and historical sampling locations that are not currently being monitored.

Tributaries to the Truckee River that undergo monitoring at this time are also included in Appendix A. Monitored tributaries to the Truckee River watershed in Nevada and California include Steamboat Creek, Thomas Creek, Whites Creek, Browns Creek, Alum Creek, Martis Creek and Prosser Creek. Site numbers on Figures 1 and 2 also correspond to these site numbers.

3.1.2 Entities Conducting Monitoring

As described earlier, water quality and other monitoring activities are conducted on the Truckee River and its tributaries for a variety of reasons. This CMP seeks consolidate the information pertaining to these monitoring activities into one comprehensive compendium that is easily accessible and functionally usable by the MOU Parties and the Public. The following monitoring is covered by this CMP:

- DRI conducts water quality monitoring from Tahoe City to Vista as part of a University of Nevada system long-term study.

- NDEP conducts water quality monitoring at a number of tributary creeks, including Steamboat, Thomas, Whites, and Browns Creeks.

- NDOW does biological monitoring, habitat assessment, and concurrent water quality monitoring at a number of sites.

- Placer County does biological, habitat, and water quality monitoring at Squaw, Bear, and Martis Creeks.

- The PLPT monitors for compliance with the Tribe's EPA approved water quality standards. They are also interested in the quality of the water in the Truckee River and the riverine habitat due to the fact that they are the most downstream user of the water; the quality of the water when it enters Pyramid Lake as it has an effect on the quality of the lake water itself and the health of the threatened and endangered fish on which their tribe's economy and fishery rely. The Tribe's original name is "Kuyuidokado" or Cui-ui Eaters, so protecting

the Truckee River's endangered Cui-ui fish is not only important for the health of the Cui-ui, but also it is protecting the Tribe's heritage. The Tribe's culture, traditions, and ceremonies involve the use of water, and wish to keep the Truckee River and Pyramid Lake as pristine as possible. Two of the Tribe's beneficial uses for the river and lake are "Water of Special Ecological Significance" and also "Primary Contact Ceremonial Use" (Mosley 2010).

- Reno Sparks and Washoe County (collectively TMWC) collects water quality data on tributaries of the Truckee River as required by their NPDES MS4 permit.

- TMWA collects data for an indication of the quality of the water entering their water treatment plants for subsequent treatment and distribution.

- TMWRF is required to collect water quality monitoring data at prescribed points along the lower Truckee River as a condition of their NPDES discharge permit.

- The Town of Truckee does discharge and habitat assessment in their region.

- UNR researchers collect benthic, invertebrate, fish and nutrient data and bacteriological sampling at numerous locations upstream and downstream of the urbanized Reno area for scientific research,

- USF&WS conducts habitat assessments and biological monitoring (fish surveys) throughout the river system

- USGS conducts flow and water quality sampling at fixed location throughout the watershed.

3.1.3 Periods of Record

The period of record for a monitoring site or location is the time period for which regular samples have been collected. The period of record for data collected at the currently monitored sites can be accessed from the agency conducting the subject monitoring. For example, the United States Geological Survey (USGS) site at Tracy (Truckee River at Tracy) has been continuously (recorded every 15 minutes) collecting gage height (feet) and discharge (cubic feet per second) for 13 years (1997 – 2010) (See station information in Appendix A).

3.1.4 Historical Locations

There are numerous locations at which monitoring has been conducted over the years. However, data collection has since been stopped in many locations. This historical data was collected mainly by TMWRF (water quality), UNR (water quality and biological), DRI (water quality and biological) and the USGS (flow). Data from historical locations can be found on the associated TRIG website. There are at least 100 historic data locations; data users are encouraged to view this data for its potential use in ongoing scientific investigations. Additionally, some data has been collected by contractors working in or adjacent to the Truckee River that are subject to temporary construction activity permits. This data may be obtained from NDEP. Other water quality data specific to California sections of the Truckee River can be accessed through the Lahontan Regional Water Quality Board and may now be available through a new online database in annual reports.

3.1.5 Site Naming Conventions

Although site names have varied according to different agencies over different periods of time, this document recommends a naming convention to be applied to all sites for consistency. However, historically used names can continue to be used by the MOU Group; the compendium provides a cross table listing the convention name and known historical names for the same site. Sites have been named according to the convention "River Name at/below Geographic Name." For example, Site 1, located upstream from Pyramid Lake at Marble Bluff Dam, is named "Truckee River at Marble Bluff." Site names and the descriptive information used by the collecting organizations are presented in Table 3-2 (see Appendix A for more information). Town of Truckee and Placer County sampling locations and site names can be found here: http://www.placer.ca.gov/Departments/Works/~/media/dpw/npdes/documents/TRWQMPFinalPlan.ashx

Table 3-2 Truckee River Monitoring Sites Names and Descriptions.

Location Name	Description	Latitude	Longitude	Primary Agency
Truckee River Below Marble Bluff Dam	Marble Bluff Dam	39.85303	-119.39949	PLPT
Truckee River Below Marble Bluff Dam	Marble Bluff Dam	39.85303	-119.39949	TMWRF
Truckee River at Marble Bluff Dam	Marble Bluff	39.855042	-119.39362	USFWS
Truckee River at Lower Nixon	Lower Nixon	39.84464	-119.38085	PLPT
Truckee River at Nixon	Nixon	39.82922	-119.36108	TMWRF
Truckee River at Nixon Bridge	Nixon Bridge	39.82929	-119.35696	PLPT
Truckee River at Nixon	Nixon	39.817546	-119.35201	USFWS
Truckee River at Upper Nixon	Upper Nixon	39.80337	-119.35088	PLPT
Truckee River at "Canyon"	Canyon	39.77808	-119.33721	PLPT
Truckee River Near Nixon, NV 10351700	Nixon	39.777372	-119.33752	USGS
Truckee River at Dead Ox	Dead Ox	39.73996	-119.32041	TMWRF
Truckee River at Dead Ox	Dead Ox	39.73996	-119.32041	PLPT
Truckee River at Numana	Numana	39.71692	-119.3121	USFWS
Truckee River at S Bar S Ranch	S Bar S Ranch	39.69568	-119.2933	PLPT
Truckee River at Tile Drain Outlet	Tile Drain Outlet	39.66806	-119.27055	PLPT
Truckee River at Paiute Pit Outlet	Paiute Pit Outlet	39.65086	-119.27985	PLPT
Truckee River at Fellnagle	Fellnagle	39.64594	-119.28891	PLPT
Truckee River at Wadsworth, NV 10351650	Wadsworth	39.632134	-119.28323	USGS
Truckee River at Wadsworth, NV	near Wadsworth	39.63214	-119.2831	TMWRF
Truckee River at Wadsworth, NV	Wadsworth Bridge	39.63085	-119.28364	PLPT
Truckee River at Big Bend	Big Bend	39.62087	-119.29006	PLPT
Truckee River at I-80	Interstate 80	39.61706	-119.30449	PLPT

Location Name	Description	Latitude	Longitude	Primary Agency
Truckee River at I-80	Wadsworth 80	39.612661	-119.3044	USFWS
Truckee River at Pierson Dam	Pierson Dam	39.6129	-119.30608	PLPT
Truckee River at Painted Rock	Painted Rock	39.59183	-119.36725	USFWS
Truckee River at Painted Rock	Painted Rock	39.591	-119.36641	NDOW
Truckee River at Painted Rock	Painted Rock	39.59108	-119.3672	TMWRF
Truckee River at Derby Dam	Derby Dam	39.587409	-119.43903	USFWS
Truckee River at Derby Dam 10351600	near derby dam	39.584634	-119.44129	USGS
Truckee River at Derby Dam	Derby Dam	39.58521	-119.44337	NDOW
Truckee River at Derby Dam	Derby Dam	39.58583	-119.44811	TMWRF
Truckee River at Eagle Picher	Eagle Picher	39.56625	-119.47438	NDOW
Truckee River at Clark	USA Parkway	39.565022	-119.48613	USFWS
Truckee River at Clark	Clark	39.56493	-119.48672	TMWRF
Truckee River at Tracy	Tracy	39.5645	-119.52037	TMWRF
Truckee River near Tracy, NV 10350340	Patrick area	39.556579	-119.55324	USGS
Truckee River at Lower McCarran Ranch	Lower McCarran	39.546782	-119.56847	USFWS
Truckee River at Upper McCarran Ranch	Upper McCarran	39.546853	-119.58376	USFWS
Truckee River at Mustang	Mustang	39.525532	-119.60976	USFWS
Truckee River at Lockwood	Lockwood	39.5099	-119.64875	TMWRF
Truckee River at Vista, NV	Truckee River at Vista	39.520467	-119.70102	USGS
Truckee River at Vista, NV	DRI at vista	39.520467	-119.70102	DRI
Truckee River near Spice Island, Sparks	Spice Island	39.513388	-119.7337	USFWS
Truckee River near Sparks, NV 10348200	mid sparks	39.517617	-119.74164	USGS
Truckee River above East McCarran Boulevard	East McCarran	39.518056	-119.74556	TMWRF
Truckee River at Rock Park	Rock Park 1	39.51866	-119.7601	NDOW
Truckee River at Rock Park	Rock Park 2	39.51913	-119.76147	NDOW
Truckee River at Glendale Intake	Glendale Water Treatment Plant Intake	39.524252	-119.77272	TMWA
Truckee River at Reno, NV	Fisherman's Park	39.53065	-119.78989	USFWS
Truckee River at Reno, NV 10348000	Reno	39.530189	-119.79547	USGS
Truckee River at Wingfield Park	Wingfield	39.525282	-119.81256	USFWS
Truckee River at Wingfield Park	Wingfield Park South Channel	39.52444	-119.81393	NDOW
Truckee River at Idlewild Park	Truckee River at Idlewild Park	39.522966	-119.83269	DRI

Location Name	Description	Latitude	Longitude	Primary Agency
Truckee River at Chalk Bluff Intake	Chalk Bluff Water Treatment Plant Intake	39.514545	-119.86673	TMWA
Truckee River at Patagonia	Patagonia	39.50521	-119.90047	NDOW
Truckee River at Patagonia	Patagonia	39.505819	-119.90165	USFWS
Truckee River at Patagonia	Patagonia	39.507132	-119.90325	DRI
Truckee River near Mogul, NV 10347460	Mogul	39.507132	-119.93186	USGS
Truckee River at Washoe Highland Dam	Washoe Highland Dam	39.5209	-119.96002	NDOW
Truckee River at Crystal Peak Park	Crystal Peak Park	39.51459	-119.9966	NDOW
Truckee River at Crystal Peak Park	Crystal Peak Park	39.511934	-119.99562	USFWS
Truckee River upstream from Verdi (Verdi Dam)	NDOW upstream from Verdi	39.49409	-119.99387	NDOW
Truckee River at Fleish Power Plant	Fleish Power Plant	39.479163	-119.99379	USFWS
Steamboat (near Steamboat diversion, Farad)	Steamboat	39.448299	-120.00693	USFWS
Truckee River at Farad, CA 10346000	Truckee River at Farad	39.427964	-120.03409	USGS
Truckee River at Farad, CA	Farad	39.427964	-120.0327	DRI
Truckee River at Farad, CA	Farad	39.424299	-120.03529	USFWS
Truckee River below Hirschdale	Below Hirschdale	39.370594	-120.0353	USFWS
Truckee River above Juniper Creek	Truckee River above Juniper Creek	39.36517	-120.07421	DRI
Truckee River at Hirschdale	Hirschdale	39.384781	-120.08318	USFWS
Truckee River at Boca Bridge near Truckee, CA 10344505	upstream of boca	39.385185	-120.0877	USGS
Truckee River above Prosser Creek	Fly Casters (near SF Flyfishing Club, Truckee)	39.359953	-120.11256	USFWS
Truckee River below Martis Creek	Truckee River below Martis Creek	39.3531	-120.12189	DRI
Sewage Plant (near Truckee Sanitation Plant)	Truckee	39.351862	-120.11788	USFWS
Truckee River above Martis Creek	Truckee River above Martis Creek	39.34847	-120.11912	DRI
Truckee River at Truckee Falls	Truckee Falls (near Hwy 267 Bridge, Truckee)	39.332842	-120.15948	USFWS
Truckee River above Donner Creek	Truckee River above Donner Creek	39.316017	-120.20103	DRI
Truckee River near Truckee, CA 10338000	Truckee	39.296295	-120.20548	USGS
Truckee River upstream of Truckee, CA	Cabin Creek Rd (near Squaw Creek, Squaw Valley)	39.278382	-120.20618	USFWS
Truckee River at Tahoe City	Tahoe City	39.162868	-120.16526	USFWS
Truckee River at Tahoe City 10337500	Truckee River at Tahoe City	39.166296	-120.14436	USGS

Location Name	Description	Latitude	Longitude	Primary Agency
Truckee River at Tahoe City	Tahoe City	39.166296	-120.14436	DRI
Alum Creek at Chrissie Caughlin Park	On Alum Creek	39.51099	-119.85544	UNR
Alum Creek at W. McCarran Blvd	On Alum Creek	39.50428	119.85928	UNR
Alum Creek at piezometers	On Alum Creek	39.48771	119.86861	UNR
Steamboat Creek, Steamboat Creek	Above and below sewage plant	Not Reported	Not Reported	UNR
Farad, Floriston	On Truckee River	39.395	-120.024	UNR
Verdi, Mayberry Park Verdi along 4th street	On Truckee River	39.503	-119.896	UNR
Mogul, Spice Island	On Truckee River	39.512	-119.732	UNR
Reno, Tracy				UNR
Sparks, McCarren Ranch East McCarren, Sparks	On Truckee River	39.547	-119.573	UNR
Lockwood, Lockwood Lockwood	On Truckee River	39.509	-119.653	UNR
Tracy Clark exit	On Truckee River	39.564	-119.487	UNR

Section 4: Monitoring

4.1 Purpose of Monitoring

Each of the monitoring agencies has developed its own Sampling and Analysis Plan (SAP) and/or Standard Operating Procedures (SOPs) guiding their sample collection and quality assurance procedures. Most organizations have defined, written protocols to follow during field sample collection. The types of monitoring by MOU organizations are listed in Table 4-1, which includes the name of their written protocol, and a brief synopsis of what the protocol document contains. These specific protocols are important to assure accuracy of data, to document how the data was collected, and to allow for reproducibility of results. A link to each agency's "sampling protocols" or "quality assurance" documents is provided within the "Analytical Sampling Matrix", which is located in Appendix C. Town of Truckee and Placer County monitoring locations and site names can be found here: http://www.placer.ca.gov/Departments/Works/~/media/dpw/npdes/documents/TRWQMPFinalPlan.ashx

Table 4-1. General Sample Types Currently Collected on the Truckee River

Sample Type	Purpose	Agencies collecting such data	Collection frequency
Grab sample	Collect samples to record measurements in the field and further laboratory analysis	DRI, UNR, TMWRF, TMWC, TOT, TRWC, Placer County	Variable
Data sonde	Continuous in-stream data collection: temperature, pH, conductivity, and dissolved oxygen	DRI TMWRF,	Hourly intervals
Fish survey	Intermittent surveys of fish populations at specified locations in the river	NDOW USFWS	Biannually
Biological/Habitat	Periphyton, macroinvertebrate, sampling and habitat assessment	NDEP, Placer County, PLPT, TMWRF, TOT, USFWS	Varies
Flow Measurement		USGS	15 minute intervals
Other	Bird, canopy, riparian zone and wetland restoration success	TNC	Varies

It is not the intent of this CMP to recommend a specific protocol or method for all organizations to implement. However, it is the intent of this document to provide all available information in an easily accessible format. If a new sampling location is established at a future date, methods of data sampling/collection protocols and collection frequency should follow those of the agencies

nearby for data consistency. Table 4-2 lists the available SOPs and SAPs for monitoring conducted on the Truckee River. Appendix D (Field Protocol Summary Table) contains possible or likely types of data collection, including that of historical data. Field data collection primarily consists of grab samples for water quality parameters, fish counts for population numbers, substrate collection for biological information, and sediment collection for habitat characterization.

