



Klamath Tribes Quality Assurance Project Plan (QAPP)

TABLE OF CONTENTS

Section	Description	Page
---	Signature Sheet.....	3
---	Distribution List.....	4
1.0	Objective(s)	5
2.0	Reasons for revision and summary of changes.....	6
3.0	References.....	7
4.0	Definitions.....	9
5.0	Prerequisites.....	14
6.0	Precautions.....	15
7.0	Equipment and Supplies.....	16
8.0	Personnel Qualification/Responsibilities & Training.....	17
9.0	Procedure.....	18
9.1	Project Management Elements.....	18
	9.1.1 Project/Task Organization.....	18
	9.1.2 Problem Definition/Background.....	19
	9.1.3 Project/Task Description.....	20
	9.1.4 Quality Objective and Criteria for Measurement.....	21
	9.1.5 Special Training/Certification.....	22
	9.1.6 Documentation and Records.....	23
	9.1.7 Laboratory Conduct.....	24
9.2	Data Generation and Acquisition.....	25
	9.2.1 Sample Process Design (Experimental Design).....	25
	9.2.2 Sampling Method Requirements.....	27
	9.2.3 Sample Handling and Custody.....	29
	9.2.4 Analytical Methods.....	30
	9.2.5 Quality Control-External Quality Assurance Samples.....	31
	9.2.6 Quality Control Requirements.....	31
	9.2.7 Instrument/Equipment Testing, Inspection and Maintenance.....	33
9.3	Assessment and Oversight.....	34
	9.3.1 Assessments and Response Actions.....	34
	9.3.2 Reports to Management (Yearly).....	34
9.4	Data Validation and Usability.....	35
	9.4.1 Data Review, Validation, and verification Requirements.....	35
	9.4.2 Review and Verification Methods.....	35
	9.4.3 Reconciliation with Data Quality Objectives (DQO).....	37

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Klamath Tribes Quality Assurance Project Plan (QAPP)

TABLE OF CONTENTS

Section	Description	Page
10.0	Quality Control (QC) and Quality Assurance (QA).....	39
11.0	Data and Records Management.....	40
12.0	Attachments.....	41
1	Organization Chart.....	42
2	KTRS Sample Sites & Associated Water Quality Sub-Programs.....	43
3	KTRS Geomorphic Data Sites.....	44
4	External QA Sample Acceptance Criteria.....	45
5	Analytical Methods for Parameters.....	46
6	Container and Holding Times.....	47
7	Chain-of-Custody (COC) Form (Facsimile) [<i>Reference 3.1.6</i>].....	48
8	Chain of Custody (COC) Offsite Phytoplankton/Zooplankton Analysis Form (Facsimile) [<i>Reference 3.1.6</i>].....	49
9	Klamath Tribes Quality Assurance Project Plan (QAPP) Training Record	50

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Signature Sheet

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1.0 Objective

- 1.1 The following quality assurance and quality control procedures describe methods and procedures to ensure well-documented data of known quality.
- 1.2 The purpose of the monitoring program is to gather baseline water quality and quantity information for assessment of endangered/threatened fishes, provide information for use in water quality models, and to provide insight into past/future management strategies of water resources in the Upper Klamath Basin.
- 1.3 The baseline information and available water quality models will be used to assess the current water quality and quantity conditions that exist under present water resource management strategies.
- 1.4 The baseline data collected, including physical, chemical and biological water quality data, will be used to assess the current condition of the Upper Klamath Lake (UKL) watershed
 - 1.4.1 The parameters were chosen to support the assessment of future best management plans, the assessment of present restoration efforts in the basin, and to aid in the development of future restoration activities.
- 1.5 This program is scheduled to run from present until September 2024.

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Klamath Tribes Quality Assurance Project Plan (QAPP)

2.0	Reasons for revision and summary of changes	
	2.1	Changes were made to account for differences in protocol for the 2012-2013 Funding Year
	2.2	Format was updated to follow revised SOP format.
	2.3	EPA review changes incorporated
	2.4	BOR review changes incorporated
	2.5	10-1-2015
	2.5.1	Organizational changes reflected on organizational chart – Attachment 1 Reflecting staffing addition of Ecosystem Restoration Scientist
	2.6	1-3-2016
	2.6.1	Organizational changes reflected on organizational chart – Attachment 1 Reflecting the staffing addition of the following: <ul style="list-style-type: none"> • Aquatics Supervisor • Fluvial Geomorphologist • Administrative Assistant
	2.7	1-18-19
	2.7.1	Organizational changes reflected on organization chart – Attachment 1 Reflecting the staffing addition/changes of the following: <ul style="list-style-type: none"> • Environmental Scientist • Lead Chemist • Hydrologist • Hydrologic Technician I • Biologist I • (2) Aquatic Technician I • Water Rights Specialist

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**Klamath Tribes Quality Assurance Project Plan (QAPP)****3.0 References**

3.1 Standard Operating Procedures (SOPs)

NOTE: SOPs are located on local server in PDF format and available upon request.

3.1.1 KTRS-III-20, "Upper Klamath Lake Field Sampling"

3.1.2 KTRS-III-30, "Tributary Field Sampling"

3.1.3 KTRS-II-50, "Processing, Preparation, Preservation & Spiking Field Samples"

3.1.4 KTRS-III-80, "Managing and Deploying Thermographs"

3.1.5 KTRS-III-60, "Geomorphic Assessment Field Data Collection Data"

3.1.6 SRWQL-I-80, "Sample Receipt and Control"

3.2 USGS Surface Water Activities: http://pubs.usgs.gov/of/1995/of/95-777/sw_act.html3.3 USGS Collection of Water Samples:
http://water.usgs.gov/owq/FieldManual/chapter4/html/Ch4_contents.html

3.4 40 CFR Part 136, May 18, 2012

3.5 American Society for Quality Control (ASQC), Definitions of Environmental Quality Assurance Terms, 1996

3.6 The NELAC Institute (TNI), 2009 Standards

3.7 Webster's New World Dictionary of the American Language

3.8 US EPA Quality Assurance Management Section (QAMS), Glossary of Terms of Quality Assurance Terms, 8/31/92 and 12/6/95

3.9 US EPA Quality Assurance Division (QAD)

3.10 APHA 1998. Standard Methods for the Examination of Water and Wastewater, 20th Edition. American Public Health Association, New York3.11 Lind, O. T., 1985. Handbook of common methods in limnology, 2nd Edition, Kendall/Hunt Publishing Company, Dubuque, Iowa. 199 pp.

3.12 US BOR. Environmental Monitoring Branch, Standard Operating Procedures for Quality Assurance, Revision 2012-07.

3.13 US EPA. 1996. The Volunteer Monitor's Guide to Quality Assurance Project Plans. Office of Wetlands, Oceans and Watersheds 4503F. 59 pp.

3.14 US EPA. 1991. A Project Manager's Guide to Requesting and Evaluating Chemical Analyses. Office of Coastal Waters. 85 pp.

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Klamath Tribes Quality Assurance Project Plan (QAPP)

3.0 References

- 3.15 US EPA. 2001. EPA Requirements for Quality Assurance Project Plans – EPA QA/R-5. Office of Environmental Information. Washington, DC. 34 pp.
- 3.16 PhycoTech. Inc., 600 Broad Street, Suite 100 St. Joseph, MI 49085, 269-983-3654
info@phycotech.com
- 3.16 Patton, Charles. J., Gilroy, Edward J., U.S. Geological Survey Nutrient Preservation Experiment – Experimental Design, Statistical Analysis, and Interpretation of Analytical Results. Water-Resources Investigation Report 98-4118.
- 3.17 USGS Methods for non-acidified sample: USGS I-2525-89, USGS I-4650-03, USGS I-2542-89, USGS I-2700-85, USGS I-2548-11.

