



**El Dorado Chapter**

***Cosumnes River  
Water Quality Monitoring Program***

**Quality Assurance Project Plan  
2015**

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El Dorado Trout Unlimited is grateful to Wolf Creek Community Alliance and South Yuba River Citizens League for their support and sharing their monitoring documents.

## Approvals:

State Water Resources Control Board Citizen Monitoring Clean Water Team  
Coordinator, Erick Burres



Signature \_\_\_\_\_ Date 06/10/15

El Dorado Trout Unlimited Monitoring Coordinator, Melinda Frost-Hurzel



Signature \_\_\_\_\_ Date 06/13/15

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## **1. Distribution List**

This Quality Assurance Project Plan (QAPP) and any approved revisions will be distributed to the Technical Advisors, posted on the EDTU website and provided to any interested party upon request. The Monitoring Coordinator is responsible for distributing updates to the QAPP to the above parties.

## **2. Project Organization**

### Primary Project Roles:

Melinda Frost-Hurzel of El Dorado Trout Unlimited (EDTU) is the Monitoring Coordinator, and is responsible for securing training for volunteer citizen scientists and ensuring the quality control and quality assurance strategies documented in this QAPP are followed. Citizen Scientist Team Leaders lead teams in field, taking water quality measurements and documenting observations. The Technical Advisors review the data as to content and quality, in accordance with the quality parameters identified in this document.

### Equipment Management Responsibilities:

The equipment kits will be rotated among the field teams made up of citizen scientists. The Monitoring Coordinator and Team Leaders are responsible for ensuring all equipment is in good working order before it is used for monitoring or sampling. All citizen scientists will be trained in proper use of equipment.

### Data Collection Responsibilities:

Each citizen scientist team will be responsible for collection of data at their site(s). The Monitoring Coordinator will be responsible for verification of procedures and data results.

### Data Management Responsibilities:

The Monitoring Coordinator is responsible for data management. Data will be stored and analyzed following the Data Management Manual of EDTU. The data and manual will be stored at 6840 Steely Ridge Rd., Somerset, CA and at American River Conservancy at 348 Highway 49, Coloma, CA, electronically and physically.

### Quality Assurance and Quality Control Responsibilities:

The Monitoring Coordinator will be responsible for implementing appropriate quality assurance and quality control measures to ensure data of value.

Technical Advisors:

The Technical Advisors are resource professionals with specialties relevant to the monitoring process design for the specific beneficial uses of the Cosumnes River. They will review quality assurance/quality control procedures, site and analyte selection, and assist in interpreting results.

Table 2.1

Name	Subject Matter Expertise	Organization
Donnie Ratcliff	Aquatic biology	United States Fish and Wildlife Anadromous Fish Restoration
Elena DeLacy	Biology/Stewardship	American River Conservancy
Peggy Cranston	Biology (Sensitive Species Habitats)	Bureau of Land Management
Karen Quidachay	Water Policy and Planning	Landmark Environmental Planning and Regulatory Compliance
Kimberly Petree	Native American Cultural Resources	Cosumnes Culture and WaterWays
Mitch Lockhart	Aquatic Biology	California Fish and Wildlife
Diane Beaulaurier	California State Water Policy	California State Water Boards
Rene Henery	Watershed Science/Aquatic Biology	California Trout Unlimited

United States Forest Service, El Dorado Irrigation District, and the El Dorado County Resource Conservation District have also been invited to participate, but are unable to at this time.

### **3. Problem Definition/Background**

Problem Statement:

Good quality information is needed to ensure Cosumnes River management preserves its beneficial uses, and to guide restoration efforts. The Cosumnes has large diversions relative to its flow, and like most Sierra rivers, has been impacted by gold mining, logging, and intrusion of invasive species. The El Dorado Trout Unlimited Cosumnes River Water Quality Monitoring Program will focus on providing that information in a long term monitoring program.