Table 4-2. List of Agency Standard Operating Procedures for Field Sampling

Agency	Document name	Document contents
DRI	DRI Water Analysis Laboratory Quality Manual	States that SOPs are available on sample collection, preservation and holding times
LRWQCB	Not Available	
NDEP	Not Available	
NDOW	Truckee River Fish Population Sampling Protocol	2 page summary describing approved techniques for fish population sampling
Placer County	Truckee River Water Quality Monitoring Plan	Section 6: Station Implementation and Data Collection Protocols
PLPT	2007 PLPT Physical Habitat and Bioassassment QAPP	Chapter 2 describes sampling design, sampling methods, sample handling and custody protocol for bioassessment sampling
PLPT	Water Quality Monitoring of Surface Waters Within the PLIR	Chapter 2 describes sampling design, sampling methods, and sample handling and custody for collection of water quality samples
TMWC	Truckee Meadows Regional Stormwater Management Plan – Sampling and Analysis Plan	Pages 2-5 describe the protocols for collecting quarterly baseline samples and procedures and protocols for collecting samples during storm events
TMWA	TMWA 2009 Micro SOP	Section VI contains protocols for collecting samples for water quality analysis
TMWRF	Truckee Meadows Regional Stormwater Quality Management Program Sample Analysis Plan, 2004	Sections III and IV contain procedures and protocols for collecting baseline samples and stormwater samples, respectively
TMWRF	TMWRF Water Quality Laboratory SOP for Continuous River Monitoring of Temperature, Dissolved Oxygen, pH & Specific Conductance	This document describes all operating conditions, calibration, and accessing the recorded data from the sonde
TMWRF	TMWRF Water Quality Laboratory SOP for River Integrated Sampling and Sample Preparation	Describes procedures to follow to take and collect samples from the river
TNC	Not Available	
Town of Truckee	Town of Truckee Final Sampling and Analysis Plan for Implementation of the Truckee River Water Quality Monitoring Plan, Water Year 2010	Chapter 3 describes water quality sample collection procedures TRWQMP Section 6: Station Implementation and Data Collection Protocols
TRWC		

Agency	Document name	Document contents
UNR	Alum Creek Discharge and Water Quality Protocols	Describes protocols to follow to collect samples in the field; includes *E.coli* samples, discharge, depth from installed piezometers,
USFWS	Not Available	

4.2 Parameters Monitored

The parameters monitored at a location are usually specific to a certain permit's requirements or research investigation. Certain parameters can be considered basic indicators of water quality conditions (temperature, dissolved oxygen, conductivity and pH) and others such as nutrients or inorganic chemical, are indicative of urban activities within the watershed. TMWRF has an interest in the quality of the river water above and below Steamboat Creek, as well as the condition of lower Steamboat Creek above and below its discharge point. The Truckee Meadows Watershed Committee (City of Reno, City of Sparks, Washoe County) monitors basic water quality above and below urbanized areas to assess impacts of urbanization on the river and its tributaries. NDEP is responsible for regulating water quality in Nevada (except waters within Tribal boundaries), and uses monitoring data to assess compliance with water quality standards. NDOW and USFWS have an interest in tracking the number of fish in the river, their locations, and the health of the fish. River volume or flow is an important measurement parameter as it serves the basis for the numerous diversions of water along the river, possible flood conditions, as well as impacts due to low-flow conditions.

Constituents measured on the Truckee River and tributaries by the MOU Group are shown in Table 4-3. These parameters are separated into seven categories or types of constituent. Parameters analyzed vary by location; Appendix D contains all the parameters measured at each site by each organization.

Table 4-3. Summary of Constituents and Parameters Measured on the Truckee River

Field Parameters	Definition
Alkalinity	*Alkalinity*
Dissolved Oxygen	*A measure of dissolved oxygen using a direct read probe or wet tested using a Hach kit in volunteer programs.*
pH	*Direct pH measurement; typically reported in pH units*
Secchi depth	*A measurement of water clarity, based on ability to see a disk with white on black, reported in feet*
Sonde - Dissolved Oxygen	*Dissolved oxygen using* Sonde *combined probe*
Sonde - pH	*pH using* Sonde *combined probe*
Sonde - Specific Conductivity	*Specific conductivity using SONDE combined probe*
Sonde - Temperature	*Temperature using* Sonde *combined probe*
Sonde - Turbidity	*Turbidity using* Sonde *combined probe*

Field Parameters	Definition
Specific Conductivity	*Direct conductivity measurement (note if temperature corrected to Specific Conductance) micromhos/centimeter or microSeimens/centimeter*
Temperature	*Temperature (note units)*
Turbidity	*A measurement of light scatter from particles in water, reported in nephelometric turbidity units*
Flow: Flume	*Flow measurement using a flume with geometry that produces laminar flow with flow proportional to height in flume.*
Flow: Full Pipe	*Flow in a full pipe, where flow is dependent on pressure and size of the pipe*
Flow: Open Channel	*Flow measured in open channel, often an estimate made using Manning's Equation*
Flow: Partial Pipe	*Flow in a partially filled pipe, similar to open channel*
Flow: Weir	*Flow measurement using a weir (note types V, sharp crested, combination, etc) where flow is proportional to height over/through the weir.*

Flow Measurement	Definition
Gauge	*Stage measured from fixed staff gauge*
Doppler	*Device uses radio waves to measure velocity and height of water*
Price Meter	
Pressure Transducer	*Device measures pressure, and therefore water level*
Marsh McBirney	*Flow meter - Flodar, FlowMate, or FlowTot*
Sonic	*Sonic device that measures velocity either from the surface or through the water column*
Time of Travel	*Floating marker is used to determine the time it takes to travel a known distance.*
Tracer	*Flow measured by timing tracer travel over a known distance*
Dilution	*Flow based on measuring concentrations upstream and downstream where flows mix*

Biological	Definition
Benthic Macroinvertebrates – EPA, DRI	*Survey of benthic macroinvertebrates using EPA method*
Benthic Macroinvertebrates - USGS	*Survey of benthic macroinvertebrates using USGS method*

Biological	Definition
Benthic Macroinvertebrates - Pyramid Lake	*Survey of benthic macroinvertebrates using PLPT method*
Benthic Macroinvertebrates Natural Conditions	*Survey of benthic macroinvertebrates that uses ratios of taxa to assess natural conditions vs. disturbed ecosystem*
Benthic Macroinvertebrates - Draft NV	*Survey of benthic macroinvertebrates using EPA method*
Benthic Macroinvertebrates - Index of Biological Integrity	*A method of calculating an index to asses ecological communities for impacts from human activities*
Benthic Macroinvertebrates - CA Rapid Assessment	*A standardized, fast, and low-cost method for assessing the health of wetlands and riparian habitats*
Benthic Macroinvertebrates - Truckee River Watershed Council	*Survey of benthic macroinvertebrates using TRWC method*
Birds	*Survey of birds*
Trees	*Survey of trees*
Shade Canopy	*Estimate of shade canopy over water*
Exotics	*Surveys for exotic (non-native) species*
Invasives	*Surveys for invasive species*
Fish - USGS	*Fish survey using USGS methods*
Fish - USFWS	*Fish survey using USF&WS methods*
Fish - DRI	*Fish survey using DRI methods*
Periphyton	*Survey of attached algae, typically macrophytes*
Algae	*General; survey of algae*
Benthic Algal Biomass	
Benthic algal nutrient limited substrate	
Chlorophyll	*Measurement of chlorophyll a, an estimate of algae*
Bank Plant	*Survey of riparian zone plants*
Presence/Absence	*Survey of presence or absence*
Success	*Percent survival of plantings*
Protozoa	*Survey of microorganisms, typically in water column*

Geomorphology	Definition
TSS	*Total Suspended Solids*
Pebble Count	*A standardized method for surveying the percentage and size of rocks in a streambed, used to assess stream habitat potential*
McNeil Core	*Substrate sampler widely used for quantitative bulk sampling of streambed sediments*
Box Core	*A coring device that captures a known depth and area of sediment*

Geomorphology	Definition
Sediment Plate	*A plate that is suspended in water to attract organisms and substrate over time*
Sediment Trap	*A device that captures suspended sediments in a water column over time*
Sieve analysis	*A method for measuring the particle size of sediments using a stacked series of sieves with progressively smaller screen size.*
Hydrometer	*Measurement of fine sediments using hydrometer density*
Proper Function Condition	*A means of assessing if riparian/wetland areas are functioning properly based on vegetation, landform, and presence of large woody debris*
Habitat Assessment	*A standardized method to asses the condition of habitat through uniform sampling*

Note: EPA method for benthic macroinvertebrate assessment is from *Wadeable Streams Assessment Field Operations Manual* (EPA 2004).

4.3 Types of Data Collected

There are different types of data that are currently and historically collected. The types of data currently collected by each agency and a description of where that data is being collected can be found in the "Protocol Survey Matrix" found in Appendix D.

Water quality data can be collected using a number of different methods. These include active, continuous sampling measures using a sonde inserted in the water column that records data at specified time intervals (usually every 15 minutes to hourly). Sonde data typically includes dissolved oxygen (DO), temperature, conductivity, and pH. These data can be downloaded directly from the sonde itself either continuously or intervals.

Field data collected intermittently from a water body is generally via a "grab sample." Grab samples describe samples where someone physically fills a sample bottle with water under specified protocols that direct where, when, and how the sample is collected. Grab samples are placed in a cooler or other collection container for transmittal to the laboratory, as set forth by the organization's specific standard operating procedures for that type of data collection. These samples are then tested for specific physical and chemical parameters (nutrients, metals, etc.) as outlined in the SAP. Additionally, grab samples collected can be immediately tested for pH, conductivity, turbidity, temperature, and dissolved oxygen, using an appropriately calibrated instrument for such measurement.

The frequency at which water quality samples are collected depends upon the intent of the sampling. In-stream data sondes record data at regular intervals, whereas water quality sample collection is made perhaps monthly or bi-annually. For example, TMWRF is required by terms its discharge permit to monitor regularly (bi-weekly or bi-annually, for example). For certain UNR

or DRI research projects, data may be collected twice a year, at which time a full suite of data is collected (water quality, biologic, fish, river reach characteristics).

Some sampling may be storm-event driven. For example, samples may be collected from a stormwater runoff event. These samples may be grab samples, or a composite based on flow or time. In the Truckee Meadows, the TMWC is permitted to sample runoff in one creek per year, from one storm in the dry season, and one storm in the wet season, as dictated by weather patterns and requirements of the SAP. A common stormwater event sample is a combination of first-flush runoff collection in a separate container triggered by the runoff event, followed by flow-weighted composites.

4.3.1 Field Analysis

4.3.1.1 Flow Measurement

Data required for calculation of flow rate includes length, width, and depth of the river channel; measures of the actual physical characteristics of the water body. For a river "reach" (a defined segment of river), these measurements, along with velocity, are required to calculate volume and flow rate of the river. The USGS is the agency most actively involved with flow measurement in the watershed, with the intent of obtaining reproducible and comparable measurements from the many locations for which measurements are made.

Measurements of the river stage (depth in feet) and flow rate (cubic feet per second) have been continuously collected by the USGS and other interested parties at strategic locations along the entire length of the Truckee River for many years. There are currently 13 stations collecting real-time data on the main stem of the Truckee River between Tahoe City (Lake Tahoe) and Pyramid Lake. The stations, river mile, and geographic locations, are listed in Table 4-4. A hyperlink is enabled from the sites listed in the table for immediate access to the data, including period of record and current conditions. For scientific studies, these measurements are integrally paired with other physical and chemical parameters measured for water quality modeling or other purposes. UNR also collects this type of data during their investigations to supplement their collected information.

Table 4-4. USGS Flow Gauges on the Truckee River.

CMP Station number	USGS No.	Station Name
add	10337500	Truckee River at Tahoe City, CA
	10338000	Truckee River near Truckee, CA
	10344505	Truckee River at Boca Bridge near Truckee, CA
	10346000	Truckee River at Farad, CA
	10347460	Truckee River near Mogul, NV
	10348000	Truckee River at Reno, NV
	10348200	Truckee River near Sparks, NV
	10350000	Truckee River at Vista, NV
	10350340	Truckee River near Tracy, NV
	10351600	Truckee River below Derby Dam near Wadsworth, NV
	10351650	Truckee River at Wadsworth, NV
	10351700	Truckee River near Nixon, NV

4.3.2 Laboratory Analysis

4.3.2.1 Water Quality Parameters

The MOU Group collects water samples for a variety of laboratory analyses. Table 4-5 lists the water quality parameters analyzed (analytes), agencies conducting the sampling, and the title of any documents describing specific sample collection procedures for that analysis; documents listed can be found in Appendix D (or by following the hyperlinks from the "Analytical Sampling Matrix" located in Appendix C). Parameters not listed in this table indicate there is not a specific agency-defined protocol for field sample collection of that specific analyte.

Table 4-5. List of Agency Standard Operating Procedures for Laboratory Analysis

Analysis	Agency	Sample collection procedure documentation
Alkalinity	TMWRF	TMWRF WQL SOP Alkalinity
Hardness	TWMRF	TMWRF WQL SOP Hardness by Titration
Nitrate-N, Nitrite-N, Ammonia-N	TMWRF	TMWRF WQL SOP NO3-N, NO2-N, NH3-N by Lachat FIAS
Phosphorus	TMWRF	TMWRF WQL SOP Phosphorus Persulfate Digestion Method/Ascorbic Acid Method
Total Dissolved Solids (TDS)	TMWRF	TMWRF WQL SOP Total Dissolved Solids (TDS) Dried at 180C
Total Kjeldahl Nitrogen (TKN)	TWMRF	TMWRF WQL SOP Total Kjeldahl Nitrogen (TKN)
Total Organic Carbon (TOC)	TMWRF	TMWRF WQL SOP Total Organic Carbon (TOC)/Dissolved Organic Carbon (DOC) Persulfate-Ultraviolet Method
Nitrogen and Phosphorus	PLPT	Appendix B: Field Standard Operating Procedures
Chemical and bacteriological testing of raw and finished water	TWMA	QA Manual Micro
E.coli, field conductivity, temperature	UNR	Alum Creek Sampling SOP

4.3.3 Conducting Monitoring

4.3.3.1 Collection Procedures and Protocols

This section relates to the sample types collected by the MOU Group and participants in the CMP. Sample collection for water quality, habitat, biological or other surveys includes sampling surface water, outfalls (discharges from specific point sources), groundwater, and sediment or substrate. As described earlier, the type of data collected at a site depends on the purpose of the study or investigation or required monitoring conditions. Organizations that conduct field

sampling activities and have developed documents that detail their sampling protocol are listed in Table 4-6 (below). These documents can be found in Appendix B.

Table 4-6. Summary of Available Water Quality Field Sampling Standard Operating Procedures.

Type	Organization	Document
Continuous River Monitoring Sonde	TMWRF	TWMRF SOP
Ground Water Well Monitoring	TMWRF	TMWRF SOP Quarterly Ground Water Well Monitoring
Surface Water Collection	TMWRF	TMWRF SOP River Integrated Sampling and Sample Preparation
Surface Water Collection	TMWA	Sampling Analysis Plan 2010
Surface Water Collection	SWPCC	Sampling Analysis Plan

4.3.3.2 Field Measurements, Protocols, and Quality Control

Several MOU organizations have specified written Quality Control/Quality Assurance (QA/QC) procedures for field work in their Sampling Analysis Plans or Quality Assurance Plans. These plans can be found in Appendix B of this document, and a link to these documents can be found on the spreadsheet in Appendix C.

4.3.3.3 Laboratory Measurements, Protocols, and Quality Control

Laboratories must also have Quality Assurance/Quality Control (QA/QC) procedures and must be certified by the NDEP or State of California (depending upon where the testing occurs and for which agency/entity). Organizations that have provided their specific QA/QC procedures by which the laboratory workers must abide are TMWA, TMWRF, and DRI. These written procedures can be found in Appendix E. Organizations that specifically have this information in previously described Sampling and Analysis Plans (SAPs) and/or Quality Assurance Project Plans (QAPPs) are listed in Table 4-5 (above), including the section of the document to which QA/QC procedures are determined.

It is important for organizations to quality check or even graphically view their data collection results. Human error is a frequent cause of data errors. For example, a monthly graphical view of the dissolved oxygen concentrations obtained from a data sonde could indicate something is wrong with the data sonde, prompting a check of the unit to ensure it is working properly.

Data entered into the TRIG database does not undergo an independent evaluation for data quality. However, data in TRIG can include data quality flags and laboratory narratives in the source data. The level of quality can be assumed from its source and can be evaluated by users by referring to the SAPs, QAPPs, and laboratory report narratives provided in this CMP and through TRIG. Further, since the source of that data will be identified, the source can be contacted for further clarification of data quality if needed.

4.4 Biological Monitoring

The MOU Group conducts biological monitoring in and adjacent to the Truckee River, ranging from bird counts, stream bank and riparian and wetland restoration success monitoring, vegetation surveys, fish counts, periphyton (attached plant and algae) surveys, riverine habitat assessments, and benthic macroinvertebrate counts and indices. The locations and types of on-going studies are summarized in the Protocol Survey Summary (Table 4-1). Agencies actively conducting on-going biological monitoring include:

- Nevada Department of Wildlife - Fish count surveys
- Placer County – Benthic macroinvertebrate counts
- Pyramid Lake Paiute Tribe - Benthic macroinvertebrate counts and riverine habitat assessments
- The Nature Conservancy – Bird Count Surveys
- Truckee Meadows Water Reclamation Facility - Benthic macroinvertebrate counts
- Town of Truckee - Benthic macroinvertebrate rapid assessment monitoring and grab samples
- U.S. Fish and Wildlife Service - Fish count surveys.

In addition, The Desert Research Institute and The Nature Conservancy conduct project-specific biological studies in and near the Truckee River.

4.4.1 Benthic Macroinvertebrate Studies

The most common biological monitoring conducted by MOU Group members are benthic macroinvertebrate studies. These studies hold promise for improved data sharing through setting minimal standardization. Data collected have the potential to provide a useful tool to look at overall river health trends when the data is pooled. Hence, focus was placed on setting goals for data collection and sharing.