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**Klamath Tribes Quality Assurance Project Plan (QAPP)****4.0 Definitions/Abbreviations**

- 4.1 Acceptance Criteria Standards use to determine whether analytical results are in control within a particular analytical run. Acceptance criteria are established by the Quality Assurance Team and define acceptable limits in the areas of accuracy, precision, and contamination.
- 4.2 Accuracy The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components, which are due to sampling and analytical operations; a data quality indicator. (Usually expressed as Percent Recovery).
- 4.3 Analyst An individual who performs analytical methods and associated procedures and who is the one responsible for applying laboratory practices and other pertinent quality controls to meet the required level of quality.
- 4.4 Batch A group of samples, including quality control samples, which are processed together using the same method, the same lots of reagents, and at the same time or in continuous, sequential time periods. Samples in each batch should be of similar composition and share common internal quality control standards
- 4.5 Blank Sample A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.
- 4.6 Blank Spike A method blank spiked with known quantities of analytes. Its purpose is to assure that the results produced by the laboratory remain within the limits specified in this method for precision and recovery.
- 4.7 Chain of Custody (COC) Form Record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes: the number and types of containers; the mode of collection; the collector; time of collection; preservation; requested analyses; signatures and date/time of persons accepting and relinquishing samples.
- 4.8 Comparability A measure of the confidence with which one data set or method can be compared to another. This is achieved by collecting the samples in the same manner at the same sites over the life of the project.
- 4.9 Completeness A measure of the amount of valid data obtained from the analytical measurement system for a given project to the amount that was expected to be obtained. It is defined as the total number of samples taken for which valid analytical data are obtained divided by the total number of expected samples and multiplied by 100.

Preparing and analyzing samples using similar methods over the life of the project.

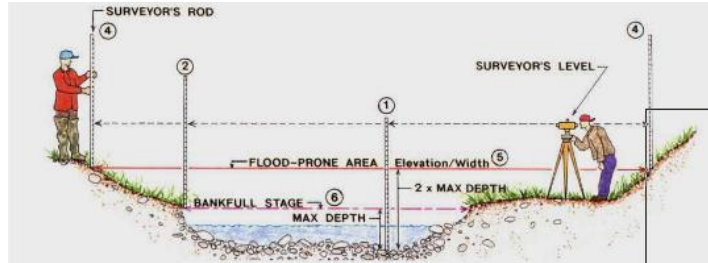
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4.0 Definitions/Abbreviations

- 4.10 Contamination Introduction of a parameter of concern at a concentration that makes the medium (water, soil, air, or other media) unfit to assess for that parameter.
- 4.11 Cross-Section A line across a stream perpendicular to the flow along which measurements are taken, so that morphological and flow characteristics of that section are described from bank to bank.



- 4.12 Data Quality Objective (DQO)s Qualitative and quantitative statements derived from the DQO Planning Process that clarify the purpose of the study, define the most appropriate type of information to collect, determine the most appropriate conditions from which to collect that information, and specify tolerable levels of potential decision errors.
- 4.13 Data Validation The process of performing a systematic review of the final data produced by a laboratory using predetermined criteria to ascertain the validity of the data with respect to the criteria.
- 4.14 Designee A person selected or designated to carry out a duty or role.
- 4.15 Double Blind Sample A sample submitted to evaluate performance with concentration and identity unknown to the analyst and laboratory.
- 4.16 Duplicate Sample A second sample collected at a selected quality assurance site, on the same day, at the same time, and from the same container as the regular sample. The duplicate sample is an external quality assurance sample and the result is compared to the regular sample result to evaluate the precision of both field and laboratory work.
- 4.17 Equipment Blank A sample of analyte-free media which has been used to rinse clean common sampling equipment to check effectiveness of decontamination procedures.
- 4.18 Field Blank Blank prepared in the field by filling a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken.
- 4.19 Finding A noncompliant practice or policy found during an audit which has a significant adverse impact on data quality, technical defensibility, or regulatory acceptance of data.
- 4.20 Geomorphology (1) Study of the changes in Geology or land features over time.
(2) Scientific study of landforms and the processes that shape them.

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Klamath Tribes Quality Assurance Project Plan (QAPP)

4.0 Definitions/Abbreviations

- 4.21 Hit A result greater than the reporting limit of the parameter for an analytical run.
- 4.22 Holding Time The maximum times that samples may be held, after the sample is taken, prior to analysis and still be considered valid or not compromised.
- 4.23 KTRS Klamath Tribes Research Station
- LIMS Laboratory Information management System (Element®)
- 4.25 Method Detection Limit (MDL) or Detection Limit (DL) The minimum concentration of an analyte that can be identified, measured and reported within 99% confidence that the analyte concentration is greater than zero. This is the statistical determination of precision and accurate quantitation is not expected at this level. The MDL is determined using the procedure at 40 CFR 136, Appendix B
- 4.26 Minimum Reporting Limit (MRL) The minimum concentration that can be reported as a quantitated value for a target analyte in a sample following analysis. This defined concentration can be no lower than the concentration of the lowest calibration standard for that analyte, and can only be used if acceptable quality control criteria for the analyte at this concentration are met.
- 4.27 NIST National Institute of Standards and Technology
- 4.28 Non-Detect (ND) A result obtained during an analytical run that is below the instrument's reporting limit (RL) or method detection limit (MDL).
- 4.29 Observation Practices or policies found during an audit which the auditor would like the laboratory to adopt to better ensure quality, technical defensibility, or regulatory acceptance of data.
- 4.30 Outlier An observation that is shown to have a low probability of belonging to a specified data population; any item rejected by the sampler, analyst, or data reviewer, usually accompanied by an attendant explanation.
- 4.31 Parameter An element or compound being measured.

- 4.32 Percent Recovery (%Rec) A measure of accuracy determined from the comparison of a sample's reported value to its true concentration

From a reference sample: % Rec = ((F/(MPV)) x 100,

Where F = reference sample value
MPV = most probable value

From a spike sample: % Rec = ((S-R)/(A)) x 100, where S = spiked sample result, R = regular sample result, and A = amount of spike added

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Klamath Tribes Quality Assurance Project Plan (QAPP)

4.0 Definitions/Abbreviations

- 4.33 Performance evaluation (PE) sample A sample of known composition that is used to assess analytical ability. It is usually submitted in conjunction with an upcoming audit.
- 4.34 Precision The consistency of measurement values quantified by measures of dispersion such as the sample standard deviation. Precision must be defined in context – e.g., for a certain analyte, matrix, method, perhaps concentration, lab or group of labs. (Expressed in terms of Relative Percent Difference (RPD))
- 4.35 Quality Assurance (QA) An integrated system of management activities involving planning, implementation, documentation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
- 4.36 Quality Assurance Project Plan (QAPP) A formal document describing in comprehensive detail the necessary quality assurance, quality control, and other technical activities that should be implemented to ensure that the results of the work performed will satisfy the stated performance criteria.
- 4.37 Quality Assurance Sample A sample that is incorporated into a batch of production samples to test the contract laboratory for accuracy, contamination or precision
- 4.38 Quality Control (QC) The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality.
- 4.39 Re-analysis; Rerun Repetition of analytical procedures by the laboratory for a single parameter or set of parameters pertaining to a sample or set of samples. Reanalysis is usually requested by the Quality Assurance Team following quality assurance evaluation of the original results.
- 4.40 Reference Sample A quality assurance sample composed of standard reference material. The data from this sample is used to evaluate laboratory accuracy.
- 4.41 Regular Sample A sample collected at a specific site selected by either the Quality Assurance Team or the Environmental Monitoring Team to be used as both a production sample and a quality assurance sample. The data from this sample is compared to data from a duplicate and/or spike sample to evaluate the precision and/or accuracy of both field and laboratory work.
- 4.42 Relative Percent Difference (RPD) Statistic for evaluating the precision of a duplicate set.
RPD = ((|X1-X2|)/((X1+X2)/2)) x 100, where X1 = Sample 1, and X2 = Duplicate Sample
- 4.43 Replicate A sample that was collected in the same location, at the same time, using the same method, and independently analyzed in the same manner, as a production sample. This sample measures uniformity of the grab or composite sample collected.
- 4.44 Reporting Limit The lowest concentration of the target parameter reported by the laboratory.