Initial Focus:

The first year (2015) of the program will establish monitoring sites, take field measurements and document limited habitat and species observations to create a baseline understanding of watershed

challenges and opportunities. EDTU will seek grant funding for a more comprehensive program based on the outcome of the 2015 efforts and the guidance of the Technical Advisors, in compliance with the California State Water Resource Control Board Surface Water Ambient Monitoring Program (SWAMP).

Regulatory Information and Action Limits:

Relevant Basin Plan Water Quality Objectives to the parameters measured in 2015 are:

Dissolved Oxygen: 7.0 mg/liter min. in the area of EDTU sites (COLD)  
Temperature: 5 degree F increase max after diversion (if COLD conditions are maintained), 20 degrees centigrade maximum  
pH: 6.5 min., 8.5 max

Program Objectives:

- To initiate and sustain a long term monitoring program for the purpose of assessing and improving natural resource management for the beneficial uses of the Cosumnes River. Of particular interest are the beneficial uses of: cold freshwater aquatic habitat (COLD), spawning habitat (SPWN), migratory habitat (MIGR), wildlife habitat (WILD), Native American cultural uses (CUL), rare and endangered species habitat (RARE), warm freshwater aquatic habitat (WARM), and recreation (RECREATION), while supporting the more visible beneficial uses of agriculture (AGR) and domestic and municipal supply (MUN).
- To use data collected on watershed disturbances and uses to identify economically feasible solutions for problems in the Cosumnes River Watershed. Trout Unlimited has a history of working to find win/win solutions that support the health of watersheds and communities.
- To identify trends in water quality.
- To evaluate the effectiveness of restoration and management practices (adaptive management).
- To involve volunteers in a hands on process of monitoring and improving the watershed in their region.

Relevant Basin Plan Water Quality Objectives to the Parameters Measured in 2015:  
(EDTU monitoring sites are considered COLD habitat beneficial use areas)

Dissolved Oxygen: 7.0 mg/liter min.  
Temperature: 5 degree F increase max after diversion (20 degrees centigrade max temp)  
pH: 6.5 min., 8.5 max

**4. Project/Task Description**

Parameters to be monitored by Citizen Scientist Teams:

- Temperature
- Dissolved Oxygen

- pH

Visual observations of site conditions and limited habitat and species surveys will be made at selected sites.

During the monitoring days, Cosumnes CDEC Stations at Main Stem Michigan Bar, North Fork in El Dorado, and Middle Fork at Somerset flows will be recorded to correlate with field measurements taken.

Parameters presently monitored by UC Davis, that will be included in reporting:

- Temperature (continuously)

During flood events:

- Dissolved oxygen
- Chlorophyll-a
- Turbidity
- Conductivity
- pH
- Nitrogen
- Phosphorous
- Carbon
- Zoo-plankton
- Benthic micro invertebrates

Project Timetable:

Table 4.1 Project Timetable

Activity	Task Completion
Recruit volunteer citizen scientists	Ongoing
Obtain and check operation of instruments	February 2015
Train volunteer citizen scientists	April 2015
Identify Team Leaders	April 2015
Provide training for Team Leaders	April 2015
Begin monitoring	May 2015
Begin data entry	May 2015
Perform calibration and quality control	Ongoing
Review data with Technical Advisors	December 2015
Citizen scientist monitoring/data management activities	May through November 2015



UC Davis monitoring/data management activities	Year Round
Upload data to CEDEN	December 2015

## 5. Data Quality Objectives

This section identifies how accurate, precise, complete, comparable, sensitive and representative our measurements will be. Objectives for these data characteristics are summarized in Table 5.1. Data quality objectives were derived by reviewing the QA plans and performance of other citizen monitoring groups (such as Wolf Creek Alliance, Friends of Deer Creek, and South Yuba River Citizens League).