4.4.1.1 Background

Sampling and analysis of resident aquatic biota, particularly benthic invertebrates can be used as an overall indicator of ecological health of the river. With long-term residence in the river or stream bottom, benthic studies provide a glimpse into long-term conditions of water quality and changes prompted by events in the water column which sporadic grab samples may not catch. biomonitoring also integrate long term effects on sediment transport from dams and modifications of the riparian corridor. Benthic studies may also serve as indicators for river restoration success monitoring. Invertebrate surveys may provide simple enumeration of each genus or species, or may be grouped to provide measures such as taxa richness, number of individuals within particular taxonomic groups, sensitive vs. opportunist taxa percentages, and population percentages of different feeding mechanisms taxa (e.g., filtering collectors, gatherers, shredders, predators, grazers). These grouping metrics represent the structure and function of the bottom-dwelling (benthic) macroinvertebrate assemblage. Such metrics change with increased human influence that alters environmental conditions (Barbour et al. 1996).

Further evaluations such as measures of diversity, composition, functional feeding group representation, and information on tolerance to pollution can be used to assess the pressures of human impacts on stream health.

There are many metric indices, such as an Index of Biotic Integrity (IBI), that incorporate multiple biological community characteristics and measure the overall response of the assemblage to environmental alteration and cumulative stressors. Such a measure of the structure and function of the biota (using a regionally-calibrated index) is an appropriate indicator of stream health. An IBI has been developed for the Truckee River (Hughes, 2005) and is available in TRIG.

Surface Water Ambient Monitoring Program (SWAMP) bioassessment protocols have been successfully applied to many fresh water streams within the Lahontan region of California and were developed, tested and approved by the EPA. Similar to the SWAMP method is the California Stream Bioassessment Procedure (CSBP), developed by the California Department of Fish and Game and the California Bioassessment workgroup. The PLPT has also developed the PLPT Stream Bioassessment Procedure which is modeled after the California Department of Fish and Game CSBP.

In addition to collection of benthic invertebrate data, it is essential to collect basic qualitative habitat conditions to make site index comparisons meaningful. Examples of rapid habitat assessment techniques include California Rapid Assessment Methodology (Collins et al. 2007), Rosgen's Stream Bank Erosion Risk Surveys (Rosgen 1996), Department of Fish and Game Fish Habitat Quality Rapid Assessment (Harris 2005), and the NRCS Stream Visual Assessment (NRCS 1998). Rapid assessment techniques rely on simple and repeatable observations of site or habitat conditions. Rapid assessment protocols are designed to produce relatively accurate, low-cost, quantitative spatial data that are consistent with, and comparable to, data from more rigorous evaluations. These evaluations are a cost-effective means of tracking changes in conditions of specific locations over time on a relative scale.

4.4.1.2 Truckee River Invertebrate Monitoring

Fairly standard field protocols are used by MOU Group members conducting routine benthic invertebrate studies on the Truckee River. For example, most MOU Group members use Hess or other "kick net" samplers to collect invertebrates for laboratory identification and collect concurrent qualitative physical habitat data. In 2007, NDEP commissioned a study to compare and recommend methods for benthic invertebrate and habitat assessments to address field and laboratory techniques (Tetra Tech 2007). The report identified five metrics that provide a reliable ability to assess stream health:

1. Number of Ephemeroptera, Plecoptera, + Trichoptera (EPT) taxa,
2. Number of filterer taxa,
3. Number of burrower taxa,
4. Percent sprawlers, and
5. Percent dominant taxon.

A final index is calculated as an average of the five metric scores.

The report also found that in the field, the relative bed stability (RBS) was the single parameter best suited to measuring the physical habitat of the rivers in this study. It was found that coarser measurements for bankfull height and thalweg depth could be employed given the homogenous nature of the rivers studied (Truckee, Carson, and Walker). The Truckee River, measured with RBS, tends toward stable habitat above Reno and in the lower river on the Pyramid Lake Paiute Reservation above Nixon. Other areas below Reno, and on the PLPT Reservation, upstream and downstream of Nixon, had more unstable habitats indicative of stresses not present at the other sites.

4.4.1.3 Consensus on Standardization

Through a teleconference on biological monitoring, the MOU agencies involved with active benthic invertebrate monitoring agreed that they could set some minimal standards on data collection and sharing that would not affect their individual on-going efforts. These standards relate to the number of organisms counted, the level of taxonomic identification, metrics, concurrent habitat data, and how the data can be reported in TRIG.

Organismal Counts: Entities (such as the PLPT) count and identify all individual specimens collected, whereas others stop at 600 individuals. Those who count all individuals will continue to do so, and for all entities, the minimum count will be 600. Users of full-count data can use a random selection method to reduce the data set to a comparable, random 600 specimens. This approach was done as part of the Tetra Tech study in 2007.

Taxonomic Identification Level: Organisms can be classified to the family, genus and species level. Some entities attempt to indentify all organisms to the species or lowest possible taxonomic level while others follow the Level II identification protocol from the Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) method (SAFIT 2006). Level I roughly corresponds to genus level identifications for all groups (where possible). Chironomidae, should be identified to the genus level, and for special studies to the species level. Monotypic taxa may be identified to the species level. Level II roughly corresponds to species level identifications for most groups and genus level identification for the Chironomidae. Entities that wish to do so, can identify all organisms to the species level then the data can be collapsed and grouped back to the genus level for comparability.

Metrics: Some agencies only report raw data as part of NPDES permit compliance requirements; however, the raw data can be used to calculate many metrics. The current users will continue to calculate metrics in accordance with their current plans; however, users agreed to report a minimum of six metrics (5 individual metrics plus an overall average score), as described in Section 4.3.1.1.2 above, if possible given staff and funding constraints.

Physical Habitat Evaluation: The entities conducting monitoring collect a variety of concurrent physical and water quality data along with the invertebrate data. These data will be made available as part of the data sharing effort through TRIG. There may be a way to flag benthic data collected concurrently with other parameters shown in TRIG (either as an attached spreadsheet or available via SODA query). At a minimum, entities collecting benthic invertebrate data will visually observe and score the 10 riffle/run stream parameters needed for the Environmental Protection Agency (EPA) Rapid Habitat Assessment method (EPA 2004):

1. Epifaunal Substrate/Available Cover
2. Embeddedness (percent siltation)
3. Velocity/Depth Regime
4. Sediment Deposition
5. Channel Flow Status
6. Channel Alteration
7. Frequency of Riffles or Bends
8. Bank Stability
9. Vegetative Protection
10. Riparian Vegetative Zone Width.

In addition, it appears to be common practice to collect temperature and dissolved oxygen data concurrently with invertebrate sampling and habitat assessment.

Data Reporting: At this juncture, it is not feasible to upload invertebrate biomonitoring data into the TRIG SODA database because standardized templates have not been developed. However, the raw data and accompanying location/method information (latitude, longitude, protocol, and count levels) and metrics can be uploaded to TRIG. Generally, BMI laboratory reports are presented as extensive Excel spreadsheets that allow for sorting/subsampling data and calculation of metrics, and while not feasible to provide templates for the large volume of BMI data reported, the spreadsheet report is easily attached to a metadata page.

Many biological study reports can be directly posted to TRIG. However, there may be sensitive data, such as bird or fish localities, for example, that should not be directly shared with the public to protect these resources. In these cases, TRIG can be used to post a synopsis of the available data and provide a contact to the agency that can determine if the data can be shared on a "need to know" basis.

Table 4-7. List of Agency Standard Operating Procedures for Biological Sampling

Agency	Document name	Document contents
NDEP	Not Available	
PLPT	2007 PLPT Physical Habitat and Bioassessment QAPP	Chapter 2 describes sampling design, sampling methods, sample handling and custody protocol for bioassessment sampling
TNC	Not Available	
TMWRF	TMWRF Water Quality Laboratory SOP for Benthic Macroinvertebrate Sampling	Describes methods to follow in the field to collect benthic macroinvertebrates at the predefined locations on the Truckee River
TMWA	SOP Protozoa	Describes sampling procedures for microorganism collection
UFWS	Not Available	

Section 5: Data Clearinghouse - TRIG

5.1 Goals for Data Sharing

The goals of this CMP are very similar to the goals for the TRIG website; to gather as much data as possible from each stakeholder and place it onto the website that is accessible to the stakeholders and the public. The information stored on the website should remain open to all individuals seeking information on the Truckee River, with the exception of potentially sensitive habitat or species data. The open availability of information from all of the Truckee River stakeholders is invaluable in the future for scientific research and understanding of the ecological health of the river and its watershed.

The CMP working group expanded the basic means of sharing data and documents within TRIG. First, the CMP will be housed as a project (projects are explained further in a power point presentation created by Ecological Resource Associates in Appendix E). The CMP will have embedded links to the various appendices created during the CMP process. For example, the "Protocol Summary Spreadsheet," "Analytical Methods Matrix," the Truckee River current and historic monitoring site maps, "Truckee River Monitoring Sites Names and Descriptions," and other data will be available as links to the CMP within TRIG.

There is no minimum threshold as to the amount of data that should be uploaded to TRIG. TRIG was developed to facilitate ease of data additions. Once an account and project is set up, it is very easy to add data, and cumulatively, many small data elements add up to very useful information. The onus is on each stakeholder to take responsibility for their agency/entity and add data and other content to TRIG in accordance with their commitment under the MOU (Memorandum of Understanding).

5.2 TRIG Information Exchange

The TRIG website allows any information to be uploaded, available and easily accessible. Data submitted as an excel spreadsheet may be attached to the metadata page for a given data set. Once a regular format is established for the dataset as a template, and each dataset is formatted accordingly, the data may be uploaded to the semantic online data access (SODA) database, in order to be available with other datasets via Queries. Instructions on how to set up a TRIG account and upload spreadsheets to TRIG and its SODA are available in Appendix E of this document.

Each stakeholder is encouraged to create an account in TRIG, and begin uploading their data to the website. Many documents that relate to the explanation of the data, the sampling, the QA/QC, techniques, locations, etc. can be uploaded as metadata, simultaneously. These documents are viewed in each data description page, or can also be attached as flat documents for any individual seeking further clarification or information regarding the data.

There are still obstacles that need to be overcome with placing information onto the website. For instance, preparing the information in a manner to which the SODA database can accept it requires creating a template for each dataset as a spreadsheet with consistent codes and alpha

numerical characters in each column and row, to be recognized by SODA. This effort likely represents the greatest challenge in obtaining the commitment from each stakeholder to go beyond simply uploading spreadsheets on TRIG, to actually adding data into the SODA. Future technical support may be required to create templates for each dataset. There may also need to be workshops to eliminate some of the difficulties for establishing project pages in TRIG, and ensure widespread data availability through SODA. In addition, greater public outreach regarding the availability of this information should be considered.

5.3 Quality Assurance

The quality assurance and quality control for information being entered into TRIG will be the responsibility of the each agency/entity entering information. Stakeholders are tasked with placing valuable information onto the website, and therefore every piece of information should be reviewed for accuracy by the contributing data provider. All information found on the TRIG website represents quality control provided by the contributing data liaison.

5.4 CMP in TRIG

This Truckee River Coordinated Monitoring Program document exists as a project within TRIG, with appendices and spreadsheet links that allow access and manipulation of the information compiled herein. It is the intent of the MOU Group that documents provided by individual members be self-maintained when they become outdated. For example, Sampling and Analysis Plans (SAPs) from each MOU member conducting routine monitoring are provided in Appendix B. If an MOU member updates their SAP, they should upload the new plan to TRIG, and because it is in the same location, links in the CMP will continue to point to the new SAP.

5.5 CMP Metadata

As part of the data compilation towards developing the CMP, parameter information for a wide variety of monitoring locations, sampling protocols, and analytical methods was collected and compiled. These data can be used to create metadata in TRIG that can be used in the SODA database, or as pick-lists in project data. However, these metadata have not been formally put into TRIG format; this could be part of a subsequent implementation project. These metadata categories are summarized in Appendix D.

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Figures

PYRAMID LAKE

-3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

446 447 80 341

Wadsworth

Sparks

DERBY DAM

VISTA GAGE

NDEP
USGS
WCDWR

NDEP
USGS

NDEP
USGS
WCDWR

PYRAMID HWY
ORR
NORTH TRUCKEE DRAIN
N MC CARRAN BLVD
GLENDALE
GLENDALE WTP
PIONEER
PIONEER
PIONEER
SPICE ISLAND
EASTN
PERRY
S MC CARRAN BLVD
BOYTON SLOUGH
DRY CREEK
THOMAS CREEK
STEAMBOAT CREEK
WHITES CREEK
WHITES CREEK
STEAMBOAT

Current Monitoring Locations

TMWRF
NDEP
TTSA (2008 Data)
USGS
UNR
WCDWR
DRI
NDOW
USFWS
TMWA
PLPT
Ditches
Streams
1 mi MARKER

Monitoring Locations on the Truckee River and Tributaries Downstream of Vista

Current Monitoring Locations

0 1 2 4 6 8 Miles

Department of Water Resources

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June 2010

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Monitoring Locations on the Truckee River and Tributaries Upstream of Vista

Current Monitoring Locations

0 1 2 4 6 8 Miles

Current Monitoring Locations

TMWRF
NDEP
TTSA (2008 Data)
USGS
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Appendix A

Sampling Location Information and Location Name Cross Table

Site Number	Location	Coordinates		Agency	Type	Sonde	Parameters	Biological	Frequency	Lab
1	Truckee River Below Marble Bluff Dam	39.85303	-119.39949	PLPT	G	Y	DO, pH, SpC, T, Turb	BMHA		
2	Truckee River Below Marble Bluff Dam	39.85303	-119.39949	TMWRF		Y	DO, pH, SpC, T		Hourly	
3	Truckee River at Marble Bluff Dam	39.855042	-119.39362	USFWS	G	N	SpC	Fish	Bi-Annually	
4	Truckee River at Lower Nixon	39.84464	-119.38085	PLPT		Y	DO, pH, SpC, T, Turb	BMHA		
5	Truckee River at Nixon	39.82922	-119.36108	TMWRF	G	Y	DO, pH, SpC, T			
				TMWRF	G		pH, EC, Alk, Chloride, Sulfate, Na, K, Ca, Mg, Silica, turbidity, color, TSS		Monthly	DRI laboratory
6	Truckee River at Nixon Bridge	39.82929	-119.35696	PLPT		Y	DO, pH, SpC, T, Turb	BMHA		
7	Truckee River at Nixon	39.817546	-119.352014	USFWS	G	N	SpC	Fish	Bi-Annually	
8	Truckee River at Upper Nixon	39.80337	-119.35088	PLPT	G	Y	DO, pH, SpC, T, Turb	BMHA		
9	Truckee River at "Canyon"	39.77808	-119.33721	PLPT		Y	DO, pH, SpC, T, Turb	BMHA		
10	Truckee River Near Nixon, NV 10351700	39.7773722	-119.337522	USGS			Gage height, flow			
11	Truckee River at Dead Ox	39.73996	-119.32041	TMWRF	G	N		Hess Sampler and TMWRF SOP		
12	Truckee River at Dead Ox	39.73996	-119.32041	PLPT		Y	DO, pH, SpC, T, Turb	BMHA		
13	Truckee River at Numana	39.71692	-119.312098	USFWS	G	N	SpC	Fish	Bi-Annually	
14	Truckee River at S Bar S Ranch	39.69568	-119.2933	PLPT		Y	DO, pH, SpC, T, Turb	BMHA		
15	Truckee River at Tile Drain Outlet	39.66806	-119.27055	PLPT		Y	DO, pH, SpC, T, Turb			
16	Truckee River at Paiute Pit Outlet	39.65086	-119.27985	PLPT		Y	DO, pH, SpC, T, Turb			
17	Truckee River at Fellnagle	39.64594	-119.28891	PLPT	G	Y	DO, pH, SpC, T, Turb	BMHA		
18	Truckee River at Wadsworth, NV 10351650	39.63213447	-119.283225	USGS			Gage height, flow			
19	Truckee River at Wadsworth, NV	39.63214	-119.2831	TMWRF	G	Y	DO, pH, SpC, T			
				TMWRF	G		pH, EC, Alk, Chloride, Sulfate, Na, K, Ca, Mg, Silica, turbidity, color, TSS		Monthly	DRI laboratory
20	Truckee River at Wadsworth, NV	39.63085	-119.28364	PLPT		Y	DO, pH, SpC, T, Turb	BMHA		
21	Truckee River at Big Bend	39.62087	-119.29006	PLPT		Y	DO, pH, SpC, T, Turb	BMHA		
22	Truckee River at I-80	39.61706	-119.30449	PLPT		Y	DO, pH, SpC, T, Turb	BMHA		
23	Truckee River at I-80	39.612661	-119.304398	USFWS	G	N	SpC	Fish	Bi-Annually	
24	Truckee River at Pierson Dam	39.6129	-119.30608	PLPT		Y	DO, pH, SpC, T, Turb			
25	Truckee River at Painted Rock	39.59183	-119.367253	USFWS	G	N	SpC	Fish	Bi-Annually	
26	Truckee River at Painted Rock	39.591000	-119.366410	NDOW	G	N		Fish		
27	Truckee River at Painted Rock	39.59108	-119.3672	TMWRF	G	Y	DO, pH, SpC, T			
28	Truckee River at Derby Dam	39.587409	-119.439032	USFWS	G	N	SpC	Fish	Bi-Annually	
29	Truckee River at Derby Dam 10351600	39.58463448	-119.441287	USGS						
30	Truckee River at Derby Dam	39.585210	-119.443370	NDOW	G	N		Fish		
31	Truckee River at Derby Dam	39.58583	-119.44811	TMWRF	G	Y	DO, pH, SpC, T			
32	Truckee River at Eagle Picher	39.56625	-119.47438	NDOW	G	N		Fish		
33	Truckee River at Clark	39.565022	-119.48613	USFWS	G	N	SpC	Fish	Bi-Annually	
34	Truckee River at Clark	39.56493	-119.48672	TMWRF	G	N		Hess Sampler and TMWRF SOP		
				TMWRF	G		pH, EC, Alk, Chloride, Sulfate, Na, K, Ca, Mg, Silica, turbidity, color, TSS		Monthly	DRI laboratory
35	Truckee River at Tracy	39.5645	-119.52037	TMWRF		Y	DO, pH, SpC, T		hourly	
36	Truckee River near Tracy, NV 10350340	39.55657878	-119.553236	USGS						
37	Truckee River at Lower McCarran Ranch	39.546782	-119.568474	USFWS	G	N	SpC	Fish	Bi-Annually	
38	Truckee River at Upper McCarran Ranch	39.546853	-119.583758	USFWS	G	N	SpC	Fish	Bi-Annually	
39	Truckee River at Mustang	39.525532	-119.609761	USFWS	G	N	SpC	Fish	Bi-Annually	
40	Truckee River at Lockwood	39.5099	-119.64875	TMWRF	G	Y	DO, pH, SpC, T	Hess Sampler and TMWRF SOP		
41	Truckee River at Vista, NV	39.5204672	-119.70102	USGS						
42	Truckee River at Vista, NV	39.5204672	-119.70102	DRI		Y	DO			
				DRI	G		TPO4, OPO4, NO2, NH4, TDS, TSS, TKN, Color, TU, pH, EC, HCO3, CO3, Cl, SO4, Na, K, Ca, Mg, Si, NO3		Monthly	DRI laboratory
43	Truckee River near Spice Island, Sparks	39.513388	-119.733704	USFWS		N	SpC	Fish	Bi-Annually	
44	Truckee River near Sparks, NV 10348200	39.51761667	-119.741644	USGS						
45	Truckee River above East McCarran Boulevard	39.518056	-119.74556	TMWRF		Y	DO, pH, SpC, T	Hess Sampler and TMWRF SOP		
46	Truckee River at Rock Park	39.51866	-119.760100	NDOW	G	N		Fish		
47	Truckee River at Rock Park	39.519130	-119.761470	NDOW	G	N		Fish		
48	Truckee River at Glendale Intake	39.524252	-119.772724	TMWA	G		pH, T, turb		Every 3 hours	
				TMWA	G		TOC, Alk		Monthly	
				TMWA	G		T, Turb, pH, Total and Fecal Coliform		twice monthly	
				TMWA	G		T, Turb, pH, Crypto and Giardia		twice monthly	
				TMWA	G		TSS, TDS, T		"Different intervals"	
49	Truckee River at Reno, NV	39.53065	-119.789888	USFWS	G	N	SpC	Fish	Bi-Annually	
50	Truckee River at Reno, NV 10348000	39.53018865	-119.795468	USGS						
51	Truckee River at Wingfield Park	39.525282	-119.812563	USFWS	G	N	SpC	Fish	Bi-Annually	
52	Truckee River at Wingfield Park	39.524440	-119.813930	NDOW	G	N		Fish		
53	Truckee River at Idlewild Park	39.52296619	-119.832693	DRI	G	Y	DO			