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**Klamath Tribes Quality Assurance Project Plan (QAPP)****4.0 Definitions/Abbreviations**

(RL)	The value is generally determined by multiplying the minimum detection limit by 2-5 times. Using the reporting limit instead of the minimum detection limit allows the laboratory to have increased confidence in the data since they are reporting parameter results above their minimum level of detection.
4.45 Representativeness	The degree to which data accurately and precisely represent a characteristic of a population, a variation in a physical or chemical property at a sampling point, or an environmental condition.
4.46 Single Blind Sample	(1) A sample submitted to evaluate performance with concentration unknown to the analyst. (2) A blind sample in which the concentration is unknown to the analyst, but is known to the provider.
4.47 Stream Slope or Gradient	Amount of vertical drop per unit of horizontal distance
4.48 SRWQL	Sprague River Water Quality Laboratory
4.49 Standard Operation Procedure (SOP)	A written document that details prescribed techniques and steps for an operation, analysis, or action. The document is the officially approved protocol for performing routine tasks.
4.50 Standard Reference Material (SRM)	Solution ordered from outside sources, such as private reference laboratories or government agencies, which are certified to contain one or more parameters at known concentrations.
4.51 Trip Blank (TB)	A sample bottle filled at the laboratory with DI water that remains unopened and is carried to the field and is stored and shipped with the environmental samples.
5.52 Turn Around Time (TAT)	The time it takes the laboratory to report the results once the samples have been received.
4.53 UKL	Upper Klamath Lake
4.54 Vertical	A location in the section identified by a tag-line distance where depth and velocity measurements are performed.
4.55 Watershed Assessment of River Stability and Sediment Supply. (WARSSS)	Geomorphology-based procedure for quantifying the effects of land uses on sediment relations and channel stability. Candidates for the WARSSS assessment include, but are not limited to Clean Water Act section 303(d) – listed streams with a variety of impairments that may be caused by sediment imbalances of channel instability.
4.56 Watershed	Area of land where all of the water that is under it or drains off of it goes into the same place.



Klamath Tribes Quality Assurance Project Plan (QAPP)

5.0 Prerequisites

- 5.1 All documentation should be in indelible ink.
- 5.2 Log books should be bound and pages numbered.
- 5.3 Errors are crossed off with a single line; the correction is initialed and dated.
- 5.4 All **glassware** is stored filled with DI water. When the glassware is needed, it is dumped, rinsed with 5% HCL, and rinsed 3 times with DI. Most glassware and labware are to be filled with DI water after use (before being washed), so contaminants are not allowed to dry.
- 5.5 Prior to use of any piece of laboratory or field equipment, refer to relevant SOP to ensure proper use and maintenance
- 5.6 Prior to performing tasks, ensure individuals are qualified to perform task independently.
- 5.7 Sample and Reagent Handling
 - 5.7.1 Minimize the length of time containers remain open.
 - 5.7.2 Always pour a small amount of stock standard or spike solution into a sample cup and use from that, never use from the original container.
 - 5.7.3 Always set caps such that the inside faces up. If a cap lands face down and touches a surface, rinse the cap three times with DI water.
 - 5.7.4 Always set volumetric flask stoppers such that the inner part does not contact other surfaces. If the inner part of the volumetric flask stopper touches a surface, rinse the inner part of the volumetric flask stopper three times with DI water.
 - 5.7.5 Avoid working over open bottles, caps or stoppers.
 - 5.7.6 Work slowly to avoid stirring up particles in the air that could contaminate the sample.
 - 5.7.7 Ensure pipette tips do not contact countertop, bottles, or other surfaces that could cause contamination.
- 5.8 Field Technician(s) and Field Supervisors will have Boat and Water Safety training prior to sampling.
- 5.9 All boat operators should have, at a minimum:
 - Department of Interior Motorboat Operator Certification Course
 - Oregon Boater Education Card

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**Klamath Tribes Quality Assurance Project Plan (QAPP)****6.0 Precautions**6.1 Lab Safety [*Reference 3.1.3*]

- 6.1.1 Use personal protective equipment when working in the lab, including gloves, a lab coat, close toed shoes and safety glasses.
- 6.1.2 Clean up spills immediately following acceptable procedures.
- 6.1.3 Dispose of chemicals and reagents properly.
- 6.1.4 Know the locations of the following:
 - safety shower
 - eyewash
 - fire extinguisher
 - emergency phone numbers
 - first aid kit
 - emergency exits
 - Emergency plan procedure 3-ring notebook
- 6.1.5 Work in fume hoods to avoid inhaling fumes when working with concentrated acids, reagent alcohol and acetone.
- 6.1.6 Return laboratory equipment, testing equipment, etc., to their proper location.
- 6.1.7 Observe clean hand/dirty hand protocols.

6.2 Field Safety [*Reference 3.1.1, 3.1.2, 3.1.4 and 3.1.5*]

- 6.2.1 Field technicians shall be wearing bright colored safety vest where appropriate and setup road signs indicating crew is working next to road(s).
- 6.2.2 **Rule of Thumb: Don't wade a stream if (Stream Depth) x (Velocity) \geq 10 ft²/s**
- 6.2.3 Observe clean hand/dirty hand protocols.

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7.0 Equipment and Supplies

7.1 Specific Equipment and Supplies [*Reference 3.1*]

7.1.1 See each referenced procedure for a detail list

7.2 General Equipment and Supplies

7.2.1 Powder-Free Nitrile gloves

7.2.2 Safety glasses

7.2.3 Laboratory wipes (Kimwipes)

7.2.4 DI water system (ASTM Type 1)

7.2.5 Dishwasher

7.2.6 Graduated cylinder(s)

7.2.7 Volumetric flasks, Class A

7.2.8 Beakers (plastic and Pyrex)

7.2.9 High Density polyethylene sample containers

7.2.10 Certified calibration stock solutions

7.2.11 Pipettes and tips

7.2.12 Refrigerator

7.2.13 Freezer

7.2.14 Calculator(s)

7.2.15 Preservatives

7.2.16 Acid (5% HCL) for rinsing containers

7.2.17 Analytical Electronic balance ($\pm 0.0001\text{g}$)

7.2.18 Analytical Electronic balance ($\pm 0.1\text{g}$)

7.2.19 Vacuum pump(s)

7.2.20 Thermometer(s) (NIST, digital, thermal)

7.2.21 Waterproof Field Notebook



Klamath Tribes Quality Assurance Project Plan (QAPP)

8.0 Personnel Qualification/Responsibilities and Training

- 8.1 Training and re-qualification should accompany all procedures upon revisions.
- 8.2 Technicians must be qualified prior to performing tasks independently.

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**Klamath Tribes Quality Assurance Project Plan (QAPP)****9.0 Procedure****9.1 Project Management Elements****9.1.1 Project/Task Organization**

- .1 The Klamath Tribe Research Station (KTRS) as part of the Klamath Tribes Natural Resources Department, works on a wide variety of natural resource and environmental research activities. Some of these activities encompass field data collection and laboratory analysis of biological and chemical substances. Methods and processes in this document establishes and ensures documented data of known quality.
- .2 Aquatics Supervisor or designee has overall responsibility for the project plan, periodically reviews data and approves yearly report. In addition, works with Aquatics Ecosystem Sciences in reviewing data on a periodic time frame to ensure applicable QA/QC results and issues.
- .3 PhycoTech, Inc. is an external laboratory that evaluates Zooplankton and Algae speciation of UKL grab samples.
- .4 Sprague River Water Quality Laboratory (SRWQL) analyzes nutrients, Turbidity, Total Suspended Sediment (TSS) samples, Suspended Sediment Concentration (SSC), Chlorophyll-a, Phaeophytin, silica, and microcystins.
- .5 Water Quality Technician III job duties include QA responsibilities i.e., QA manager.
- .6 The Lead Chemist or designee will assume responsibility for maintaining the QA Project Plan.
- .7 Fluvial Geomorphologist assumes the responsibility for tributary physical properties, analysis and trending of stream morphology.
- .8 Organization Chart (Attachment 1)

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Effective Date:	1/1/2013	Amended Date:	7/18/2019
		Revised By:	Travis Bartholomew, Mark Buettner



Klamath Tribes Quality Assurance Project Plan (QAPP)

9.1.2 Problem Definition/Background

- .1 The Upper Klamath Basin above Upper Klamath Lake (UKL) in south-central Oregon is the region relied upon by the Klamath Tribes for our physical and spiritual well-being. As a result of intensive land use over the past century, resources provided by this land have experienced dramatic declines and extinctions. Of particular concern is the present highly degraded condition of the UKL catchment, a concern that is not unique to the tribes. Virtually all resource-oriented state and federal agencies in the basin as well as many private groups and landowners, have become involved in some aspect of the challenges presented by this problem.
- .2 The KTRS has been involved in extensive water quality monitoring of Upper Klamath Lake since 1988. Since then we have continued the UKL monitoring and have intensively monitored UKL tributaries (since 2001). Monitoring programs have continued with the help of numerous funding agencies, with the hopes of developing numerical models that will help predict/prevent point and non-point source nutrient loading from the watershed. Ideally, these efforts will reduce the toxic algal effects associated with UKL and return endangered species to harvestable levels for all residents of the basin.
- .3 The KTRS monitoring program provides baseline information on the conditions of the Upper Klamath Lake and its watershed. The KTRS collects information such as physical, chemical, and biological water quality constituents. These constituents will be used to characterize water quality in the UKL and its tributaries. Information gained from this monitoring will be used to estimate potential restoration activity successes.