Table 5.1

Data Objectives							
Parameter	Method/ Range	Units	Detection Limit	Resolution	Precision	Accuracy	Completeness
Temperature	Hobo Tidbit Datalogger	degrees centigrade	-20 to 70	.02	$\pm 1$	$\pm 0.21$	80.00%
Temperature	La Motte alcohol filled thermometer	degrees centigrade	0 to 50	.5	$\pm 1$	$\pm .3$	80.00%
Dissolved Oxygen	Hanna and La Motte modified Winkler Method Titration Kit	mg/liter	0 to 10	.1	$\pm 10\%$	$\pm 10\%$	80.00%
pH	Hanna pH Probe	pH units	0 to 14	.01	$\pm .2$	$\pm .2$	80.00%

### Accuracy:

Accuracy describes how close the measurement is to its true value. Accuracy is the measurement of a of a sample of known concentration or physical value and comparing the known value against the measured value. A standard is a known concentration of a certain solution. Standards can be purchased from chemical or scientific supply companies.

Instructions for determining accuracy:

Record results for each instrument that will be used by the citizen scientists in testing a known standard (which has the known true value). Determine the average value. Compare the average value to the true value (based on the standard). Compare this difference to the accuracy objective set in the previous

table. If the difference is greater, corrective action will be taken to improve performance. If need be, we will consult our Technical Advisors to determine appropriate corrective action.

### Comparability:

Comparability is the degree to which data can be compared directly to UC Davis' measurements on the Cosumnes Watershed. We will follow the procedures in the SWRCB Citizen Monitoring Compendium for Water Quality and Assessment and the U.S. EPA' Volunteer Monitoring Manuals for Streams, Lakes or Estuaries to ensure the data can be compared to others.

### Completeness:

Completeness is the fraction of planned data collection goal that must be collected in order to fulfill the statistical criteria of the project's required data needs. Measurements are not always able to be taken for a variety of reasons such as weather conditions, equipment problems, or safety concerns. For the purposes of this project, it is expected that 80% of measurements may be taken when planned.

Completeness will be determined by comparing the number of measurements we plan to take with the number of measurements we actually take that were also deemed valid. An invalid measurement is one that does not meet the sampling methods requirements and data quality objectives. Completeness results will be checked every two months. If we are not meeting our objectives, corrective action will be taken.

### Precision:

Precision describes how well repeated measurements agree. The precision objectives refer to the repeated measurements by different trained citizen scientists or the same individual on the same sample. Variability would also be expected if comparisons were made between different samples at the same location.

### Representativeness:

Representativeness is how relevant the data are to the actual environmental condition. Data is not representative if sample is taken in the wrong location (such as headwaters sample is taken downstream of a diversion) or if the sample is not analyzed or processed appropriately (such as measurements are not taken immediately), etc.

## **6. Training Requirements**

Citizen monitoring Team Leaders must participate in two hands on training sessions on water quality monitoring. The Clean Water Team Coordinator or an equivalently qualified instructor will initially teach one training class and the Monitoring Coordinator will teach the other. The following topics are covered under this training:

- Safety
- Ecology of riparian habitats
- Quality assurance and quality control measures
- Field measurement procedures
- Habitat and species assessment protocols
- Data recording

EDTU Program Leaders will examine monitoring kits for completeness of components; date, condition, and supply of reagents, and whether the equipment is in good repair. The EDTU QA Officer will check data quality by testing equipment against blind standards. The EDTU QA Officer will also ensure that monitors are reading instruments and recording results correctly. Sampling and safety techniques will also be evaluated. Certificates will be issued when results meet the quality objectives.

Trained Team Leaders may then train the rest of their team. Trainees are evaluated based on their performance of field measurement techniques by comparing their results to known values and to results obtained by trainers and other trainees. This may occur in a training environment or in a field audit.