				DRI	G		TPO4, OPO4, NO2, NH4, TDS, TSS, TKN, Color, TU, pH, EC, HCO3, CO3, Cl, SO4, Na, K, Ca, Mg, Si, NO3		Monthly	DRI laboratory
54	Truckee River at Chalk Bluff Intake	39.514545	-119.86673	TMWA	G		pH, T, turb		Every 3 hours	
				TMWA	G		TOC, Alk		Monthly	
				TMWA	G		T, Turb, pH, Total and Fecal Coliform		twice monthly	
				TMWA	G		T, Turb, pH, Crypto and Giardia		twice monthly	
				TMWA	G		TSS, TDS, T		"Different intervals"	
55	Truckee River at Patagonia	39.505210	-119.900470	NDOW	G	N		Fish		
56	Truckee River at Patagonia	39.505819	-119.90165	USFWS	G	N	SpC	Fish	Bi-Annually	
57	Truckee River at Patagonia	39.5071324	-119.903252	DRI		N	DO			
				DRI	G		TPO4, OPO4, NO2, NH4, TDS, TSS, TKN, Color, TU, pH, EC, HCO3, CO3, Cl, SO4, Na, K, Ca, Mg, Si, NO3		Monthly	DRI laboratory
58	Truckee River near Mogul, NV 10347460	39.50713218	-119.931864	USGS						
59	Truckee River at Washoe Highland Dam	39.520900	-119.960020	NDOW	G	N		Fish		
60	Truckee River at Crystal Peak Park	39.514590	-119.996600	NDOW	G	N		Fish		
61	Truckee River at Crystal Peak Park	39.511934	-119.995617	USFWS	G	N	SpC	Fish	Bi-Annually	
62	Truckee River upstream from Verdi (Verdi Dam?)	39.494090	-119.993870	NDOW	G	N		Fish		
63	Truckee River at Fleish Power Plant	39.479163	-119.993793	USFWS	G	N	SpC	Fish	Bi-Annually	
64	Steamboat (near Steamboat diversion, Farad)	39.448299	-120.006926	USFWS		N	SpC	Fish	Bi-Annually	
65	Truckee River at Farad, CA 10346000	39.42796385	-120.034087	USGS						
66	Truckee River at Farad, CA	39.42796385	-120.032698	DRI		Y	DO			
				DRI	G		TPO4, OPO4, NO2, NH4, TDS, TSS, TKN, Color, TU, pH, EC, HCO3, CO3, Cl, SO4, Na, K, Ca, Mg, Si, NO3		Monthly	DRI laboratory
67	Truckee River at Farad, CA	39.424299	-120.03529	USFWS		N	SpC	Fish	Bi-Annually	
68	Truckee River below Hirschdale	39.370594	-120.035296	USFWS	G	N	SpC	Fish	Bi-Annually	
69	Truckee River above Juniper Creek	39.36517	-120.07421	DRI		Y	DO			
				DRI	G		TPO4, OPO4, NO2, NH4, TDS, TSS, TKN, Color, TU, pH, EC, HCO3, CO3, Cl, SO4, Na, K, Ca, Mg, Si, NO3		Monthly	DRI laboratory
70	Truckee River at Hirschdale	39.384781	-120.083176	USFWS	G	N	SpC	Fish	Bi-Annually	
71	Truckee River at Boca Bridge near Truckee, CA 10344505	39.38518517	-120.087698	USGS						
72	Truckee River above Prosser Creek	39.359953	-120.112559	USFWS	G	N	SpC	Fish	Bi-Annually	
73	Truckee River below Martis Creek	39.3531	-120.12189	DRI		Y	DO			
73	Truckee River below Martis Creek			DRI	G		TPO4, OPO4, NO2, NH4, TDS, TSS, TKN, Color, TU, pH, EC, HCO3, CO3, Cl, SO4, Na, K, Ca, Mg, Si, NO3		Monthly	DRI laboratory
74	Sewage Plant (near Truckee Sanitation Plant)	39.351862	-120.117883	USFWS	G	N	SpC	Fish	Bi-Annually	
75	Truckee River above Martis Creek	39.34847	-120.11912	DRI		Y	DO			
				DRI	G		TPO4, OPO4, NO2, NH4, TDS, TSS, TKN, Color, TU, pH, EC, HCO3, CO3, Cl, SO4, Na, K, Ca, Mg, Si, NO3		Monthly	DRI laboratory
76	Truckee River at Truckee Falls	39.332842	-120.159479	USFWS		N	SpC	Fish	Bi-Annually	
77	Truckee River above Donner Creek	39.31601744	-120.201031	DRI		Y	DO			
				DRI	G		TPO4, OPO4, NO2, NH4, TDS, TSS, TKN, Color, TU, pH, EC, HCO3, CO3, Cl, SO4, Na, K, Ca, Mg, Si, NO3		Monthly	DRI laboratory
78	Truckee River near Truckee, CA 10338000	39.2962952	-120.205475	USGS						
79	Truckee River upstream of Truckee, CA	39.278382	-120.206178	USFWS	G	N	SpC	Fish	Bi-Annually	
80	Truckee River at Tahoe City	39.162868	-120.165257	USFWS		N	SpC	Fish	Bi-Annually	
81	Truckee River at Tahoe City 10337500	39.16629577	-120.144359	USGS						
82	Truckee River at Tahoe City	39.16629577	-120.144359	DRI		Y	T			
				DRI	G		TPO4, OPO4, NO2, NH4, TDS, TSS, TKN, Color, TU, pH, EC, HCO3, CO3, Cl, SO4, Na, K, Ca, Mg, Si, NO3		Monthly	DRI laboratory

PYRAMID LAKE

-3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59

446 447 80 341

Wadsworth

Sparks

DERBY DAM

VISTA GAGE

NDEP
USGS
WCDWR

NDEP
USGS

NDEP
USGS
WCDWR

PYRAMID HWY
ORR
NORTH TRUCKEE DRAIN
N MC CARRAN BLVD
GLENDALE
GLENDALE WTP
PIONEER
PIONEER
PIONEER
SPICE ISLAND
EASTN
PERRY
S MC CARRAN BLVD
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WHITES CREEK
WHITES CREEK
STEAMBOAT

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Monitoring Locations on the Truckee River and Tributaries Downstream of Vista

Current Monitoring Locations

0 1 2 4 6 8 Miles

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Monitoring Locations on the Truckee River and Tributaries Upstream of Vista

Current Monitoring Locations

0 1 2 4 6 8 Miles

Current Monitoring Locations

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USGS
UNR
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DRI
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USFWS
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Ditches
Streams
1 mi MARKER

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H:/aragon/work/Buzzone/2010/Monitoring Well Sites/monitor sites upstream.mxd

Appendix B

MOU Group Sampling and Analysis Plans and
Quality Assurance Project Plans

Appendix C

MOU Group and Associated Laboratories Analytical Procedures

	Agency/Entity											
Questions/comments/considerationsreporting limits? Detection limits? Units? How is ND or < or > handled for statistics? Qualifier flags -	TMWRF (Reno / Sparks / Washoe County)	TNC	NDEP	NDOW	USFWS	PLPT	TMWA	UNR	DRI	LRWQB	Placer County	TOT
Constituents	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP	Insert Links to SAP/QAP
CONVENTIONAL POLLUTANTS OR PROPERTIES												
Alkalinity	SM 2320 B 20th ED		SM 2320 B 19TH ED				SM 2320 B 18th, 19th & 20th	SM 2320 (1998) USGS Alkalinity calculator (http://or.water/usgs.gov/alk/)	USGS I 1030-85; SM 2320 B 19th Ed.		SM 4500 NH3 D	SM 4500 NH3 D
Bicarbonate as HCO3			SM 2320 B									
Carbonate as CO3			SM 2320 B									
Chemical Oxygen Demand (COD)											SM 5220C	SM 5220C
Color			SM 2120 C 19TH ED									
Electrical Conductivity (EC)	SM 2510B		SM 2510 19TH ED			SBE 19plus SEACAT Profiler User's Manual	SM 2510B 18th, 19th & 20th	YSI 85-10 Dissolved Oxygen & Conductivity meter, Model 85/10 FT	SM 2510 B 19th Ed.		SM 2510B	SM 2510B
Hardness	By Titration		EPA 200.7				SM 2340 C					
Total Dissolved Solids (TDS)	SM 2540 C 20th ED		SM 2540 C 19TH ED				SM 2540 C 18th, 19th 20th		SM 2540 C; 19th Ed.			
Total Suspended Solids (TSS)			EPA 160.2				SM 2540D 18th, 19th & 20th		EPA 160.2		SM 2540 D	SM 2540 D
Turbidity			EPA 180.1			SBE 19plus SEACAT Profiler User's Manual	EPA 180.1; SM 2130B 18th, 19th & 20th		SM 2130B 19th Ed.		EPA 180.1	EPA 180.1
Dissolved Oxygen (DO)	Internal Method - YSI Sonde		YSI 55A Dissolved Oxygen/Temperature Meter			SBE 19plus SEACAT Profiler User's Manual		YSI 85-10 Dissolved Oxygen & Conductivity meter, Model 85/10 FT				
pH	Internal Method - YSI Sonde; SM 2550B		SM 4500 H B			SBE 19plus SEACAT Profiler User's Manual	SM 4500-H+ B 18th, 19th & 20th	Oakton® pH/mV/Temperature	SM 4500 H+ B; 19th Ed.		SM 4500 H+ B	SM 4500 H+ B
Temperature	Internal Method - YSI Sonde		YSI 55A Dissolved Oxygen/Temperature Meter		Hach temperature probe	SBE 19plus SEACAT Profiler User's Manual		YSI 85-10 Dissolved Oxygen & Conductivity meter, Model 85/10 FT				
Specific Conductance	Internal Method - YSI Sonde				Hach HQ Portable Conuctivity meter User Manual							
NUTRIENTS												
Nutrients Dissolved Inorganic Nitrogen (DIN)						Dissolved Inorganic Nitrogen (DIN): DIN = Total Ammonia + Nitrate + Nitrite						
Total Kjeldahl Nitrogen (TKN)	EPA 351.2		SM 4500 N B, NH3 D			4500-Norg C 19th ED			EPA 351.2			
Total Nitrogen (TN)	Total nitrogen(TN) = Total Kheldahl Nitrogen + Nitrate + Nitrite		Calculated from TKN and NO2+NO3 N			Total Nitrogen (TN): TN = Total Kjeldahl Nitrogen + Nitrate + Nitrite		SM 4500-Norg D. (1998)				
Nitrite NO_2^-			SM 4500 NO2 B 19TH ED			4500-NO3- E SM 19th ED			SM 4500-NO3 F; 19th Ed.			
Nitrate NO_3^-	SM 4500-NO3 I, 20th ED SM 4500-NH3 H, 20th ED		EPA 300.0			4500-NO3- E SM 19th ED			SM 4500-NO3 F; 19th Ed.			
Ammonium NH_4^+			SM 4500 NH3 F 19TH ED			4500-NH3 F 19th ED			SM 4500-NH3 H; 19th Ed.			
Nitrate+Nitrite as N			EPA 300.0									
Dissolved Organic Carbon (DOC)	SM 5310 C							Shimadzu Total Organic Carbon analyzer (Model TOC-5050A), as described in Deflandre and Gagne (2001)				
Total Organic Carbon (TOC)	SM 5310 C, 20th ED						SM 5310 B 18th, 19th & 20th					
Total Phosphorus (TP)	SM 4500-P B E, 20th ED		SM 4500 P E 19TH ED			EPA 365.3		SM 4500-P-E	SM 4500-P B F 19th Ed.			
Orthophosphorus (OP or OPO4)	SM 4500 P E		SM 4500 P E 19TH ED			EPA 365.3			SM 4500-P F, 19th Ed.; USGS I-4600-85			
MAJOR IONS												
Major Ions Manganese			EPA 200.7								EPA 200.7	EPA 200.7
Calcium			EPA 200.7				SM 3500 Ca D		SM 3111B 19th ed.			
Chloride			EPA 300.0						EPA 300.0			
Fluoride			EPA 300.0									
Magnesium			EPA 200.7				SM 3111 B Mg		SM 3111B 19th Ed.			
Potassium							SM 3111 B K		SM 3111B; 19th Ed.			
Silica									EPA 370.1			
Sodium			EPA 200.7				SM 3111 B Na		SM 3111B; 19th Ed.			
Sulfate			EPA 300.0					SM 4500-SO_4^{2-}-Sulfate-E (1998)	EPA 300.0			
Anions by ion chromatography							EPA 300.0					

Questions/comments/considerationsreporting limits? Detection limits? Units? How is ND or < or > handled for statistics? Qualifier flags -	TMWRF (Reno / Sparks / Washoe County)	TNC	NDEP	NDOW	USFWS	PLPT	TMWA	UNR	DRI	LRWQB	Placer County	TOT
METALS AND TRACE METALS												
Antimony			EPA 200.8									
Arsenic			EPA 200.8				EPA 200.8 As				EPA 200.8	EPA 200.8
Barium			EPA 200.7									
Beryllium			EPA 200.8									
Boron			EPA 200.7									
Cadmium			EPA 200.8								EPA 200.7	EPA 200.7
Chromium			EPA 200.8									
Copper			EPA 200.8									
Iron			EPA 200.7				SM 3111 B Fe					
Lead			EPA 200.8								EPA 200.8	EPA 200.8
Lead and Copper (ICP-MS)							EPA 200.8 PbCu					
Mercury			EPA 245.2				EPA 200.8 Hg				EPA 200.8	EPA 200.8
Total Hg analysis								US EPA Method 1631 (2002)				
Total Hg in solid samples								a Milestone Direct Mercury Analyzer (DMA) to EPA Method 7473 (USEPA);				
Molybdenum			EPA 200.8									
Nickel			EPA 200.8									
Selenium			EPA 200.8								EPA 200.8	EPA 200.8
Silver			EPA 200.8								EPA 200.7	EPA 200.7
Thallium			EPA 200.8									
Zinc			EPA 200.8									
Arsenic, Iron and Manganese (ICP-MS)							EPA 200.8 AsFeMn					
MeHg analysis								US EPA Method 1630 (2001)				

Metals and Trace Metals

BACTERIOLOGIC												
Total Coliform			SM 9223 B				SM 9223 B					
E Coli			SM 9223 B									
Fecal Coliform			SM 9222 D				SM 9222 D					
Cryptosporidium/Giardia							EPA 1623					

Bacteriologic

BIOLOGIC												
Benthic macro invertebrate Sampling	Internal Method - widely accepted											
Bird Surveys		TBD										
Vegetation Surveys		TBD										
Zooplankton						SOP: Zooplankton Analysis						

Biologic

OTHER MISCELLANEOUS												
EPA Method 200.8 Metals (ICP-MS)							EPA 200.8					
Haloacetic Acids							EPA 552.2					
Hydroxide	SM 2340C		SM 2320 B									
Oil & Grease											EPA 1664	EPA 1664
Residual Chlorine (DPD colorimetric)							SM 4500 Cl D					
Total Cyanide											SM 4500 CNC	SM 4500 CNC
Volatile Organic Compounds, Trihalomethanes							EPA 524.2					

Other Misc.