Klamath Tribes Quality Assurance Project Plan (QAPP)

9.1.3 Project / Task Description

- 9.1.3.1 Each revision of the QA Project Plan (QAPP) should be completed within the first quarter of the year.
- 9.1.3.2 Final data review and annual report should be completed by October first of the year the data is collected.
- 9.1.3.3 KTRS monitors the Upper Klamath Lake (UKL) and main stems of the following streams and their tributaries.
- 9.1.3.4 KTRS continuously monitors tributaries morphology and temperature.
- 9.1.3.5 All tributaries sampling is continuous, i.e. yearly, bi-weekly sampling schedule.
- 9.1.3.6 Upper Klamath Lake (UKL) starts the last week in April and finishes the third week of October, and has a bi-weekly sampling schedule.
- 9.1.3.7 Multiple water quality sampling sub-programs are included within this design, distributed as described in the following: (Attachment 2 and Attachment 3).
 - .1 Bi-weekly grab samples (Grab)
 - .2 Instantaneous acquisition of physical parameters with YSI multi-probe sonde instrumentation (Profile or Probe)
 - .3 Continuous acquisition of physical parameters with the deployment of multi-probe instrumentation (Sonde)
 - .4 Continuous acquisition of temperature with deployment of temperature Dataloggers (Tw)
 - .5 Periodic discharge measurements are collected with a RiverPro® Acoustic Doppler Current Profiler or Flowtracker® by Sontek.
 - .6 Zooplankton and Algae speciation. (Grabza) – Bi-weekly
 - .7 Suspended Sediment Concentration (SSC) – During High Flow Events (seasonal peaks in the natural hydrograph)
 - .8 Geomorphic Assessments (WARASS methodology) – Yearly

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Klamath Tribes Quality Assurance Project Plan (QAPP)

9.1.4 Quality Objectives and Criteria for Measurement

9.1.4.1 Project Objectives

- .1 The purpose of this monitoring program is to gather baseline water quality and quantity information for assessment of endangered/threatened fishes, provide information for use in water quality models, and to provide insight into past/future management strategies of water resources in the Upper Klamath Basin. The baseline information and available water quality models will be used to assess the current water quality and quantity conditions that exist under present water resource management strategies. The baseline data collected including physical, chemical, and biological water quality data will be used to assess the current condition of the UKL and its watershed. The parameters were chosen to support the assessment of future best management plans, the assessment of present restoration efforts in the basin, and to aid in the development of future restoration activities.

9.1.4.2 Scope of Work

- .1 This program is scheduled to run from now until September 2024. Chemical, biological, and physical parameters affecting the water quality for aquatic life in the UKL and its watershed will be measured and assessed.

9.1.4.3 Data Assessment

- .1 All external check samples submitted are double-blind samples.
- .2 To evaluate external Quality Assurance samples, KTRS will follow the protocols outlined in Attachment 5 for chemical, biological, and physical parameters.
- .3 Part of this analysis may include reanalysis of external QA check samples for project parameters or the whole sample set associated with the external QA check samples for certain parameter, if external QA check sample results are not confirmed upon reanalysis.
- .4 The laboratory's QC check samples must also meet certain levels of acceptability, when analyzed with the production samples (Attachment 4).
- .5 To ensure data quality, QA personnel will assess laboratory data packages to determine if all samples and any reanalysis of QA check samples were analyzed within the holding times (Attachment 6).
- .6 Rounding results
 - .1 **IF** the number following those to be retained is less than 5, round down;
IF the number following those to be retained is greater than 5, round up; **OR**,
IF the number following the last digit to be retained is equal to 5, round down if the digit is even, or round up if the digit is odd.

9.1.4.4 Completeness

- .1 Completeness criterion is 80%.

9.1.4.5 Representativeness

- .1 Sample sites are selected to maximize the representativeness of the samples.



Klamath Tribes Quality Assurance Project Plan (QAPP)

9.1.5 Special Training / Certification

9.1.5.1 All field personnel (Water Quality Technician III, II and I, Environmental Scientist, Aquatics Supervisor and others as deemed by the Aquatics Supervisor) will attend refresher training course on new version of this QAPP.

.1 Environmental Scientist or designee will lead the discussion and review.

9.1.5.2 Training Records should be completed (Attachment 7).

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Effective Date:	1/1/2013	Amended Date:	7/18/2019
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Klamath Tribes Quality Assurance Project Plan (QAPP)

9.1.6 Documentation and Records [Reference 3.1.1, 3.1.2, 3.1.4 and 3.1.5]

- 9.1.6.1 See Section 11.0 of this document for data retention and backup.
- 9.1.6.2 Field data sheets will be filled out at location of sampling site.
- 9.1.6.3 Field data sheets will be filed with laboratory data sheets, YSI calibration and maintenance forms, chain of custody forms, and data quality review sheets.
- 9.1.6.4 Equipment Calibration Sheet
 - .1 Calibration data prior to sampling
 - .2 Calibration/verification data post sampling
- 9.1.6.5 Field QC Sample Log Book
 - .1 QA designee documents the field QC sample(s) with associated field sample(s).
 - .2 QC schema is verified by second party before sampling.
- 9.1.6.6 Analytical Report
 - .1 Sprague River Water Quality Laboratory (SRWQL) produces the analytical report via Laboratory Information management System (LIMS).
 - .2 Documents the analytical results for each parameter analyzed on each sample submitted for analysis.
 - .3 Report contains:
 - Analytical results (unit concentration)
 - Detection Limit (DL) and Reporting Limit (RL) for parameters
 - Date sample collected
 - Date sample received
 - Date sample reported
 - Laboratory QC results (upon request)
- 9.1.6.7 Data Assessment / Data Tables
 - .1 Spreadsheet table(s) data will be used for inclusion in water quality reports.
 - .2 Assessment of water quality data will occur to pinpoint possible quality concerns, as well as trends or changes in water quality over time.
 - .3 Approximately ten (10) years of data will be compiled into an initial monitoring assessment. Follow-up reports will occur every two (2) years.

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Klamath Tribes Quality Assurance Project Plan (QAPP)

9.1.7 Laboratory Conduct [Reference 3.1.1, 3.1.2, & 3.1.3]

9.1.7.1 Laboratory Safety (see section 6.1 of this SOP)

9.1.7.2 Field Safety (see section 6.2 of this SOP)

9.1.7.3 Communication

.1 Communication is an essential part of teamwork. Two-way communication can occur between all personnel. Knowledge of the following information can simplify QA sample incorporation and sample shipment:

- Sample holding times
- Estimated time of sample arrival
- Number of samples collected
- Sample size
- Type of QA collected or required
- Laboratory reported limits (RL)
- Historical data

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Klamath Tribes Quality Assurance Project Plan (QAPP)

9.2 Data Generation and Acquisition

9.2.1 Sample Process Design (Experimental Design)

9.2.1.1 This program is divided into 8 different sub-programs; each designed to provide an assessment of the UKL and its watershed.