Team Leaders will also participate in two quality control sessions held by EDTU during the monitoring period, May through November. The sessions will be used to review and test field measurement and assessment techniques. They will also be used to discuss the teams' experience with their monitoring efforts, answer questions or provide resources as needed. The Team Leader will demonstrate that their techniques meet the data quality objectives. If a Team Leader is unable to meet the objectives, the Monitoring Coordinator will retrain the Team Leader and assist with calibration of equipment, or schedule a another time to do so if necessary. The Team Leader will be asked to discontinue with monitoring activities until data quality objectives can be met.

## **7. Documentation and Records**

### Records Management:

Field results will be recorded at time of completion. Data sheets will be reviewed for outliers and omissions before leaving the monitoring site. The Team Leader will sign data sheets after review. Data sheets will be stored in hard copy form and archived for three years from the time they are collected. Data will be input electronically within a month of collection. Data will be protected using an electronic back up, as well as surge protection.

A maintenance log will also be kept at the same locations, that details dates of equipment inspection, calibration, and replacement of reagents, etc.

### Storage Locations of Data:

The data will be stored at 6840 Steely Ridge Rd. and at American River Conservancy at 348 Highway 49, Coloma, CA. The information will be uploaded to the CEDEN database, where it can be freely accessed. EDTU's intent is that the the data will be shared and used by the State Water Resources Control Board, the Central Valley Regional Water Quality Control Board, and upon request, to other state, federal, and local agencies and organizations.

## 8. Monitoring Process Design

### Site Selection Criteria:

Monitoring sites map and sensitive species map are included in Appendix 1. The following criteria were used to select monitoring sites:

- Representativeness
- Access is safe and legal
- Measurements can be taken in main river current or where mixing of water occurs
- Headwaters of each fork as a reference point
- Above and below (some) diversions
- Near likely sensitive species habitats
- Below diversion and ditch entry points
- Near potential wild trout designation area—North Fork
- Above and below the confluence of North Fork and Middle Fork
- Mainstem as it moves toward valley disconnect area
- A site chosen to reflect the impact of disturbances (such as a diversion) shall be located sufficiently downstream that the impact is completely integrated with the water, but upstream of any secondary discharge, disturbance, or diversion

All the sites will be monitored for temperature, dissolved oxygen, and pH, to bracket conditions across the watershed as diversions and other disturbances occur.

### Monitoring Site Information:

The Monitoring Coordinator will visit all monitoring sites. A Monitoring Information Sheet will be created for each site to describe conditions (that include photographs), per recommendations in the SWRCB Compendium for Citizen Water Quality Monitoring and Assessment. Sites are identified by GPS coordinates, as well as relative to known landmarks if possible (such as a bridge or diversion structure). If safety becomes an issue with any monitoring site, the Project Manager will select a new site, based on the above criteria. Safety is further addressed in the EDTU Cosumnes River Water Quality Monitoring Program Volunteer Field Manual.

### Monitoring Observations:

Teams at particular sites will also record visual observations of habitat, herps, and fish to the extent the reach is accessible. These observations will draw upon SWAMP Standard Operation Procedures for Rapid Habitat Assessment (4.2.2.2c), Herps Surveys (4.4.2.1), and Fish Surveys (4.5.1.2) to the extent possible.

### Monitoring Logistics:

Citizen scientists will work in teams of at least two people. If someone is unable to work, a substitute

will be found or the sampling will be canceled or delayed. No in stream sampling will be conducted if there are flood warnings/advisories. No sampling will be done if there are fires in the area.

Teams will be trained to take measurements in a well mixed, representative area of the stream. By having a well defined location to take measurements, bias by moving around the stream will be prevented.

Monitoring Event Schedule:

Monitoring will be done on Friday and Saturday of the third week of each month from May through November.