Appendix D

Field Protocol Summary Table

Summary of Field Protocols Survey **Truckee River CMP**

For definitions of the parameters in pull downs see parameters and definitions page that follows.

Agency	Sampling Station	Type	River Position	Water Column Position	Sample Type	Field Parameters	Flow Measurement	Flow Frequency	Biological	Geomorphology	Comments (Explain 'Other')
DRI	Truckee R. @ Tahoe City	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
DRI	Truckee R. @ Tahoe City	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Also temperature
DRI	Truckee R. above Donner Creek	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
DRI	Truckee R. above Donner Creek	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Also temperature
DRI	Truckee R. above Martis Creek	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
DRI	Truckee R. above Martis Creek	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Also temperature
DRI	TruckeeR.belowMartisCreek	Open Water	Right Bank	Surface	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
DRI	TruckeeR.belowMartisCreek	Open Water	Right Bank	Surface	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Also temperature
DRI	Truckee R. Above Juniper Creek	Open Water	Right Bank	Surface	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
DRI	Truckee R. Above Juniper Creek	Open Water	Right Bank	Surface	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Also temperature
DRI	Truckee R. @ Farad, CA	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
DRI	Truckee R. @ Farad, CA	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Also temperature
DRI	Truckee R. @ Patagonia	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
DRI	Truckee R. @ Patagonia	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Also temperature
DRI	Truckee R. @ Idlewild Park, Nevada	Open Water	Right Bank	Surface	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
DRI	Truckee R. @ Idlewild Park, Nevada	Open Water	Right Bank	Surface	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Also temperature
DRI	Truckee R. @ Vista, NV	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
DRI	Truckee R. @ Vista, NV	Open Water	Left Bank	Surface	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Also temperature
NDEP	Steamboat Creek @ Cleanwater Way	Open Water	Center	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Steamboat Creek @ Cleanwater Way	Open Water	Center	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Steamboat Creek @ Cleanwater Way	Open Water	Center	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Steamboat Creek @ Rhodes Road	Open Water	Left Bank	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Steamboat Creek @ Rhodes Road	Open Water	Left Bank	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Steamboat Creek @ Rhodes Road	Open Water	Left Bank	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Thomas Creek near Alexander Pond	Open Water	Center	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Thomas Creek near Alexander Pond	Open Water	Center	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Thomas Creek near Alexander Pond	Open Water	Center	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Steamboat Creek @ Geiger Grade	Open Water	Right Bank	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Steamboat Creek @ Geiger Grade	Open Water	Right Bank	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Steamboat Creek @ Geiger Grade	Open Water	Right Bank	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Whites Creek @ Sage Hill Road	Open Water	Center	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Whites Creek @ Sage Hill Road	Open Water	Center	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Whites Creek @ Sage Hill Road	Open Water	Center	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Steamboat Creek @ Short Lane	Open Water	Center	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Steamboat Creek @ Short Lane	Open Water	Center	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Steamboat Creek @ Short Lane	Open Water	Center	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Steamboat Creek @ Pembroke	Open Water	Center	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Steamboat Creek @ Pembroke	Open Water	Center	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Steamboat Creek @ Pembroke	Open Water	Center	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Whites Creek @ Arrow Creek Parkway	Open Water	Center	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Whites Creek @ Arrow Creek Parkway	Open Water	Center	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Whites Creek @ Arrow Creek Parkway	Open Water	Center	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Browns Creek @ Joy Lake Road	Open Water	Center	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Browns Creek @ Joy Lake Road	Open Water	Center	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Browns Creek @ Joy Lake Road	Open Water	Center	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Thomas Creek @ Ventana Parkway	Open Water	Center	Surface	Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	**Field Parameters** = pH, Temperature and D.O.
NDEP	Thomas Creek @ Ventana Parkway	Open Water	Center	Surface	Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDEP	Thomas Creek @ Ventana Parkway	Open Water	Center	Surface	Grab	Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
NDOW	Painted Rock	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
NDOW	Derby Dam	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
NDOW	Eagle Picher	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
NDOW	Rock Park 1	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
NDOW	Rock Park 2	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
NDOW	Wingfield - South Channel	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
NDOW	Patagonia	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
NDOW	Washoe-Highland Dam	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
NDOW	Crystal Peak Park	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
NDOW	Verdi Power Dam	Biological	Longitudinal Composite	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Biological Survey for Fish Population utilizing NDOW Methodology
PLCO	Squaw Creek	Sediment	Longitudinal Composite	Bottom	Other:	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Other:	TRWQMP Rapid Assessments. Physical measurements of channel substrate and sediment distribution
PLCO	Squaw Creek	Biological	Cross Section Composite	Bottom	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Benthic Macroinvertebrates -	Habitat Assessment	
PLCO	Squaw Creek	Open Water				Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLCO	Bear Creek	Sediment	Longitudinal Composite	Bottom	Other:	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Other:	TRWQMP Rapid Assessments. Physical measurements of channel substrate and sediment distribution
PLCO	Martis Creek	Biological	Cross Section Composite	Bottom	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Benthic Macroinvertebrates -	Habitat Assessment	
PLCO	Martis Creek	Open Water				Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLCO	Martis Creek	Sediment	Longitudinal Composite	Bottom	Other:	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Other:	TRWQMP Rapid Assessments. Physical measurements of channel substrate and sediment distribution
PLCO	Martis Creek	Open Water	Cross Section Composite	Center	Active Flow Grab	Flow: Open Channel	Gauge	Instantaneous	Not Applicable	TSS	
PLCO	Martis Creek	Outfall	Not Applicable	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Not Applicable	TSS	
PLCO	East Martis Creek	Sediment	Longitudinal Composite	Bottom	Other:	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Other:	TRWQMP Rapid Assessments. Physical measurements of channel substrate and sediment distribution
PLCO	East Martis Creek	Biological	Cross Section Composite	Bottom	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Benthic Macroinvertebrates -	Habitat Assessment	
PLCO	East Martis Creek	Open Water				Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLCO	East Martis Creek	Open Water	Cross Section Composite	Center	Active Flow Grab	Flow: Open Channel	Gauge	Instantaneous	Not Applicable	TSS	
PLCO	West Martis Creek	Sediment	Longitudinal Composite	Bottom	Other:	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Other:	TRWQMP Rapid Assessments. Physical measurements of channel substrate and sediment distribution
PLCO	West Martis Creek	Biological	Cross Section Composite	Bottom	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Benthic Macroinvertebrates -	Habitat Assessment	
PLCO	West Martis Creek	Open Water				Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLCO	West Martis Creek	Open Water	Cross Section Composite	Center	Active Flow Grab	Flow: Open Channel	Gauge	Instantaneous	Not Applicable	TSS	
PLCO	West Martis Creek	Outfall	Not Applicable	Not Applicable	Grab	Not Applicable	Not Applicable	Not Applicable	Not Applicable	TSS	
PLCO	Martis Creek East Branch	Biological	Cross Section Composite	Bottom	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Benthic Macroinvertebrates -	Habitat Assessment	
PLCO	Martis Creek East Branch	Open Water				Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Pierson Dam	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Pierson Dam	Open Water	Right Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data

Summary of Field Protocols Survey **Truckee River CMP**

For definitions of the parameters in pull downs see parameters and definitions page that follows.

Agency	Sampling Station	Type	River Position	Water Column Position	Sample Type	Field Parameters	Flow Measurement	Flow Frequency	Biological	Geomorphology	Comments (Explain 'Other')
PLPT	Pierson Dam	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Pierson Dam	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Pierson Dam	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Wadsworth Bridge	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Wadsworth Bridge	Open Water	Left Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Wadsworth Bridge	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Wadsworth Bridge	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Wadsworth Bridge	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Dead Ox	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Dead Ox	Open Water	Left Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Dead Ox	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Dead Ox	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Dead Ox	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Nixon Bridge	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Nixon Bridge	Open Water	Right Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Nixon Bridge	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Nixon Bridge	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Nixon Bridge	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Marble Bluff Dam	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Marble Bluff Dam	Open Water	Left Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Marble Bluff Dam	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Marble Bluff Dam	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Marble Bluff Dam	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Paiute Pit Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Paiute Pit Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Paiute Pit Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Paiute Pit Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Paiute Pit Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - Turbidity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Numana Wetland Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Numana Wetland Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Numana Wetland Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Numana Wetland Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Numana Wetland Outlet	Open Water	Center	Center	Active Flow Grab	SONDE - Turbidity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Tile Drain Outlet	Open Water	Flow Lane	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Tile Drain Outlet	Open Water	Flow Lane	Center	Active Flow Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Tile Drain Outlet	Open Water	Flow Lane	Center	Active Flow Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Tile Drain Outlet	Open Water	Flow Lane	Center	Active Flow Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Tile Drain Outlet	Open Water	Flow Lane	Center	Active Flow Grab	SONDE - Turbidity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
PLPT	Interstate 80	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Interstate 80	Open Water	Right Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Interstate 80	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Interstate 80	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Interstate 80	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Interstate 80	Biological							Benthic Macroinvertebrates -	Habitat Assessment	USGS Gaging Station Data
PLPT	Big Bend	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Big Bend	Open Water	Right Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Big Bend	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Big Bend	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Big Bend	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Big Bend	Biological							Benthic Macroinvertebrates -	Habitat Assessment	
PLPT	Fellnagle	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Fellnagle	Open Water	Right Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Fellnagle	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Fellnagle	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Fellnagle	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Fellnagle	Biological							Benthic Macroinvertebrates -	Habitat Assessment	
PLPT	S Bar S Ranch	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	S Bar S Ranch	Open Water	Right Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	S Bar S Ranch	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	S Bar S Ranch	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	S Bar S Ranch	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	S Bar S Ranch	Biological							Benthic Macroinvertebrates -	Habitat Assessment	
PLPT	Canyon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Canyon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Canyon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Canyon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Canyon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Canyon	Biological							Benthic Macroinvertebrates -	Habitat Assessment	
PLPT	Upper Nixon	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Upper Nixon	Open Water	Right Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Upper Nixon	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Upper Nixon	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Upper Nixon	Open Water	Right Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Upper Nixon	Biological							Benthic Macroinvertebrates -	Habitat Assessment	
PLPT	Lower Nixon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Dissolved Oxygen	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Lower Nixon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - pH	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Lower Nixon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Specific Conductivity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Lower Nixon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Temperature	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Lower Nixon	Open Water	Left Bank	Center	Active Flow Grab	SONDE - Turbidity	Other:	Daily	Not Applicable	Not Applicable	USGS Gaging Station Data
PLPT	Lower Nixon	Biological							Benthic Macroinvertebrates -	Habitat Assessment	

Summary of Field Protocols Survey **Truckee River CMP**

For definitions of the parameters in pull downs see parameters and definitions page that follows.

Agency	Sampling Station	Type	River Position	Water Column Position	Sample Type	Field Parameters	Flow Measurement	Flow Frequency	Biological	Geomorphology	Comments (Explain 'Other')	
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Sample collected every 3 hours by plant operator
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Sample collected every 3 hours by plant operator
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Turbidity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Sample collected every 3 hours by plant operator
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Represents TOC sample taken monthly
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Represents Alkalinity sample taken monthly
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	pH	Not Applicable	Not Applicable	Presence/Absence	Not Applicable	Sample taken from intake to plant from diversion channel	Represent
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Temperature	Not Applicable	Not Applicable	Presence/Absence	Not Applicable	Sample taken from intake to plant from diversion channel	s Total
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Turbidity	Not Applicable	Not Applicable	Presence/Absence	Not Applicable	Sample taken from intake to plant from diversion channel	and Fecal
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	pH	Not Applicable	Not Applicable	Protozoa	Not Applicable	Sample taken from intake to plant from diversion channel	Represent
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Temperature	Not Applicable	Not Applicable	Protozoa	Not Applicable	Sample taken from intake to plant from diversion channel	s Crypto
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Turbidity	Not Applicable	Not Applicable	Protozoa	Not Applicable	Sample taken from intake to plant from diversion channel	and
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Not Applicable	Not Applicable	Not Applicable	Not Applicable	TSS	Sample taken from intake to plant from diversion channel	TSS sample taken at different intervals
TMWA	Chalk Bluff Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	TDS sample taken at different intervals
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Sample collected every 3 hours by plant operator
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Sample collected every 3 hours by plant operator
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Turbidity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Sample collected every 3 hours by plant operator
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Represents TOC sample taken monthly
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	Represents Alkalinity sample taken monthly
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	pH	Not Applicable	Not Applicable	Presence/Absence	Not Applicable	Sample taken from intake to plant from diversion channel	Represent
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Temperature	Not Applicable	Not Applicable	Presence/Absence	Not Applicable	Sample taken from intake to plant from diversion channel	s Total
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Turbidity	Not Applicable	Not Applicable	Presence/Absence	Not Applicable	Sample taken from intake to plant from diversion channel	and Fecal
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	pH	Not Applicable	Not Applicable	Protozoa	Not Applicable	Sample taken from intake to plant from diversion channel	Represent
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Temperature	Not Applicable	Not Applicable	Protozoa	Not Applicable	Sample taken from intake to plant from diversion channel	s Crypto
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Turbidity	Not Applicable	Not Applicable	Protozoa	Not Applicable	Sample taken from intake to plant from diversion channel	and
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	TSS	Sample taken from intake to plant from diversion channel	TSS sample taken at different intervals
TMWA	Glendale Water Treatment Plant Intake	Not Applicable	Flow Lane	Center	Active Flow Grab	Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Sample taken from intake to plant from diversion channel	TDS sample taken at different intervals
TMWRF	North Truckee Drain	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	North Truckee Drain	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	North Truckee Drain	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	North Truckee Drain	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Steamboat Creek	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Steamboat Creek	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Steamboat Creek	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Steamboat Creek	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Wadsworth	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Wadsworth	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Wadsworth	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Wadsworth	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Dead Ox	Biological	Other:	Bottom	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Hess sampler and TMWRF SOP	
TMWRF	Nixon	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Nixon	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Nixon	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Nixon	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Marble Bluff Dam	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	YSI sonde installed at Dam on visitor center side; sampling hourly	
TMWRF	Marble Bluff Dam	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Marble Bluff Dam	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Marble Bluff Dam	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Painted Rock	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Painted Rock	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Painted Rock	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Painted Rock	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Derby Dam	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Derby Dam	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Derby Dam	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Derby Dam	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	McCarran	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	McCarran	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	McCarran	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	McCarran	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	McCarran	Biological	Other:	Bottom	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Hess sampler and TMWRF SOP	
TMWRF	Lockwood	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Lockwood	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Lockwood	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Lockwood	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Lockwood	Open Water	Other:	Bottom	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Hess sampler and TMWRF SOP	
TMWRF	Clark	Open Water	Other:	Bottom	Grab	Not Applicable	Not Applicable	Not Applicable	Other:	Not Applicable	Hess sampler and TMWRF SOP	
TMWRF	Tracy	Open Water	Center	Column Composi	Grab	SONDE - Dissolved Oxygen	Not Applicable	Not Applicable	Not Applicable	Not Applicable	YSI sonde installed mid river; sampling hourly	
TMWRF	Tracy	Open Water	Center	Column Composi	Grab	SONDE - pH	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Tracy	Open Water	Center	Column Composi	Grab	SONDE - Specific Conductivity	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Tracy	Open Water	Center	Column Composi	Grab	SONDE - Temperature	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Upstream of TMWRF	Open Water	Center	Bottom	Grab	Temp	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TMWRF	Downstream of TMWRF Mixing Zone	Open Water	Center	Bottom	Grab	Temp	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TOT	Airport Business Park	Outfall	Not Applicable	Surface	Runoff	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TOT	Brickelltown Outfall	Outfall	Not Applicable	Surface	Runoff	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TOT	Trout Creek Outfall	Outfall	Not Applicable	Surface	Runoff	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable		
TOT	Truckee River Rapid Assessement	Sediment	Longitudinal Composite	Bottom	Not Applicable	Other:	Not Applicable	Not Applicable	Not Applicable	Other:	TRWQMP Rapid Assessments. Physical measurements of channel substrate and sediment distribution	
TOT	Trout Creek Rapid Assessment	Sediment	Longitudinal composite	Bottom	Not Applicable	Other:	Not Applicable	Not Applicable	Not Applicable	Other:	TRWQMP Rapid Assessments. Physical measurements of channel substrate and sediment distribution	
TOT	Donner Creek Rapid Assessment	Sediment	Longitudinal composite	Bottom	Not Applicable	Other:	Not Applicable	Not Applicable	Not Applicable	Other:	TRWQMP Rapid Assessments. Physical measurements of channel substrate and sediment distribution	
UNR	Alum Creek at Chrissie Caughlin Park	Open Water	Cross Section Composite	Center	Other:	Flow: Open Channel	Marsh McBirney	Instantaneous	Not Applicable	Not Applicable	biweekly sampling	
UNR	Alum Creek at Chrissie Caughlin Park	Open Water	Center	Center	Active Flow Grab	Other:	Not Applicable	Instantaneous	Other:	Not Applicable	biweekly sampling - E.coli collection	

Summary of Field Protocols Survey **Truckee River CMP**

For definitions of the parameters in pull downs see parameters and definitions page that follows.