9.2.1.2 Aquatics Supervisor or designee authorizes changes on sampling based on conditions, personnel, and equipment availability.

9.2.1.3 Sites are identified by GPS location (Attachment 2 and Attachment 3).

9.2.1.4 Sites inaccessible due to environmental conditions are re-visited as soon as conditions warrant sampling.

9.2.1.5 Instantaneous Acquisition of Physical Parameters (Profile or Probe)
[Reference 3.1.1 & 3.1.2]

- .1 Sprague River and Wood River watersheds are sampled on a biweekly schedule throughout the year.
- .2 UKL is measured biweekly during the period of the last week in April to the first week in October.
- .3 Parameters include:
 - Temperature
 - Dissolved oxygen
 - pH
 - Specific conductance
 - ORP
- .4 Measurements in UKL are obtained at surface (0.1 m), 0.5 m, 1.0 m, and at one meter intervals until the bottom is reached (Profile).
- .5 The probes of the YSI® units are approximately 0.1 m above the sediment for the bottom reading.

9.2.1.6 Grab Samples (Grab): (Attachment 2) [Reference 3.1.1 & 3.1.2]

- .1 Target parameters include:

<ul style="list-style-type: none"> • Total Suspended Solids (TSS) • Turbidity • Ammonium (NH₄)⁺ • Nitrate+Nitrite as N • Total Nitrogen (TN) • SSC 	<ul style="list-style-type: none"> • Total Phosphorus (TP) • Orthophosphate (SRP) • Chlorophyll-<i>a</i>, phaeophytin-<i>a</i> • Silica • Nitrite (NO₂)⁻¹ • Microcystins
--	--
- .2 This list of parameters may differ from site to site within the monitoring programs (See Attachment 2).

9.2.1.7 Discharge Measurements [Reference 3.1.1]

Author(s):	Craig Spoonemore (CS)	Contact:	Travis Bartholomew
Effective Date:	1/1/2013	Amended Date:	7/18/2019
		Revised By:	Travis Bartholomew, Mark Buettner

**Klamath Tribes Quality Assurance Project Plan (QAPP)**

- .1 Sprague River and Wood River watersheds are sampled on a biweekly schedule throughout the year.
- .2 Measurements are made using a RiverPro® Acoustic Doppler Current Profiler or Flowtracker® by Sontek.
- .3 Discharge measurements will conform to USGS standards and a minimum of 20 verticals will be measured at each cross-section.
- .4 Every vertical discharge will be kept below 5% of the total discharge measurement as required by USGS.

9.2.1.8 Algal Speciation [*Reference 3.1.1*]

- .1 UKL is measured biweekly during the period of the last week in April to the first week in October.
- .2 Samples are collected in a composite tube sampler and preserved with Glutaraldehyde solution before being sent out for classification.

9.2.1.9 Zooplankton Speciation [*Reference 3.1.1*]

- .1 UKL is measured biweekly during the period of the last week in April to the first week in October.
- .2 Samples are collected in a 30 L Schindler-Patalas Plankton Trap and preserved in ethanol before being sent out for classification.

9.2.1.10 Water Temperature Study [*Reference 3.1.4*] (Attachment 3)

- .1 Water temperature is monitored with Onset® HOBO Datalogger® temperature loggers.
- .2 Loggers are placed at multiple locations throughout the Upper Klamath Basin watershed.
- .3 Dataloggers sampling frequency is one hour.
- .4 Dataloggers are pre-calibrated prior to deployment.
- .5 Data retrieved on a monthly schedule throughout a year.

9.2.1.11 Suspended Sediment Concentration (SSC) (Attachment 3)

- .1 Samples collected on “High Flow” events.
- .2 High Flow events are seasonal peaks in the natural hydrograph and the frequency of samples collection vary with these events.

9.2.1.12 Geomorphic Assessment [*Reference 3.1.5*] (Attachment 3)

- .1 As projects develop
- .2 Projects are assessed at an interval of two (2) years.
- .3 Assessment utilizes WARSSS methodologies.

**Klamath Tribes Quality Assurance Project Plan (QAPP)****9.2.2 Sampling Method Requirements** [*Reference: 3.1.1 and 3.1.2*]

- 9.2.2.1 All water samples will be collected using the grab-sample method.
- 9.2.2.2 All sample bottles are rinsed three (3) times with environmental water prior to filling with sample.
- 9.2.2.3 Samples will be collected using a clean sample bottle, churn splitter or Van Dorn sampler, appropriate to site conditions.
- .1 A churn splitter or sample bottle will be used to collect water from the river's shore.
 - .2 A Van Dorn sampler and churn splitter will be used to collect water from bridges and boats.
- 9.2.2.4 A multi-probe instrument (YSI®) will be used to measure the physical parameters (pH, specific conductance, dissolved oxygen, water temperature, and ORP) of the environmental water.
- 9.2.2.5 Churn Splitter [*Reference 3.1.1 & 3.1.2*]
- .1 The churn splitter allows different sub-sample volumes to be obtained from the composite sample while still maintaining the same basic chemical and physical properties of the original sample. The volume of the churn splitter limits the volume of sample that can be divided. Suspended inorganic sediments coarser than 62 micrometers (μm) cannot be split. Samples may be taken from a plastic churn splitter for analysis of all other dissolved and suspended inorganic constituents. Sub-samples totaling 10 liters may be withdrawn from the 14-liter churn splitter. The 4 liters remaining in the 14 liter churn should not be used for unfiltered sub-samples because they will not be representative.
- 9.2.2.6 Van Dorn Sampler [*Reference 3.1.1 & 3.1.2*]
- .1 The Van Dorn sampler is used to collect samples from a site where it is not possible to directly fill the sample bottle or churn splitter. (e.g., reservoir sampling from a boat or river sampling from a bridge). The Van Dorn sampler is then lowered down a rope below the water's surface (predetermined by water level and verticals taken; usually 1 meter below the surface), the trigger mechanism is activated by sliding the messenger down the rope, and then elevated to the sampling platform. The water is then poured from the Van Dorn sampler into the churn splitter.
- 9.2.2.7 Grab Sample [*Reference 3.1.1 & 3.1.2*]
- .1 The sample bottle or churn splitter is used to collect a water quality grab sample.
 - .2 Samples are stored in a cooler at approximately 4 ± 2 °C.



Klamath Tribes Quality Assurance Project Plan (QAPP)

9.2.2.8 Filtering and Preservation of Water Samples [*Reference: 3.1.3*]

- .1 All filtering and preservation will take place at the Sprague River Water Quality Lab (SRWQL) to minimize contamination.
- .2 Sample Bottle Requirements (Attachment 6)
- .3 Water samples (ammonia, nitrate-nitrite, silica, orthophosphate (SRP) are filtered using a vacuum pump, 300 ml magnetic filter funnel (Pall Gelman®), and a 47 mm 0.45 µm sterile membrane filter (Millipore®)¹.
- .4 Water samples, Total Nitrogen and Total Phosphorous, will be acid preserved, (1 mL of 4.5 N H₂SO₄ /125 mL of sample).

9.2.2.9 Sample Quality Assurance [*Reference 3.1.1 &3.1.2*]

- .1 Trip Blank
- .2 Equipment Blank
- .3 Duplicate

¹ - Patton, Charles. J., Gilroy, Edward J., U.S. Geological Survey Nutrient Preservation Experiment – Experimental Design, Statistical Analysis, and Interpretation of Analytical Results. Water-Resources Investigation Report 98-4118.