## 9. Field Measurement Requirements

Temperature, dissolved oxygen, and pH will be monitored using protocols outlined in SWRCB Standard Operating Procedures, found in the Clean Water Team Compendium and Appendix 2. The methods chosen were based on the following criteria:

- Ease of use
- Appropriate for site
- Provide data that meets EDTU's criteria
- Cost

Parameter	Method	Modification	Reference
Air Temperature	La Motte Alcohol filled Thermometer		SWAMP SOP 3.1.2.1 and Manufacturer's Instructions
Water Temperature	Hobo Tidbit Data Logger		Manufacturer's Instructions
Water Temperature	La Motte Alcohol Filled Thermometer		SWAMP SOP 3.1.2.1 and Manufacturer's Instructions
Dissolved Oxygen	Hanna and La Motte Dissolved Oxygen Titration Kit	Pre-packaged reagents	SWAMP SOP 3.1.1.2 and Manufacturer's Instructions
pH	Hanna Electronic Checker Meter		SWAMP SOP 3.1.4.3 and Manufacturer's Instructions

## 10. Quality Control Requirements

Quality control sessions will be held twice during the monitoring season to refresh volunteers in monitoring techniques and determine if quality objectives are being met. Reagent dates are checked during each sampling event, pH meter is calibrated before and after each event, and thermometers are calibrated at the two quality control sessions.

Parameter	Replicates	QC Session
Temperature	Three per event, four if measurement range is > 1 deg. C	Twice a year
Dissolved oxygen	Three per event, four if measurement range is > .3 mg/L	Twice a year
pH	Three per event, four if measurement range is > .2 units	Twice a year

## 11. Instrument/Equipment Testing, Inspection, Maintenance and Calibration Requirements

The Monitoring Coordinator keeps a maintenance and calibration log. This log records any problems with equipment and calibration information. Calibration will be conducted at the intervals described below for each parameter.

### Temperature:

The Hobo Tidbit is calibrated using a valid NIST certified thermometer at the beginning and end of the monitoring season. The La Motte bulb thermometer is calibrated at the beginning, end, and twice during the monitoring season, using the NIST certified thermometer.

### Dissolved Oxygen:

The reagents in the Hanna and La Motte Dissolved Oxygen titration kits expiration dates are checked before each monitoring event. Reagents are replaced before they exceed the manufacturer's recommended shelf life. Reagent replacement dates are noted in the maintenance log.

### pH:

Before each use, pH meters are checked to see if they are clean and in good working order. pH meters are compared with standards before and after each use. If the meter does not meet the accuracy standards, then a different pH meter will be substituted and/or results discarded. pH standards are replaced at least annually or prior to expiration date, whichever is sooner. pH standards are stored with the cap firmly in place and in dry place away from extreme heat. Standards will be purchased from La Motte or Hanna Instruments.

### Instrument Calibration Records:

Calibration records will be kept at a location where they can be easily accessed before and after a monitoring event. This will be at 6840 Stealy Ridge Rd, Somerset, CA and at American River Conservancy at 348 Highway 49, Coloma, CA.

## **12. Inspection/Acceptance Requirements**

Upon receipt, buffer solutions, standards and reagents used in the field kits will be inspected by the Monitoring Coordinator for leaks or broken seals, and to compare the age of each reagent to the manufacturer's recommended shelf life. All other monitoring equipment will be inspected for broken or missing parts, and will be tested to ensure proper operation.

## **13. Data Acquisition**

USGS maps will be used to verify watershed boundaries and river courses. Additional information on distribution of natural resources will be obtained from the Bureau of Land Management and the California Department of Fish and Wildlife's Biodiversity database. When information is requested from these agencies, they will be asked to provide appropriate metadata and any information on data limitations. This information will be maintained with the data files.

## **14. Data Management**

Field data sheets are checked and signed in the field by the Team Leader. The Team Leader will flag as unusable any results where precision information is missing or inadequate. The Monitoring Coordinator will also review the field data sheets for outliers or missing information or other problems. The Team Leader or Monitoring Coordinator will enter the data in the Microsoft Excel Spreadsheet created for that purpose. The data are also reviewed by the Technical Advisors in December, for the environmental implications of the data.