Agency	Sampling Station	Type	River Position	Water Column Position	Sample Type	Field Parameters	Flow Measurement	Flow Frequency	Biological	Geomorphology	Comments (Explain 'Other')
UNR	Alum Creek at Chrissie Caughlin Park	Open Water	Center	Bottom	Other:	SONDE - Dissolved Oxygen	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at Chrissie Caughlin Park	Open Water	Center	Bottom	Other:	SONDE - pH	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at Chrissie Caughlin Park	Open Water	Center	Bottom	Other:	SONDE - Specific Conductivity	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at Chrissie Caughlin Park	Open Water	Center	Bottom	Other:	SONDE - Temperature	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at W McCarran Blvd	Open Water	Cross Section Composite	Center	Other:	Flow: Open Channel	Marsh McBirney	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at W McCarran Blvd	Open Water	Center	Center	Active Flow Grab	Other:	Not Applicable	Instantaneous	Other:	Not Applicable	biweekly sampling - E.coli collection
UNR	Alum Creek at W McCarran Blvd	Open Water	Center	Bottom	Other:	SONDE - Dissolved Oxygen	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at W McCarran Blvd	Open Water	Center	Bottom	Other:	SONDE - pH	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at W McCarran Blvd	Open Water	Center	Bottom	Other:	SONDE - Specific Conductivity	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at W McCarran Blvd	Open Water	Center	Bottom	Other:	SONDE - Temperature	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at piezometers	Open Water	Cross Section Composite	Center	Other:	Flow: Open Channel	Marsh McBirney	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at piezometers	Open Water	Center	Center	Active Flow Grab	Other:	Not Applicable	Instantaneous	Other:	Not Applicable	biweekly sampling - E.coli collection
UNR	Alum Creek at piezometers	Open Water	Center	Bottom	Other:	SONDE - Dissolved Oxygen	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at piezometers	Open Water	Center	Bottom	Other:	SONDE - pH	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at piezometers	Open Water	Center	Bottom	Other:	SONDE - Specific Conductivity	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at piezometers	Open Water	Center	Bottom	Other:	SONDE - Temperature	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at piezometers	Open Water	Other:	Other:	Other:	Other:	Other:	Other:	Not Applicable	Not Applicable	biweekly sampling; water depth to shallow groundwater using a depth sounder
UNR	Alum Creek at Alum Spring	Open Water	Cross Section Composite	Center	Other:	Flow: Open Channel	Marsh McBirney	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at Alum Spring	Open Water	Center	Center	Active Flow Grab	Other:	Not Applicable	Instantaneous	Other:	Not Applicable	biweekly sampling - E.coli collection
UNR	Alum Creek at Alum Spring	Open Water	Center	Bottom	Other:	SONDE - Dissolved Oxygen	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at Alum Spring	Open Water	Center	Bottom	Other:	SONDE - pH	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at Alum Spring	Open Water	Center	Bottom	Other:	SONDE - Specific Conductivity	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
UNR	Alum Creek at Alum Spring	Open Water	Center	Bottom	Other:	SONDE - Temperature	Not Applicable	Instantaneous	Not Applicable	Not Applicable	biweekly sampling
USFWS	Below Hirschdale	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Below Hirschdale	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Cabin Creek Rd	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Cabin Creek Rd	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Crystal Peak Park	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Crystal Peak Park	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Derby Dam	Open Water	Left Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Derby Dam	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Farad	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Farad	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Fishermans Park	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Fishermans Park	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Fleish Power Plant	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Fleish Power Plant	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Fly Casters	Open Water	Left Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Fly Casters	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Hirschdale	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Hirschdale	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Lower McCarran	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Lower McCarran	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Marble Bluff	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Marble Bluff	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Mustang	Open Water	Left Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Mustang	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Nixon	Open Water	Left Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Nixon	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Numana	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Numana	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Painted Rock	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Painted Rock	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Patagonia	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Patagonia	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Sewage Plant	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Sewage Plant	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Spice Island	Open Water	Left Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Spice Island	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Squaw Creek	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Squaw Creek	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Steamboat	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Steamboat	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Tahoe City	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Tahoe City	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Truckee Falls	Open Water	Left Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Truckee Falls	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Upper McCarran	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Upper McCarran	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	USA Parkway	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	USA Parkway	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Wadsworth 80	Open Water	Right Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Wadsworth 80	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.
USFWS	Wingfield	Open Water	Left Bank	Bottom	Composite Time-Based Hou	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
USFWS	Wingfield	Biological	Other:	Not Applicable	Not Applicable	Specific Conductivity	Not Applicable	Not Applicable	Fish - USF&WS	Not Applicable	500 m transcects for fish population metrics. Conductivity measured at start of reach.

Summary of Truckee River Field Protocols

Matrix_Type	Definition
Open Water	*Sample collected from any open surface water (river, lake, etc.)*
Hyporheic	*Sample collected from area of exchange between surface water and groundwater, or subsurface flow*
Interstitial	*Sample collected from pore water in sediment/sand/gravel*
Weir	*Sample collected from a weir discharge*
Flume	*Sample collected from a flume discharge*
Spring	*Sample collected from a spring*
Seep	*Sample collected from a small seep*
Outfall	*Sample collected from a wastewater or stormwater outfall*
Groundwater: GWISW Interface	*Groundwater sample collected where it flows to surface water*
Groundwater: Lysimeters	*Soil moisture collected from a lysimeter*
Groundwater: Piezometers	*Sample from well designed to monitor water level*
Groundwater: Well	*Sample from water or monitoring well*
Precipitation	*Rain, snow, or hail sample*
Sediment	*Sediment from water body (can include sand and gravel)*
Biological	*Biological monitoring*
Not Applicable	
Other:	

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River_Position	Definition
Right Bank	*Sample collected from river right (facing downstream)*
Center	*Sample collected from center of river*
Left Bank	*Sample collected from river left (facing downstream)*
Flow Lane	*Sample collected from area of river where flow is higher/highest*
Cross Section Composite	*Sample is a composite obtained by collecting multiple samples in a line perpendicular to flow*
Longitudinal Composite	*Sample is a composite obtained by collecting multiple samples in a line parallel to flow*
Not Applicable	
Other:	

Column_Position	Definition
Surface	*Sample atnear surface*
Center	*Sample atnear center of water column*
Bottom	*Sample atnear bottom*
Column Composite	*Sample is composite of samples from multiple depths at same location*
Not Applicable	
Other:	

Collection_Type	Definition
Grab	*Sample is taken directly over a very short period of time.*
Active Flow Grab	*Sample is taken directly over a very short period of time from an active flow lane*
Composite Time-Based Hourly	*Sample is a composite over time, one sample per hour*
Composite Time-Based Daily	*Sample is a composite over time, one sample per day*
Composite Time-Based Monthly	*Sample is a composite over time, one sample per month*
Composite Flow-Based	*Sample is a composite based on the amount of flow at the time the subsample is collected, or sample is collected when a certain volume of flow has occurred*
Composite Stormwater	*Special sampling protocol designed to collect first flush, plus subsequent time or flow based composite*
Runoff	*Sample is runoff from a source (e.g., stormwater, or street flushing)*
Event	*Sample coincides with some event (e.g flood stage or spring freshen)*
Not Applicable	
Other:	

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Field_Parameters	Definition
Alkalinity	*Alkalinity*
Dissolved Oxygen	*Direct pH measurement; typically reported in units*
pH	*A measurement of water clarity, based on ability to see a disk with white on black; reported in feet*
Secci depth	*Dissolved oxygen using SONDE combined probe*
SONDE - Dissolved Oxygen	*pH using SONDE combined probe*
SONDE - pH	*Specific conductivity using SONDE combined probe*
SONDE - Specific Conductivity	*Temperature using SONDE combined probe*
SONDE - Temperature	*Turbidityusing SONDE combined probe*
SONDE - Turbidity	*Direct conductivity measurement (note if temperature corrected to Specific Conductance) micromhos/centimeter or microSeimens/centimeter*
Specific Conductivity	*Temperature (note units)*
Temperature	*A measurement of light scatter from particles in water, reported in nephalometric turbidity units*
Turbidity	*Flow measurement using a flume with geometry that produces laminar flow with flow proportional to height in flume*
Flow: Flume	*Flow in a full pipe, where flow is dependent on pressure and size of the pipe*
Flow: Full Pipe	*Flow measured in open channel, often an estimate made using Manning's Equation*
Flow: Open Channel	*Flow in a partially filled pipe, similar to open channel*
Flow: Partial Pipe	*Flow measurement using a weir (note types V, sharp crested, combination, etc) where flow is proportional to height overthrough the weir.*
Flow: Weir	
Not Applicable	
Other:	

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Flow_Measurement	Definition
Gauge	*Stage measured from fixed staff gauge*
Doppler	*Device uses radio waves to measure velocity and height of water*
Price Meter	
Pressure Transducer	*Device measures pressure, and therefore water level*
Marsh McBirney	*Flodar, FlowMate, or FlowTot*
Sonic	*Sonic device that measures velocity either from the surface or through the water column*
Time of Travel	Floating marker is used to
Tracer	*Flow measured by timing tracer travel over a known distance*
Dilution	*Flow based on measuring concentrations upstream and downstream where flows mix*
Not Applicable	
Other:	

Flow_Frequency	Definition
Instantaneous	*One time measurement*
Minute	*Recorded every minute*
Hourly	*Recorded every hour*
Daily	*Recorded once per day*
Monthly	*Recorded monthly*
Not Applicable	
Other:	

Biological	Definition
Benthic Macroinvertebrates - EPA	*Survey of benthic macroinvertebrates using EPA method*
Benthic Macroinvertebrates - DRI	*Survey of benthic macroinvertebrates using EPA method*
Benthic Macroinvertebrates - USGS	*Survey of benthic macroinvertebrates using USGS method*
Benthic Macroinvertebrates - Pyramid Lake	*Survey of benthic macroinvertebrates using PLPT method*
Benthic Macroinvertebrates Natural Conditions	*Survey of benthic macroinvertebrates that uses ratios of taxa to assess natural conditions vs. disturbed ecosystem*
Benthic Macroinvertebrates - Draft NV	*Survey of benthic macroinvertebrates using EPA method*
Benthic Macroinvertebrates - Index of Biological Integrity	*A method of calculating an index to asses ecological communities for impacts from human activities*
Benthic Macroinvertebrates - CA Rapid Assessment	*A standardized, fast, and low-cost method for assessing the health of wetlands and riparian habitats*
Benthic Macroinvertebrates - Truckee River Watershed Council	*Survey of benthic macroinvertebrates using TRWC method*
Birds	*Survey of birds*
Trees	*Survey of trees*
Shade Canopy	*Estimate of shade canopy over water*
Exotics	*Surveys for exotic (non-native) species*
Invasives	*Surveys for invasive species*
Fish - USGS	*Fish survey using USGS methods*
Fish - USF&WS	*Fish survey using USF&WS methods*
Fish - DRI	*Fish survey using DRI methods*
Periphyton	*Survey of attached algae, typically macrophytes*
Algae	*General; survey of algae*
Benthic Algal Biomass	
Benthic algal nutrient limited substrate	
Chlorophyll	*Measurement of chlorophyll, an estimate of algae*
Bank Plant	
Presence/Absence	
Success	
Protozoa	*Survey of microorganisms, typically in water column*
Not Applicable	
Other:	

Geomorphology	Definition
TSS	*Total Suspended Solids*
Pebble Count	*A standardized method for surveying the percentage and size of rocks in a streambed, used to assess stream habitat potential*
McNeil Core	*Substrate sampler widely used for quantitative bulk sampling of streambed sediments*
Box Core	*A coring device that captures a known depth and area of sediment*
Sediment Plate	*A plate that is suspended in water to attract organisms and substrate over time*
Sediment Trap	*A device that captures suspended sediments in a water column over time*
Sieve analysis	*A method for measuring the particle size of sediments using a stacked series of sieves with progressively smaller screen size.*
Hydrometer	*Measurement of fine sediments using hydrometer density*
Proper Function Condition	*A means of assessing if riparian/wetland areas are functioning properly based on vegetation, landform, and presence of large woody debris*
Habitat Assessment	*A standardized method to asses the condition of habitat through uniform sampling*
Not Applicable	
Other:	

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Agency	Definition
DRI	*Desert Research Institute*
NDEP	*Nevada Department of Environmental Protection*
PLCO	*Placer County*
PLPT	*Pyramid Lake Paiute Tribe*
RENO	*City of Reno, Nevada*
SPARKS	*City of Sparks, Nevada*
TMWA	*Truckee Meadows Water Authority*
TNC	*The Nature Conservancy*
TRFMP	*Truckee River Flood Management Project*
TOT	*Town of Truckee, California*
UNR	*University of Nevada, Reno*
USFWS	*US Fish and Wildlife Service*
USGS	*US Geological Survey*
WCDWR	*Washoe County Department of Water Resources*