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**Klamath Tribes Quality Assurance Project Plan (QAPP)****9.2.3 Sample Handling and Custody [Reference - Attachment 6]**

9.2.3.1 Labeling for field samples should include the following:

- .1 All sample labels should include a unique identifying number generated from LIMS.
- .2 Site identification
- .3 Time
- .4 Station
- .5 Analysis
- .6 Samplers name

9.2.3.2 Raw sample(s) are stored in a ice chest at approximately 4°C.

9.2.3.3 Raw Sample(s) Analyte Processing: [Reference 3.1.5]

- .1 SRP, NO₃+NO₂, NO₂, silica, and NH₄: Filtered and stored into individual amber 125 mL HDPE containers, and stored at ≤ 6°C to prevent degradation¹.
- .2 Total Nitrogen and Total Phosphorus: Preserved with 4.5N H₂SO₄ and stored into individual amber 125 mL HDPE containers, and stored at ≤ 6°C to prevent degradation.
- .3 Chlorophyll-a & Pheophytin-a: Filtered and stored at -20±3°C.
- .4 Turbidity: 60 mL HDPE container and stored at ≤ 6°C to prevent degradation.
- .5 Total Suspended Solids: 1 Liter HDPE container and stored ≤ 6°C to prevent degradation.
- .6 Suspended Sediment samples collected in one (1) liter HDPE and stored at room temperature.
- .7 Microcystins samples are stored refrigerated in 50 mL amber glass vials or frozen if stored for longer than five days.
- .8 Zooplankton: Preserved with 90% Reagent alcohol and stored at room temperature.
- .9 Algae: Preserved with 2.5 mL of Glutaraldehyde and stored at room temperature.

9.2.3.4 Chain of Custody is completed and signed (Attachment 7)

9.2.3.5 Shipping Requirements for Off-Site Analysis of Zooplankton and Algae speciation(Attachment 8)

- .1 The chain of custody (COC) sheet(s) accompanies all batches of samples submitted. It must be signed by all parties receiving, handling, and relinquishing the samples, from time of collection to the time of sample delivery to the laboratory.

¹ - Patton, Charles. J., Gilroy, Edward J., U.S. Geological Survey Nutrient Preservation Experiment – Experimental Design, Statistical Analysis, and Interpretation of Analytical Results. Water-Resources Investigation Report 98-4118.



Klamath Tribes Quality Assurance Project Plan (QAPP)

9.2.4 Analytical Methods

- 9.2.4.1 The analyses selected were based on previous analyses of UKL water and requirements for water quality models.
- 9.2.4.2 The Sprague River Water Quality Laboratory (SRWQL) will be responsible for the analysis of Total Nitrogen, ammonia, nitrate+nitrite, nitrite, nitrate, Total Phosphorus, Soluble Reactive Phosphorus (SRP), silica, turbidity, microcystins, Total Suspended Solids (TSS) and Suspended Sediment Concentration (SSC) (Attachment 5).
- 9.2.4.3 Sprague River Research Station water quality technicians will be responsible for acquiring (Utilizing the YSI Sonde) and documenting pH, specific conductivity, dissolved oxygen, temperature and oxidation potential (Attachment 5).
- 9.2.4.4 Biologist 1 will be responsible for temperature data loggers data and geomorphic assessment data (Attachment 3).
- 9.2.4.5 PhytoTech, Inc. will be responsible for Zooplankton and Algae speciation.

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Klamath Tribes Quality Assurance Project Plan (QAPP)

9.2.5 Quality Control – External Quality Assurance Samples

Klamath Tribes Research Station (KTRS) incorporates QA check samples into a batch of production samples submitted to a laboratory. The laboratory must meet certain standards of acceptance on these QA samples. For this project, the standards of acceptability for the QA check for the data to be approved as reliable are described in this section.

9.2.5.1 Accuracy

- .1 **Percent Recovery** A measure of accuracy determined from a reference sample is calculated as follows:

$$\% \text{ Rec.} = ((F / (\text{MPV})))(100)$$

%Rec. = percent recovery
F = reference sample result
MPV = most probable value

9.2.5.2 Precision

- .1 **Duplicates**
 - For values > 5X Detection Limit, $RPD \leq 20\%$.
 - For value(s) $\leq 5X$ Detection Limit, values may vary \pm Detection Limit.
- .2 **RPD** A statistic for evaluating the precision of a duplicate set. For duplicate results X1 and X2:

$$RPD = ((X1 - X2) / ((X1 + X2) / 2)) (100)$$

9.2.5.3 Contamination

- .1 **Blanks**
 - Blank concentration should be less than 10% of lowest sample concentration **OR** $\leq 2X$ the Detection Limit.

9.2.5.4 Completeness % completeness = $V/n \times 100$

where: V = number of measurements judged valid
n = total number of measurements

9.2.5.5 All data entered into Excel® by KTRS is subject to a thorough secondary review before being released to other interested parties.

9.2.6 Quality Control Requirements

9.2.6.1 Each field sampling crew will incorporate the following, at a minimum, per sampling event:

- .1 (1) DI Blank sample
- .2 (1) Trip Blank sample
- .3 (1) Equipment (rinsate) Blank sample (first sampling site)
- .4 (1) Duplicate sample

9.2.6.2 Field samplers will label all external QA check samples with identifications similar to regular samples so they can pass as double blind samples.

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Effective Date:	1/1/2013	Amended Date:	7/18/2019
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Klamath Tribes Quality Assurance Project Plan (QAPP)

- 9.2.6.3 The QA officer or designee ensures that field personnel properly prepare external QA check samples.
- 9.2.6.4 The laboratory will incorporate their own QC check samples, including duplicates, and blanks, to ensure data reliability. Laboratory QC check sample results are reported to the client as QC summary reports.

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**Klamath Tribes Quality Assurance Project Plan (QAPP)****9.2.7 Instrument / Equipment Testing, Inspection and Maintenance**

9.2.7.1 All Field Equipment will be calibrated and inspected in accordance with the referenced SOP.

- .1 YSI Multi-parameter Sondes [*Reference 3.1.1 and 3.1.2*]
- .2 Current meters [*Reference 3.1.1 and 3.1.2*]
- .3 Thermographs [*Reference 3.1.4*]

9.2.7.2 Laboratory Analytical Balance(s)

- .1 All balances are cleaned and calibrated professionally on an annual basis by an outside vendor.
- .2 Prior to each use the analytical balance is cleaned and the balance level is checked using the internal bubble level. The balance is then zeroed and checked against the internal weight calibration. The results of the check against the internal weights are recorded internally and on the "Equipment Monitoring" data sheet. –Note: Only Chemists shall adjust the physical aspects of the balance.
- .3 Primary / Secondary weights are used to check the accuracy and precision of the internal weights daily.
- .4 All daily data will be recorded on the "Equipment Monitoring" data sheet.

9.2.7.3 Pipets

- .1 All pipets are checked quarterly for accuracy and sent out for cleaning and recalibration as needed by an outside vendor.

9.2.7.4 Refrigerator

- .1 Refrigerators are checked daily against a NIST certified thermometer.
- .2 All monthly data will be recorded on an "Equipment Monitoring" data sheet.

9.2.7.5 Freezer

- .1 Freezers are checked daily against a certified NIST thermometer to assure they are staying within recommended temperatures.
- .2 All monthly data will be recorded on an "Equipment Monitoring" data sheet.

9.2.7.6 Thermometer(s)

- .1 All thermometers are verified over the range of use annually using a certified NIST reference thermometer. Inaccurate thermometers are replaced or recalibrated by an outside vendor.
- .2 An in-house NIST reference thermometer is sent out for recertification annually.

**Klamath Tribes Quality Assurance Project Plan (QAPP)****9.3 Assessment and Oversight****9.3.1 Assessments and Response Actions**

9.3.1.1 Three-tier laboratory audits.

- .1 Environmental Scientist or designee will perform laboratory audits.
- .2 Review of laboratory QA/QC manual
- .3 Reviewing laboratory's Performance Evaluation sample results
- .4 Conducting an on-site system audit of the laboratory:
 - expertise in conducting analyses
 - capability for producing valid data
 - ability to effectively support the data
 - integrity of the QA/QC practices
- .5 Laboratory audits are conducted every three (3) years.
- .6 Audit reports are issued to the laboratory.
- .7 Laboratory issues findings response with corrective action(s).

9.3.1.2 Field audits

- .1 Environmental Scientist or designee will perform laboratory audits.
- .2 Observation of sample collection process
- .3 Reviewing SOP's
- .4 Reviewing Performance Evaluation sample results
- .5 Field audits are conducted every 2 years.
- .6 Audit reports are issued to the sampler and supervisor or designee.
- .7 The supervisor or designee are responsible for issuing corrective actions for identified findings.