Data will be entered into an MS Excel spreadsheet using a format that is compatible with the CEDEN database guidelines. The Monitoring Coordinator will review the electronic data, compare to the original data sheets, and correct any entry errors. After performing data checks, and ensuring data quality objectives have been met, data analysis will be performed.

Raw data from temperature data loggers will be maintained in its original file form, as well as plotted and analyzed.

Raw data, once approved by the Technical Advisors, will be provided to the State Water Resources Control Board and the Regional Water Quality Control Board in electronic form via CEDEN at least once every year. Appropriate quality assurance information will be provided upon request. A report will be generated at the end of the monitoring season, analyzing the data and the quality of the data.

## **15. Assessment and Response Actions**

Review of all field and data activities is the responsibility of the Monitoring Coordinator. If data

results are out of range for aquatic creatures to survive or are surprising in some other way, the Technical Advisors will be consulted with. Citizen scientist teams will be accompanied by the Monitoring Coordinator, on at least one of their first 5 trips to their monitoring sites. If possible, citizen scientists in need of performance improvement will be retrained on site. All citizen scientists must attend a quality control refresher course by EDTU twice during the monitoring season. If errors in monitoring technique are consistently identified, retraining may be scheduled more frequently.

State and EPA quality assurance officers may review all field and laboratory activities and records.

## **16. Reports**

Raw data reports will be made available after approval by the Technical Advisors. Approved data and reports will be shared by EDTU and submitted to CEDEN, the State Water Resources Control Board and the Regional Water Quality Control Board for their data uses, annually at a minimum.

## **17. Data Review, Validation, and Verification**

Data sheets or data files may reviewed at the end of the monitoring year or more frequently by the Technical Advisors to determine if the data meets the Quality Assurance Project Plan objectives. They will identify outliers, spurious results or omissions to the Monitoring Coordinator. They will also evaluate compliance with the data quality objectives, presented in the yearly report. They will suggest corrective actions that will be implemented by the Monitoring Coordinator. Problems with data quality and corrective action will be reported in final yearly report. A quorum will be established ( $\frac{1}{2} + 1$ ) and used for Technical Advisory Committee decisions. If a quorum isn't present for a meeting, work can still proceed. The work product (review and comments on report of monitoring results and data quality) must then be sent out to the whole committee for approval with a 30 day review period. This approach will prevent delays and provide efficient and timely feedback to the Monitoring Coordinator, Field Teams, and Data Users such as the State Water Resources Control Board and the Regional Water Quality Control Board.

## **18. Validation and Verification Methods**

As part of standard field protocols, any monitoring readings out of the expected range will be reported to the Monitoring Coordinator. Three measurements are routinely taken; a fourth will be taken for comparison if need be to verify the condition and accuracy of the measurements. It is the responsibility of the Monitoring Coordinator to verify the readings and re-train the citizen scientist if necessary.

## **19. Reconciliation with Data Quality Objectives**

The Technical Advisory Committee will review the data in December 2015 to determine if the data quality objectives have been met. If the data do not meet the data quality objectives, the Technical Advisors will suggest corrective action. First, the Technical Advisors will review the errors and determine if the problem is equipment failure, calibration/maintenance techniques, or monitoring/sampling techniques. If the problem cannot be corrected by training, revision of



techniques, or replacement of supplies/equipment, then the Technical Advisors will review the data quality objectives and determine if they are feasible. If the specific data quality objectives are not achievable, they will determine if the specific data quality objective can be relaxed, or if the parameter should be eliminated from the monitoring program. Any revisions to the data quality objectives will be appended to this Quality Assurance Project Plan with the revision date and the reason for modification. The appended plan will be sent to the quality assurance panel that approved this plan. When the appended plan is approved, the Monitoring Coordinator will ensure that all data meeting the new data quality objectives are entered into the data spreadsheet. Archived data can also be entered.