STATION IDENTIFICATION	AGENCY
Truckee R. @ Farad, CA	DRI
Truckee R. @ Idlewild Park, Nevada	DRI
Truckee R. @ Patagonia	DRI
Truckee R. @ Tahoe City	DRI
Truckee R. @ Vista, NV	DRI
Truckee R. above Donner Creek	DRI
Truckee R. Above Juniper Creek	DRI
Truckee R. above Martis Creek	DRI
Truckee@RBelowMartisCreek	DRI
Browns Creek @ Joy Lake Road	NDEP
Steamboat Creek @ Clearwater Way	NDEP
Steamboat Creek @ Geiger Grade	NDEP
Steamboat Creek @ Pembroke	NDEP
Steamboat Creek @ Rhodes Road	NDEP
Steamboat Creek @ Short Lane	NDEP
Thomas Creek @ Ventana Parkway	NDEP
Thomas Creek near Alexander Pond	NDEP
Whites Creek @ Arrow Creek Parkway	NDEP
Whites Creek @ Sage Hill Road	NDEP
Crystal Peak Park	NDOW
Derby Dam	NDOW
Eagle Picher	NDOW
Painted Rock	NDOW
Patagonia	NDOW
Rock Park 1	NDOW
Rock Park 2	NDOW
Verdi Power Dam	NDOW
Washoe-Highland Dam	NDOW
Wingfield - South Channel	NDOW
Big Bend	PLPT
Canyon	PLPT
Dead Ox	PLPT
Fellnagle	PLPT
Interstate 80	PLPT
Lower Nixon	PLPT
Marble Bluff Dam	PLPT
Nixon Bridge	PLPT
Numana Wetland Outlet	PLPT
Pasute Pit Outlet	PLPT
Pierson Dam	PLPT
S Bar S Ranch	PLPT
Tile Drain Outlet	PLPT
Upper Nixon	PLPT
Wadsworth Bridge	PLPT
Chalk Creek at Chalk Bluff	RENO
Chalk Creek at Wetland	RENO
Truckee River below Derby Dam Reach (Downstream)	RENO
Truckee River below Derby Dam Reach (Upstream)	RENO
Flowing drop inlets to North Truckee Drain	SPARKS
Flowing drop inlets to the Truckee River	SPARKS
Chalk Bluff Water Treatment Plant Intake	TMWA
Glendale Water Treatment Plant Intake	TMWA
Clark	TMWRF
Dead Ox	TMWRF
Derby Dam	TMWRF
Lockwood	TMWRF
Marble Bluff	TMWRF
McCarran	TMWRF
Nixon	TMWRF
North Truckee Drain	TMWRF
Painted Rock	TMWRF
Steamboat Creek	TMWRF
Tracy	TMWRF
Upstream of TMWRF & downstream mixing zone	TMWRF
Wadsworth	TMWRF
Airport Business Park	TOT
Brickelbown Outfall	TOT
Trout Creek Outfall	TOT
Alum Creek at Chrissie Caughlin Park	UNR
Alum Creek at piezometers	UNR
Alum Creek at W McCarran Blvd	UNR
Floriston	UNR
Lockwood	UNR
Mayberry	UNR
McCarran Ranch	UNR
Nixon	UNR
Spice Island	UNR
Thiobe	UNR
Tracy	UNR
Wadsworth	UNR
Below Hirschdale	USFWS
Cabin Creek Rd	USFWS
Crystal Peak Park	USFWS
Derby Dam	USFWS
Farad	USFWS
Fishermans Park	USFWS
Flesh Power Plant	USFWS
Fly Casters	USFWS
Hirschdale	USFWS
Lower McCarran	USFWS
Marble Bluff	USFWS
Mustang	USFWS
Nixon	USFWS
Numana	USFWS
Painted Rock	USFWS
Patagonia	USFWS
Sewage Plant	USFWS
Spice Island	USFWS
Squaw Creek	USFWS
Steamboat	USFWS
Tahoe City	USFWS
Truckee Falls	USFWS
Upper McCarran	USFWS
USA Parkway	USFWS
Wadsworth 80	USFWS
Wingfield	USFWS
003 N19 E20 11ADDB1 TRUCKEE RV AT REST AREA	USGS
087 N18 E19 12AD 2	USGS
087 N19 E20 21DADB1 USGS	USGS
087 N20 E20 34DABB1	USGS
ALDER CK NR TRUCKEE, CA	USGS
BAILEY CYN AT TOLL RD NR STEAMBOAT, NV	USGS
BOCA RES NR TRUCKEE CA	USGS
BOYNTON SLOUGH ABV BOYNTON LN NR RENO, NV	USGS
BOYNTON SLOUGH BLW SOUTH MCCARREN BLVD NR RENO, NV	USGS
BRONCO CK AT MOUTH NR FLORISTON, CA.	USGS
BROWNS CK DIV AT GALENA STATE PARK NR WASHOE CITY	USGS
BROWNS CK NR STEAMBOAT, NV	USGS
CABIN CK AT HWY 89 NR TRUCKEE, CA	USGS
COCHRAN DITCH ABV VIRGINIA LAKE INLET AT RENO, NV	USGS
CYN 24 AT MOUTH NR FLORISTON, CA	USGS
DATA FOR TRUCKEE-CARSON PROJ TRUCKEE NR NIXON	USGS
DEEP CK ABV MOUTH NR TRUCKEE, CA	USGS
DEEP CYN CK AT MOUTH NR VERDI, NV	USGS
DIV TO ALFALFA FIELD AT WADSWORTH, NV	USGS
DIV TO GRASS FIELD AT LOCKWOOD, NV	USGS
DIV TO GRASS PASTURE BLW PATRICK, NV	USGS
DOG CK AT VERDI, NV	USGS
DOG CK NR VERDI, NV	USGS
DONNER C & DONNER LK NR TRUCKEE CA	USGS
DONNER C AT HWY 89 NR TRUCKEE CA	USGS
DONNER CK AT MOUTH NR TRUCKEE, CA	USGS
DONNER CK NR TRUCKEE, CA	USGS
DONNER LK NR TRUCKEE CA	USGS
DRY CK ABV STEAMBOAT DITCH NR RENO, NV	USGS
DRY CK AT BOYNTON SLOUGH NR RENO, NV	USGS
DRY CK AT HUFFAKER LN NR RENO, NV	USGS
DRY CK BLW HUFFAKER LN NR RENO, NV	USGS
DRY CK DIV ABV HUFFAKER LN NR RENO, NV	USGS
FRANKTOWN CK AT FRANKTOWN, NV	USGS
FRANKTOWN CK NR CARSON CITY, NV	USGS
FWM DATA LINE 4 TOTAL FROM RESERVOIRS	USGS
FWM DATA LINE 6 ICELAND LESS RESERVOIRS	USGS
FWM DATA LINE 10 WASHOE POWER	USGS
FWM DATA LINE 12 HOGAN	USGS
FWM DATA LINE 13 NASTIN	USGS
FWM DATA LINE 15 SPARKS-CAPURRO	USGS
FWM DATA LINE 16 BERTN	USGS
FWM DATA LINE 20 INDIAN FLAT	USGS
FWM DATA LINE 21 RENO POWER-IRRIGATION	USGS
FWM DATA LINE 22 COUNTRYMAN	USGS
FWM DATA LINE 23 ENGLISH MILL	USGS
FWM DATA LINE 26 DIV-STEAMBOAT- COCHRAN	USGS
FWM DATA LINE 27 RV AT RENO	USGS
FWM DATA LINE 28 GAIN OR LOSS-ICELAND TO RENO	USGS
FWM DATA LINE 29 SCOTT RANCH	USGS
FWM DATA LINE 30 ABBEE	USGS
FWM DATA LINE 31 PERRY	USGS
FWM DATA LINE 36 STEPHENS	USGS
FWM DATA LINE 38 DIV - SCOTT RANCH - GLENDALE	USGS
FWM DATA LINE 39 RV AT VISTA	USGS
FWM DATA LINE 40 GAIN OR LOSS-RENO TO VISTA	USGS
FWM DATA LINE 41 DIV - STEAMBOAT - VISTA	USGS
FWM DATA LINE 43 GAIN OR LOSS-ICELAND TO VISTA	USGS
FWM DATA LINE 44 FAIRCHILD PUMP	USGS
FWM DATA LINE 50 MCCARRAN-S.S.	USGS
FWM DATA LINE 53 DIV - FAIRCHILD - DERBY CANAL	USGS
FWM DATA LINE 54 RV AT DERBY	USGS
FWM DATA LINE 55 GAIN OR LOSS-VISTA TO DERBY	USGS
FWM DATA LINE 56 DIV - STEAMBOAT - DERBY	USGS
FWM DATA LINE 58 GAIN OR LOSS-ICELAND TO DERBY	USGS
FWM DATA LINE 59 PRESTON	USGS
FWM DATA LINE 66 OLINGHOUSE NO 1	USGS
FWM DATA LINE 67 OLINGHOUSE NO 2	USGS
FWM DATA LINE 69 OLINGHOUSE NO 3	USGS
FWM DATA LINE 71 PRESTON TO INDIAN	USGS
FWM DATA LINE 72 RV AT PYRAMID	USGS
FWM DATA LINE 73 GAIN OR LOSS-PRESTON TO INDIAN	USGS
FWM DATA LINE 74 STEAMBOAT - INDIAN	USGS
FWM DATA LINE 76 TOTAL SUPPLY	USGS
FWM DATA LINE 78 TOTAL GAIN OR LOSS FOR RV	USGS
FWM10 STEAMBOAT DITCH NR FLORISTON, CA	USGS
FWM12 COLDBRON DITCH AT VERDI, NV	USGS
FWM13 KATZ DIV NR VERDI, NV	USGS
FWM14 HIGHLAND DITCH AT RENO, NV	USGS
FWM15 LAST CHANCE DITCH AT HUNTERS C NR RENO N	USGS
FWM16 LAKE DITCH AT MAYBERRY DR NR RENO, NV	USGS
FWM17 SOUTH SIDE DITCH NR RENO, NV	USGS
FWM18 ORR DITCH NR RENO, NV	USGS
FWM19 COCHRAN DITCH AT RENO, NV	USGS
FWM20 SULLIVAN & KELLY'S D AT SPARKS, NV	USGS
FWM21 N TRUCKEE DITCH AT RENO, NV	USGS
FWM22 EASTMAN D AT RENO, NV	USGS
FWM23 SESSIONS DITCH NR RENO, NV	USGS
FWM24 SPPCO GLENDALE DIV NR SPARKS, NV	USGS
FWM25 PIONEER DITCH AT RENO, NV	USGS
FWM26 GLENDALE DITCH NR SPARKS, NV	USGS
FWM28 N TRUCKEE DR BLW SPANISH SPGS Y NR SPARKS,	USGS
FWM31 PIONEER D AT JONES RANCH NR SPARKS, NV	USGS
FWM32 STEAMBOAT CK AT WASHOE CITY, NV	USGS
FWM33 CRUTCHFIELD DITCH NR STEAMBOAT, NV	USGS
FWM35 N CALLAHAN DITCH NR STEAMBOAT, NV	USGS
FWM36 S CALLAHAN DITCH NR STEAMBOAT, NV	USGS
FWM37 SMITH DITCH NR STEAMBOAT, NV	USGS
FWM38 GALENA CK NR WASHOE CITY, NV	USGS
FWM39 UPPER SAUR DITCH NR STEAMBOAT, NV	USGS
FWM40 LOWER SAUER DITCH NR STEAMBOAT, NV	USGS
FWM41 STEAMBOAT CK NR STEAMBOAT, NV	USGS
FWM42 BIG DITCH NR STEAMBOAT, NV	USGS
FWM43 HUGHES & CAMERON D NR STEAMBOAT, NV	USGS
FWM44 HANSEN DITCH NR STEAMBOAT, NV	USGS
FWM45 CRANE-CLOW DITCH NR STEAMBOAT, NV	USGS
FWM46 CHANELER D AT HWY 17 NR STEAMBOAT, NV	USGS
FWM47 STEAMBOAT DITCH NR STEAMBOAT, NV	USGS
FWM48 STEAMBOAT CK AT BELLEVISTA RV NR SPARKS, NV	USGS
FWM49 WHITES CK MAIN CHANNEL NR STEAMBOAT, NV	USGS
FWM50 BROWN DITCH NR STEAMBOAT, NV	USGS
FWM51 HOWARDS DITCH NR STEAMBOAT, NV	USGS
FWM52 HOWARDS D ABV HWY 395 NR RENO, NV	USGS
FWM53 THOMAS CK ABV STEAMBOAT D NR RENO, NV	USGS
FWM54 EVANS CK NR RENO, NV	USGS
FWM55 HUNTER CK INTO SPPCO DIV NR RENO, NV	USGS
FWM57 LARGOMARSINO-NOCE DITCH NR VISTA, NV	USGS
FWM58 LARGOMARINO-MURPHY DITCH NR VISTA, NV	USGS
FWM59 GROTON DITCH AT LOCKWOOD, NV	USGS
FWM60 SHEEP RANCH DITCH NR LOCKWOOD, NV	USGS
FWM61 MCCARRAN DITCH NR PATRICK, NV	USGS
FWM62 HILL DITCH AT HEADGATE NR TRACY, NV	USGS
FWM63 HILL DITCH AT TRACY, NV	USGS
FWM64 WASHBURN DITCH AT ORCHARD, NV	USGS
FWM65 TRUCKEE CANAL BLW DERBY DAM NR WADSWORTH NV	USGS
FWM66 HERMAN DITCH NR WADSWORTH, NV	USGS
FWM67 PIERSON DITCH AT WADSWORTH, NV	USGS
FWM68 PROCTOR DITCH AT WADSWORTH, NV	USGS
FWM69 FELLNAGLE DITCH NR WADSWORTH, NV	USGS
FWM70 GARDELLA DITCH NR WADSWORTH, NV	USGS
FWM71 INDIAN DITCH NR NIXON, NV	USGS
FWM72 COCHRAN DITCH (V LK OUTLET) AT RENO, NV	USGS
FWM73 YORI DRAIN ABV STEAMBOAT CK NR SPARKS, NV	USGS
FWM74 ORR DITCH SIPHON NR SPARKS, NV	USGS
FWM75 GREGORY-MONTE DITCH NR WADSWORTH, NV	USGS
GALENA CK AT GALENA CK STATE PARK, NV	USGS
GALENA CK NR STEAMBOAT, NV	USGS
GRAY C NR FLORISTON CA	USGS
GROTON DIV TO S SIDE WINGFALL WITH GATE, NV	USGS
HERMAN RETURN	USGS
HIGHLAND PLANT SPILL AT ARLINGTON BRG AT RENO	USGS
HUNTER CK ABV LAST CHANCE DITCH NR RENO, NV	USGS
HUNTER CK AT MOUTH NR RENO, NV	USGS
HUNTER CK BLW STEAMBOAT DITCH NR RENO, NV	USGS
HUNTER CK NR RENO, NV	USGS
HUNTER CK RESERVOIR DRAIN AT MAYBERRY DR AT RENO	USGS
INDEPENDENCE C NR TRUCKEE CA	USGS
INDEPENDENCE LK NR TRUCKEE CA	USGS
JUMBO WASH NR NEW WASHOE CITY, NV	USGS
JUNIPER CK. AT MOUTH NR HIRSCHDALE, CA	USGS
LAKE DITCH AT DEL MONTE LANE NEAR RENO, NV	USGS
LAKE DITCH AT HOLCOMB LN NR RENO NV	USGS
LAST CHANCE DITCH AT DAVIS LN NR RENO NV	USGS
LAST CHANCE DITCH AT THOMAS CK RD NR RENO NV	USGS
LITTLE TRUCKEE R AB BOCA RES NR TRUCKEE CA	USGS
LITTLE TRUCKEE R BL BOCA DAM NR TRUCKEE CA	USGS
LITTLE TRUCKEE RV AT BOCA RESERVOIR	USGS
LITTLE WASHOE LAKE NR STEAMBOAT, NV	USGS
LONG VALLEY CK NR HAPPY VALLEY, NV	USGS
MARTIS C LK NR TRUCKEE CA	USGS
MARTIS C NR TRUCKEE CA	USGS
MARTIS CK AT HWY 267 NR TRUCKEE, CA	USGS
MARTIS CK NR MOUTH AT TRUCKEE RV NR TRUCKEE, CA	USGS
MCCRAYS CYN NR CARSON CITY, NV	USGS
MYSTIC CYN CK AT MOUTH NR FLORISTON, CA	USGS
N TRUCKEE DRAIN AT KLEPPE LN NR SPARKS, NV	USGS
N TRUCKEE DRAIN AT SPANISH SPRINGS RD NR SPARK, NV	USGS
OPHIR CK NR STEAMBOAT, NV	USGS
ORR DITCH AB SPANISH SPRINGS V NR SPARKS, NV	USGS
ORR DITCH AT SPANISH SPRINGS VALLEY NEAR SPARKS NV	USGS
PLAVINE CK NR RENO, NV	USGS
PIONEER D RETURN NO. 2 BLW KIMLICK LN NR RENO, NV	USGS
PIONEER DITCH ABV MCCARREN BLVD NEAR SPARKS, NV	USGS
PIONEER DITCH AT UNIV. FARMS NR RENO, NV	USGS
PROSSER C BL PROSSER C DAM NR TRUCKEE CA	USGS
PROSSER C RES NR TRUCKEE CA	USGS
PROSSER CK AT HOBART MILLS, CA	USGS
PROSSER CK AT MOUTH NR TRUCKEE, CA	USGS
PROSSER CK NR TRUCKEE, CA	USGS
PUNY DIP CYN AT MOUTH NR FLORISTON, CA	USGS
PYRAMID LAKE NR NIXON, NV	USGS
PYRAMID LK TRIB NR NIXON, NV	USGS
RENO-SPARKS STP OUTFALL AT RENO, NV	USGS
RENO-SPARKS STP OUTFALL NR RENO, NV	USGS
RETURN FROM ALFALFA FIELD AT WADSWORTH, NV	USGS
RETURN FROM GRASS FIELD AT LOCKWOOD, NV	USGS
RETURN FROM GRASS PASTURE BLW PATRICK, NV	USGS
RIO POCO DRAIN AT BOCA DRIVE NR RENO, NV	USGS
ROCKY WASH AT MOUTH NR TRUCKEE, CA	USGS
SAGEHEN C NR TRUCKEE CA	USGS
SQUAW CK AT HWY 89 NR SQUAW VALLEY, CA	USGS
SQUAW CK AT SQUAW V RD AT SQUAW VALLEY, CA	USGS
STAMPEDE RES NR BOCA CA	USGS
STEAMBOAT CK ABV YORI DRAIN NR RENO, NV	USGS
STEAMBOAT CK AT CLEANWATER WAY NR RENO, NV	USGS
STEAMBOAT CK AT GEIGER GD NR STEAMBOAT, NV	USGS
STEAMBOAT CK AT SHORT LN AT RENO, NV	USGS
STEAMBOAT CK AT STEAMBOAT, NV	USGS
STEAMBOAT CK AT US 395 NR PLEASANT VALLEY, NV	USGS
STEAMBOAT CK BL W STEAMBOAT D AT STEAMBOAT, NV	USGS
STEAMBOAT DITCH ABV THOMAS CK NR RENO NV	USGS
STEAMBOAT DITCH DIVERSION, RT BANK	USGS
STEAMBOAT DITCH NEAR EVANS CK NR RENO, NV	USGS
STEAMBOAT DITCH NR FARRETTI LN NR RENO NV	USGS
TROUT CK AT MOUTH NR TRUCKEE, CA	USGS
Truckee Canal at Painted Rock Exit nr Wadsworth, NV	USGS
TRUCKEE CANAL NR WADSWORTH, NV	USGS
TRUCKEE R A BOCA BRIDGE NR TRUCKEE CA	USGS
TRUCKEE R A FARAD CA	USGS
TRUCKEE R A TAHOE CITY CA	USGS
TRUCKEE R NR TRUCKEE CA	USGS
TRUCKEE RV ABV BRONCO CK NR FLORISTON, CA	USGS
TRUCKEE RV ABV DERBY DAM NR WADSWORTH, NV	USGS
TRUCKEE RV ABV DONNER CK AT HIGHWAY 89 NR TRUCKEE	USGS
TRUCKEE RV ABV DONNER CK AT HWY89 NR TRUCKEE(NDEP)	USGS
TRUCKEE RV ABV DONNER CK NR TRUCKEE, CA	USGS
TRUCKEE RV ABV FLESH POWER DIV NR VERDI, NV	USGS
TRUCKEE RV ABV SPPCO IDLEWILD INTAKE AT RENO, NV	USGS
TRUCKEE RV ABV TRACY, NV	USGS
TRUCKEE RV ABV TROUT CK NR TRUCKEE, CA	USGS
TRUCKEE RV ABV W MCCARRAN BLVD NR RENO, NV	USGS
TRUCKEE RV AT BRG ST BRG AT VERDI, NV	USGS
TRUCKEE RV AT BROCKWAY RD AT TRUCKEE, CA	USGS
TRUCKEE RV AT CERESOLA RANCH NR WADSWORTH NV(NDEP)	USGS
TRUCKEE RV AT CERESOLA RANCH NR WADSWORTH, NV	USGS
TRUCKEE RV AT CHALK BLUFF TREAT PLNT INTAKE N RENO	USGS
TRUCKEE RV AT CIRCLE CK RANCH NR RENO, NV	USGS
TRUCKEE RV AT CIRCLE CK RANCH NR RENO, NV (NDEP)	USGS
TRUCKEE RV AT CLARK, NV	USGS
TRUCKEE RV AT CRYSTAL PEAK PARK AT VERDI, NV	USGS
TRUCKEE RV AT DEAD OX WASH NR NIXON, NV	USGS
TRUCKEE RV AT DERBY DAM, NV	USGS
TRUCKEE RV AT FLORISTON DAM NR FLORISTON, CA	USGS
TRUCKEE RV AT GLEN MEADOWS TP NR VERDI, NV	USGS
TRUCKEE RV AT GLENDALE AVE NR SPARKS, NV	USGS
TRUCKEE RV AT HILL DIV DAM, NV	USGS
TRUCKEE RV AT HWY 447 AT NIXON, NV	USGS
TRUCKEE RV AT I-80 ABV L TRUCKEE RV NR TRUCKEE, CA	USGS
TRUCKEE RV AT IDLEWILD PARK AT RENO, NV	USGS
TRUCKEE RV AT IDLEWILD PARK AT RENO, NV (NDEP)	USGS
TRUCKEE RV AT JAMES HOWARD BRG NR CHALK BLUFF, NV	USGS
TRUCKEE RV AT LAWTON, NV	USGS
TRUCKEE RV AT LOCKWOOD, NV	USGS
TRUCKEE RV AT MARBLE BLUFF DAM, NV	USGS
TRUCKEE RV AT MAYBERRY DR BLW LAWTON, NV	USGS
TRUCKEE RV AT MCCARRAN DIV DAM NR PATRICK, NV	USGS
TRUCKEE RV AT MUSTANG BRG NO 1 NR HAFED, NV	USGS
TRUCKEE RV AT MUSTANG BRG NO 2 NR HAFED, NV	USGS
TRUCKEE RV AT NUMANA DAM NR NIXON, NV	USGS
TRUCKEE RV AT OLD US 40 BRG AT WADSWORTH, NV	USGS
TRUCKEE RV AT OLD US 40 BRIDGE, BLW TRUCKEE, CA	USGS
TRUCKEE RV AT PAINTED ROCK BRIDGE, NV	USGS
TRUCKEE RV AT PATRICK, NV	USGS
TRUCKEE RV AT POLARIS NR TRUCKEE, CA	USGS
TRUCKEE RV AT RENO, NV	USGS
TRUCKEE RV AT REST AREA NR VISTA, NV	USGS
TRUCKEE RV AT VISTA, NV	USGS
TRUCKEE RV AT WADSWORTH, NV	USGS
TRUCKEE RV BLW DERBY DAM NR WADSWORTH, NV	USGS
TRUCKEE RV BLW DONNER CK NR TRUCKEE, CA	USGS
TRUCKEE RV BLW FARAD POWERHOUSE AT FARAD CA (NDEP)	USGS
TRUCKEE RV BLW FARAD POWERHOUSE AT FARAD, CA	USGS
TRUCKEE RV BLW HIRSHDALE DUMP, CA	USGS
TRUCKEE RV BLW JUNIPER CK NR HIRSCHDALE, CA	USGS
TRUCKEE RV BLW LITTLE TRUCKEE RV NR TRUCKEE, CA	USGS
TRUCKEE RV BLW MARBLE BLUFF DAM, NV	USGS
TRUCKEE RV BLW PROSSER CK NR TRUCKEE, CA	USGS
TRUCKEE RV BLW S-S RANCH NR WADSWORTH, NV	USGS
TRUCKEE RV BLW TRACY, NV	USGS
TRUCKEE RV BLW VIKING PLANT NR VERDI, NV	USGS
TRUCKEE RV DELTA AT PYRAMID LAKE, NV	USGS
TRUCKEE RV DELTA AT PYRAMID LK, NV	USGS
TRUCKEE RV FISHWAY AT MARBLE BLUFF DAM NR NIXON NV	USGS
TRUCKEE RV IN WINGFIELD PARK AT RENO, NV	USGS
TRUCKEE RV INTRAGRAVEL AT DEAD OX, NV	USGS
TRUCKEE RV INTRAGRAVEL BLW S-S RANCH, NV	USGS
TRUCKEE RV INTRAGRAVEL NR SPARKS, NV	USGS
TRUCKEE RV INTRAGRAVEL NR VERDI, NV	USGS
TRUCKEE RV NR ESSEX, NV	USGS
TRUCKEE RV NR HIRSHDALE DUMP, CA	USGS
TRUCKEE RV NR MOGUL, NV	USGS
TRUCKEE RV NR NIXON, NV	USGS
TRUCKEE RV NR SPARKS, NV	USGS
TRUCKEE RV NR TRACY, NV	USGS
TRUCKEE RV NR VERDI, NV	USGS
TRUCKEE RV RT BK BLW TRACY, NV	USGS
UNION VALLEY CK AT MOUTH NR TRUCKEE, CA	USGS
UNNAMED TRIB RB 13PCT DEEP CK NR TRUCKEE, CA	USGS
UNR AGRICULTURAL EXPERIMENTAL FARM FIELD 20A	USGS
VIKING METALS STORM DRAIN FROM PONDS VERDI, NV	USGS
WASHOE LAKE NR CARSON CITY, NV	USGS
WC-2 WHITES CK NR STEAMBOAT, NV	USGS
WC-3 THOMAS CK NR STEAMBOAT, NV	USGS
WC-5 ALEXANDER D AT SHORT RD SPARKS, NV	USGS
WHITES CK NR STEAMBOAT, NV	USGS
Kleppe	WCDWR
North Truckee Drain	WCDWR
Steamboat @ Clearwater	WCDWR
Steamboat Creek @ Rhodes	WCDWR
Thomas Creek @ Timberline	WCDWR
Thomas Crk-South Meadows Parkway	WCDWR
Whites Creek @ Timberline	WCDWR
Whites Crk-Old Virginia	WCDWR