9.3.1.3 Documentation

- .1 Twice a year the following are reviewed by the Environmental Scientist or designee:
 - field logbook(s)
 - field instrument calibration sheet(s)

9.3.2 Reports to Management (Yearly)

9.3.2.1 Yearly Project Report will be constructed by the Environmental Scientist or designee for the following content:

- .1 Summary of Field activities
- .2 Tabulation of validated analytical and field results
- .3 Field Sampling maps and diagrams
- .4 Deviations from project plan
- .5 Comparison of previous studies
- .6 Project beginning and ending dates

**Klamath Tribes Quality Assurance Project Plan (QAPP)****9.4 Data Validation and Usability****9.4.1 Data Review, Validation, and Verification Requirements**

9.4.1.1 KTRS will review and verify all data generated from this program. The laboratory's QC check samples must meet certain levels of acceptability when analyzed with the regular samples. These levels of acceptability are set at certain limits found in the methods. Part of the data verification process involves checking these laboratory QC check sample results to ensure they are within acceptable ranges. If a laboratory QC check sample fails to demonstrate an acceptable result, the anomaly must be explained with a footnote or included in the case narrative section of the data report. In order to ensure data quality, QA personnel will assess laboratory data packages to determine if all samples were analyzed within the holding times.

9.4.2 Review and Verification Methods

9.4.2.1 Evaluation of Data with Incorporated QA Samples

- .1 Whenever possible, external QA samples are incorporated into the batch of production samples to assess laboratory accuracy, precision, and potential contamination. By evaluating the external QA samples, the validity of the analytical results of the lab can be assessed.
- .2 When the lab analytical report is received, it is evaluated by doing the following:
 - .1 Verify that parameters were analyzed within their holding times.
 - .2 Calculate the precision and evaluate the result against the QA acceptance criteria for each set of regular and duplicate samples for each parameter.
 - .3 Calculate the accuracy and evaluate the result against QA acceptance criteria for each spike for each parameter.
 - .4 Evaluate the potential contamination against QA acceptance criteria for each field blank, equipment blank, and DI blank.

9.4.2.2 Evaluating the Contract Laboratory Internal QC Data

- .1 The lab will include a report of their internal QC data with the analytical results that will include blanks, and duplicates. Data needs to be reviewed to verify that the results meet the appropriate acceptance criteria.
- .2 The acceptance criteria are established by the laboratory with control charts, or are set at certain limits found in the methods.
- .3 If any of the results do not meet acceptance criteria, the lab should explain the unacceptable values on the report in a footnote or in the case narrative section of the report.

Continued on Next Page

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Effective Date:	1/1/2013	Amended Date:	7/18/2019
		Revised By:	Travis Bartholomew, Mark Buettner



Klamath Tribes Quality Assurance Project Plan (QAPP)

9.4.2.3 Requesting Re-analysis from the Laboratory

- .1 Re-analysis requests should be made by calling or emailing the contract lab. Parameters measured at the SRWQL can be addressed by contacting the Lab Manager or Analyst.
- .2 Re-analysis request should include the following information:
 - .1 The batch/laboratory ID number
 - .2 The field ID number(s) of the sample(s) to be reanalyzed
 - .3 The parameter(s) to be reanalyzed
 - .4 The data result in question from the analytical report

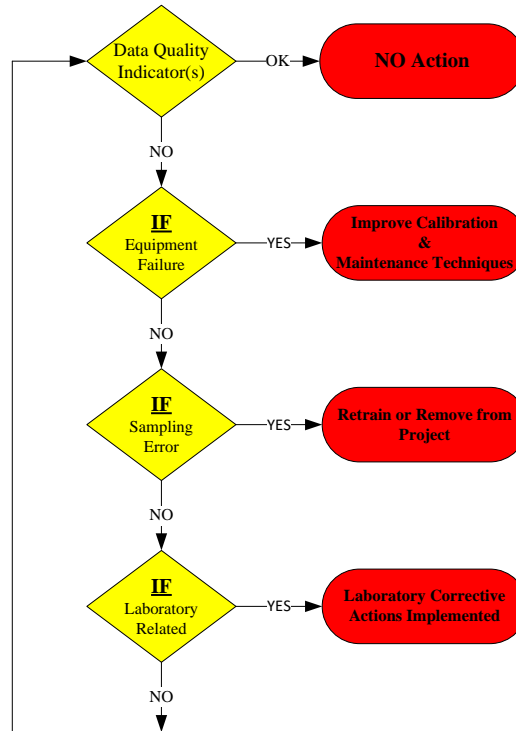
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Klamath Tribes Quality Assurance Project Plan (QAPP)

9.4.3 Reconciliation with Data Quality Objectives (DQO)

- 9.4.3.1 After each sampling event, the KTRS receives analytical reports containing laboratory results, approximately 2-3 weeks after the samples are submitted to the laboratory.
- 9.4.3.2 After receiving the analytical report calculation and determinations for precision, completeness, and accuracy will be made immediately and corrective actions implemented if needed.



9.4.3.3 Any limitations on data will be detailed in the final report.

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Effective Date:	1/1/2013	Amended Date:	7/18/2019
		Revised By:	Travis Bartholomew, Mark Buettner



Klamath Tribes Quality Assurance Project Plan (QAPP)

9.4.3.7 Receiving Re-analysis Results

- .1 Upon receiving the re-analysis analytical report, evaluate to determine whether or not the original results are confirmed.
- .2 **IF** the original results are confirmed, **THEN** accept the original data as valid, keeping the original data in the database.
- .3 **IF** the original results are not confirmed, **THEN** evaluate the sample bracket that was analyzed an additional time for the parameter to see if the results meet QA acceptance criteria.
- .4 Employ professional judgment to decide which set of data to accept and whether or not it should be qualified as suspect.
- .5 Include the original data in the notes part of the database so further judgment can be made on the acceptance of the other results in the analytical report.

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Klamath Tribes Quality Assurance Project Plan (QAPP)

10.0 Quality Control (QC) and Quality Assurance (QA)

- 10.1 All external check samples submitted are double-blind samples.
- 10.2 Laboratory QC check samples are reported to the client as QC summary reports from the Laboratory Information Management System (LIMS).

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Klamath Tribes Quality Assurance Project Plan (QAPP)

11.0 Data and Records Management

- 11.1 Review and verify all data generated from this program is acceptable.
- 11.2 Data is entered into appropriate Excel spreadsheets.
- 11.3 Hardcopy data stored in appropriate 3-ring binders.
- 11.4 All data sheets and forms will be kept on file with raw data for at least 3 years.
- 11.5 All logbook shall be bound and pages numbered.
- 11.6 All electronic data is stored on the server with redundant systems and external hard drive.

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Klamath Tribes Quality Assurance Project Plan (QAPP)