Appendix E

TRIG Project Set Up Procedures

Truckee River Information Gateway

Overview, Objectives, and Tutorial

Prepared by:
Dave Waetjen and Ted Daum
Ecological Research Associates

Who are we?

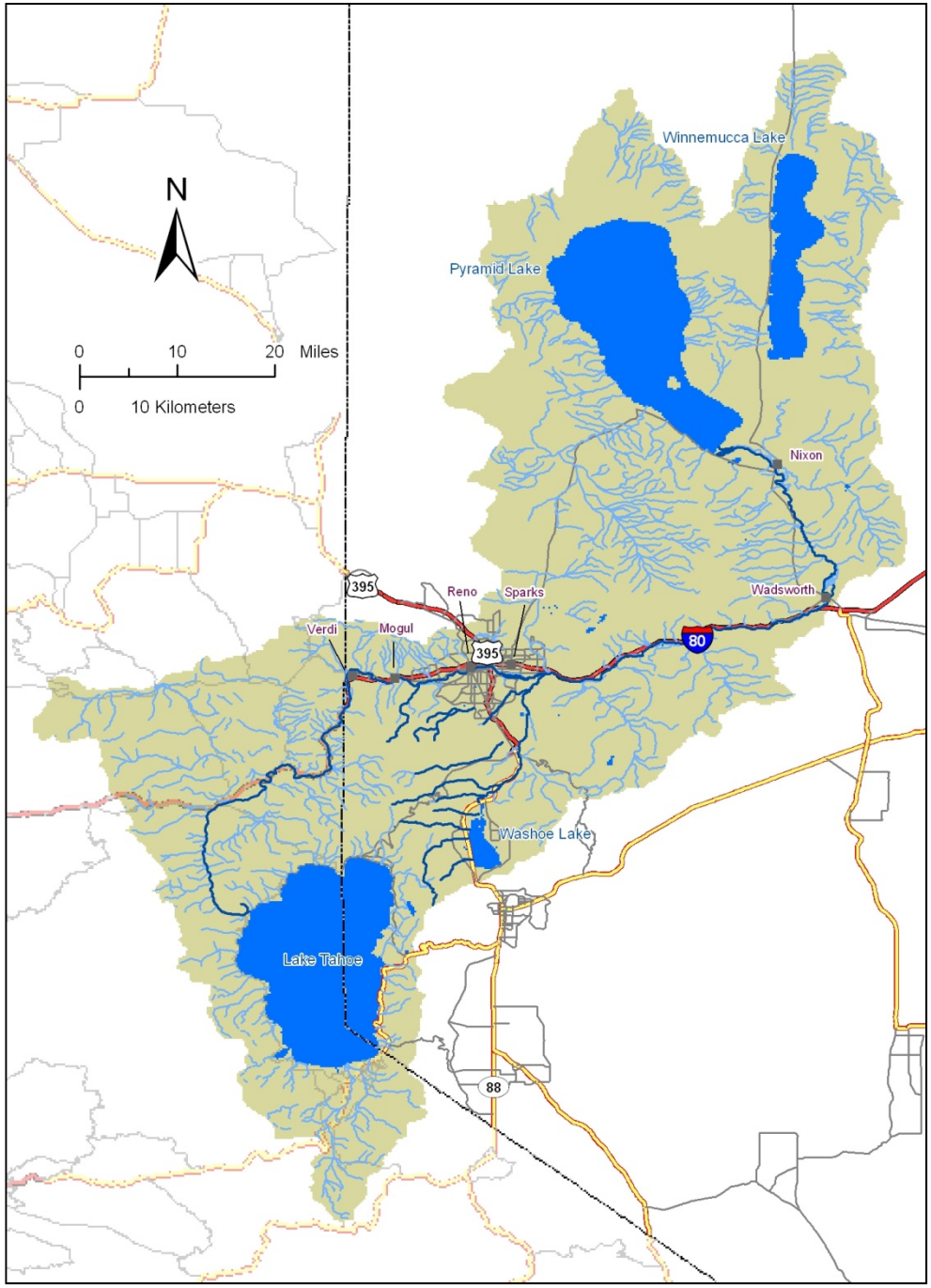
- Dr. Charles Goldman
  - President of Ecological Resource Associates
  - Professor Emeritus, UC Davis
- Ted Daum
  - Consultant for ERA
  - Water quality scientist at AECOM Planning + Design specializing in regulatory compliance
- Dave Waetjen
  - Consultant for ERA
  - Graduate Student Researcher at the Information Center for the Environment, UC Davis

What is TRIG?

- TRIG is a content management system / collaborative web portal
  - Projects (“container” for resources and organizations)
  - Organizations (primary organizations working on the Truckee River)
  - Resources (documents, reports, data, maps, presentations, website links, posters, protocols, etc.)
  - People (Truckee River contact list)
  - Collection Sites (interactive map)
  - News (recent news on the Truckee River)
  - Bibliography (available articles)
  - Images (being overhauled)

TRIG Spatial Extent

- The Truckee River from Tahoe City downstream to (but not including) Pyramid Lake, and the surrounding watershed which includes Steamboat Creek, Truckee Canal, and smaller creeks and drainages
- Some TRIG Resources (documents, reports, etc.) may be outside of this spatial extent but pertain to the Truckee River (e.g. TTSA lab accreditation program)



Truckee River Basin

Current Status

- 47 Organizations
- 103 Resources (documents, maps, etc.)
- 60 Sample Sites
- 119 Bibliographies
- 500 K Data Points (TMWRF, TRWC)
- Report produced using TRIG
  - Truckee River Water Quality: Current Conditions and Trends Relevant to TMDLs and WLAs. Jassby et. al. 2007.

Why TRIG?

- Designed specifically for the Truckee River TMDL process and Coordinated Monitoring Plan
- Improved Integration with Data Collection Entities in the Truckee Basin
- Valuable tool for unfunded mandate requirements
- Database scalability
- Promoting collaboration

Potential Challenges

- Overcoming Common Data Sharing Barriers
  - Proprietary Treatment
  - Concerns of Data Misrepresentation or Misuse
  - Lack of Quality Assurance or Metadata Associated with Program
  - Resource Constraints

Potential Data Analyses

- Basic calculations
  - Minimum, mean, median, and maximum values for each day, month, year, or other timeframe, calculated for each sample site
- Loading Calculations
  - Plant Influent and Effluent Flows
  - Non-Point Loading
  - TMDL and WLAs (TDS, N, P)
- Contaminant Status and Trends
- Data Gaps

Future Plans

- Continue Integration of CMP within TRIG
- Developing a data format standard for data submittal
- Completing TRIG User's Manual
- Updates to Semantic Online Data Access (SODA) to make integration into TRIG easier and better
- TRIG Website maintenance (backups / security module updates / software updates)

TRIG
www.truckeeriverinfo.org

- City of Reno
- City of Sparks
- Ecological Research Associates
- UC Davis, Information Center for the Environment

Data Formatting Standards

- Consistent Format
  - Value types don’t change within a column of data (e.g. integers must always be integers)
  - Format consistent through time for establishing a data template
- Clarity
  - Good column names that define the data values (e.g. N = ?)
  - Define values on a separate spreadsheet

Data Formatting Standards

- Data Qualifiers
  - Add separate column (after data values) to add qualifier codes
  - Qualifier codes are metadata for a particular data value (e.g. below detection limit)
  - Do not add “<“, “>” within the data values… a statistics program does not know how to handle these.
  - Store numbers as numbers! Some spreadsheets have numbers stored as characters.

Data Formatting Suggestions

- Date: Use the ANSI/ISO data standard format: “YYYY-MM-DD”
- Hours / minutes: military time (shorter and less ambiguous)
- Timezone: sometimes important to include if the data will every be aggregated across regions.
- Units of Measure: metric! with some exceptions (cfs, more?)

Spatial Data

- Geography: Storing Lat/Long as decimal degrees is preferred because the values have numeric meaning in the database
- Coordinate System / Projection: Look for agreement across the CMP to make sharing data easier.

TRIG Interactive Data Download Facility (SODA)

- Data Collection
- QA/QC procedure by agency personnel
- Attach data file (Excel, csv) to TRIG Project → Resource
- Incorporated into SODA, fully integrated into TRIG

Truckee River Information Gateway (TRIG)

Instruction Manual Draft

Why Create an Account?

In order to add content to TRIG you must first create a user account. Once you create an account, you will be granted the ability to add the following content to the site:

- Projects (the "container" for resources and organizations)
- Organizations (primary organizations working on the Truckee River)
- Resources (documents, reports, data, maps, presentations, website links, posters, protocols, etc.)
- People (Truckee River contact list)
- Collection Sites (project collection sites, using an interactive map)
- News (recent news on the Truckee River)
- Bibliography (available articles)
- Images (this is currently being redesigned for greater ease of use)

By registering for an account, you are also expressing your consent not to post material unrelated to this site (i.e. not related to the water quality and aquatic habitat of the Truckee River basin). In other words, you take responsibility for the content you add!

Creating an Account

1. Go to the TRIG homepage (http://www.truckeeriverinfo.org) and on the left hand side, click "Create new account".
2. The "User Account/Create New Account" page appears. Note that the fields with red asterisks are required. Fill out the entire form and click "Create new account" at the bottom of the page.

Further Detail

TRIG requests various information so that a Truckee River contacts list can be created which will hopefully be a helpful reference to those who register. Some information is also collected to fulfill the requirements of the website itself.

Username: A unique identifier that will be your log in ID. *Required field*.

Email address: This must be a valid email address where registration confirmation, password change requests, and other pertinent TRIG information can be sent. *Required field*.

Full Name: *Required field*.

First Name: *Optional*.

Last Name: The contacts list is sorted by last name. *Required field*.

The remaining fields are optional.

Organization: If applicable. "None" is the default. This is a pull-down list of organizations currently in TRIG. If your organization is not on this list it can be added after you are a registered on TRIG.

Contact Information

Address: Your street address. If an organization was or will be added, use that address. (Note: the TRIG site allows formatting in HTML if so desired. The link underneath this field – “More information about formatting options” – has a very useful page with easy to use basic HTML "tags").

City:

State:

Zip Code:

Phone: Enter your organization phone number.

Website: If you wish to add your organization’s website do so here.

Captcha

This question is for testing whether you are a human visitor and to prevent automated spam submissions. Type the letters shown in the field. There is an option for an audio captcha as well.

After the information is entered click on the “Create new account” box at the bottom of the page.

If any required fields are missing the page will return with a message at the top requesting the missing information. The process may take a minute or so. When registration has been completed successfully the following message at the top of the page will appear – “Your password and further instructions have been sent to your e-mail address.”

Once you receive your password you may log in with the user name you defined above and the password sent to you under “User Login”.

After you have logged in

Once logged in, “TRIG menu” and your user name will appear underneath the “Online Resources” menu available to everyone visiting the site. The TRIG menu is only available to registered TRIG users who have logged in and is used to add content to the site. The TRIG menu contains the following:

- Contact List: This is a list of all of the TRIG registrants
- Create Collection Site
- Create News Item
- Create Organization
- Create Project
- Create Reference
- Create Resource
- My account
- Logout

You may now add content to any one of the above elements with “Create” in front of it, as well as modify your account information in “My account”.