12.0 Attachments

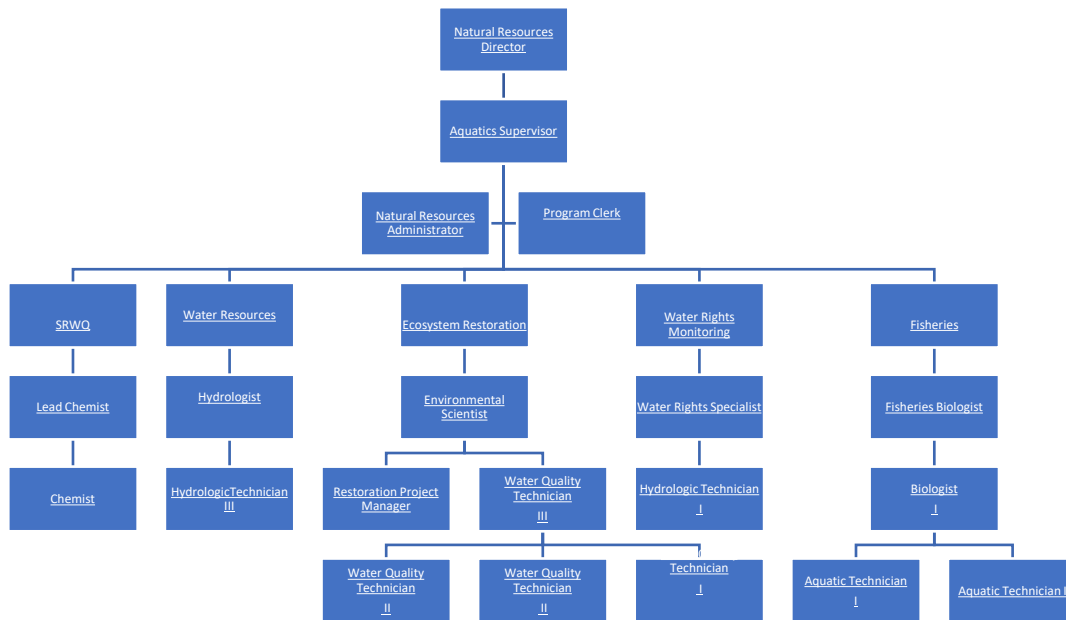
- 1 Organization Chart
- 2 KTRS Sample Sites & Associated Water Quality Sub-Programs
- 3 KTRS Geomorphic Data Sites
- 4 External QA Sample Acceptance Criteria
- 5 Analytical Methods for Parameters
- 6 Container and Holding Times
- 7 Chain-of-Custody (COC) Form (Facsimile) [*Reference 3.1.6*]
- 8 Chain of Custody (COC) Offsite Phytoplankton/Zooplankton Analysis Form (Facsimile) [*Reference 3.1.6*]
- 9 Klamath Tribes Quality Assurance Project Plan (QAPP) Training Record

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Klamath Tribes Quality Assurance Project Plan (QAPP)

Attachment 1 – Organization Chart



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Klamath Tribes Quality Assurance Project Plan (QAPP)

Attachment 2 - KTRS Sample Sites & Associated Water Quality Sub-Programs

Location	Site ID Code	*Latitude (N) (ddd.dddd°)	*Longitude (W) (ddd.dddd°)	Profile ^a	Sonde ^b	Grab ^c	Probe ^d	Flow ^f	Grabza ^g
Sprague River (SR)									
N. Fork Sprague River @ FS 3411 Rd.	SR0040	42.49672	121.005556			x	x	x	
S. Fork Sprague River @ Picnic Area	SR0050	42.376056	120.969444			x	x	x	
Sprague River @ Godowa Springs	SR0060	42.460389	121.269861			x	x	x	
Sycan River @ Drews Rd	SR0070	42.485694	121.348722			x	x	x	
Sprague River @ Lone Pine	SR0080	42.5505	121.617611			x	x	x	
Sprague River @ Chiloquin Ridge Rd.	SR0090	42.584639	121.841861			x	x	x	
N. Fork Sprague River @ Ivory Pines	SR0140	42.456306	121.111667			x	x	x	
S. Fork Sprague R @ Ivory Pine	SR0150	42.717667	121.164889						
Wood River (WR)									
Wood River @ Sprague	WR1000	42.567806	121.864472			x			
Wood River @ Annie	WR2000	42.768444	120.055361			x		x	
Wood River @ Weed	WR3000	42.646611	121.993833			x		x	
Wood River @ Dike	WR4000	42.581583	121.040389			x		x	
Wood River @ 7-Mile Canal	WR5000	42.575972	121.9686			x		x	
Wood River @ Williamson	WR6000	42.514528	121.915806			x			
Upper Klamath Lake (KL)									
UKL @ Fremont Bridge	KL0001	42.23861	121.80588			x	x		
UKL @ Pelican Marine (PM)	KL0002	42.241722	121.822306	x		x			x
UKL @ North Buck Island (NB)	KL0003	42.308389	121.856222	x		x			x
UKL @ Wocus Bay (WB)	KL0004	42.32689	121.919922	x		x			x
UKL @ Mid-Lake (ML)	KL0005	42.369083	121.848694	x		x			x
UKL @ Eagle Ridge (ER)	KL0006	42.422083	121.943278	x		x			x
UKL @ Shoal Water Bay (SB)	KL0007	42.40725	121.963083	x		x			x
UKL @ Mid-Lake North (MN)	KL0008	42.441361	121.998833	x		x			x
UKL @ Coon Point (CP)	KL0009	42.435722	121.028194	x		x			x
UKL @ Agency Lake South (AS)	KL0010	42.523583	121.984278	x		x			x
UKL @ Agency Lake North (AN)	KL0011	42.560556	121.947444	x		x			x
QA/QC Samples (Vary with blind analysis)									
Trip Blanks (SR,WR,KL)	0110					x			
Duplicates (SR,WR,KL)	0330					x			
Duplicates (SR,WR,KL)	0440					x			
Equipment Blank(SR,WR,KL)	0550					x			
Spike Sample A(SR,WR,KL)	0770					x			
Spike Sample B(SR,WR,KL)	0880					x			
DI Water Sample (SR,WR,KL)	0990					x			

* - (NAD84) Geographic Coordinate Conversion Website: cmilono.users.sonic.net/GPS/ConvCoord.html

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Effective Date:	1/1/2013	Amended Date:	7/18/2019
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Klamath Tribes Quality Assurance Project Plan (QAPP)

Attachment 3 – KTRS Geomorphic Data Sites

Site Name	**Latitude (N) (ddd.dddd°)	**Longitude (W) (ddd.dddd°)	H ₂ O Temp. Data Logger (Tw)	SSC	Geomorphic Assessment	Last Geomorphic Assessment Date	Next Geomorphic Assessment Date
Sprague River							
Kirchers	42.56758	121.86526	X				
Hatchery	42.60675	121.81036	X	X			
Lone Pine	42.55146	121.61977	X				
Trout Creek	42.48841	121.61851	X				
Elde Flat	42.61551	121.3468	X				
Drews Road	42.48522	121.27843	X	X			
Lower Yainix	42.46846	121.28102	X				
Godowa	42.46009	121.27133	X	X			
USGS	42.44772	121.23858	X				
5 Mile	42.54405	121.11922	X				
N. Fork @ Ivory Pine	42.48513	121.09567	X	X			
S. Fork @ Ivory Pine	42.43941	121.09544	X				
3411 Road	42.4968	121.0063	X				
34 Road	42.39846	120.99227	X	X			
Picnic	42.37391	120.96975	X	X			
Blaisdell	42.37437	120.84576	X				
Kimball	42.60909	121.81262	X				
Coyote Bucket	42.54264	121.30725	X				
Fishhole Creek	42.39601	121.03635	X				
Demming Downstream	42.4183	121.03683	X				
Demming Upstream	42.41524	121.01744	X	X			
Wood River							
Fort Creek	42.68122	121.97311	X				
Loosley	42.66908	121.97905	X				
Weed	42.6464	121.99487	X				
Wetlands	42.58147	121.94165	X				
Crooked	42.64403	121.94514	X				
Williamson River							
Knapps	42.66591	121.84452	X				
Spring	42.64315	121.87946	X				
Williamson	42.63261	121.87806	X				
Williamson @ 97	42.52562	121.88493	X	X			
Spencer Creek							
Spencer @ Shade	42.19431	122.07403	X				
Spencer @ Sun	42.19431	122.07403	X				
Spencer @ Hookup	42.22506	122.09882	X				
Spencer @ Boyle	42.515812	122.02835	X				
Spencer @ Clover Creek Rd.	42.26308	122.15762	X				
Spencer Above Buck Lake	42.28668	122.20815	X				
Anderson Ranch	Numerous	Numerous			WARSSS*		
Yainix Ranch	Numerous	Numerous			WARSSS	2012	2015
Lee Thomas Camp Ground	Numerous	Numerous			WARSSS	2012	2015
Long Creek	Numerous	Numerous			WARSSS	2012	2015
Demming Ranch	Numerous	Numerous			WARSSS	NEW	

*Modified WARSSS

WARSSS – Watershed Assessment of River Stability and Sediment Supply

** - (NAD84) Geographic Coordinate Conversion Website: cmilono.users.sonic.net/GPS/ConvCoord.html

Author(s):	Craig Sponemore (CS)	Contact:	Travis Bartholomew
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Klamath Tribes Quality Assurance Project Plan (QAPP)

Attachment 4 - External QA Sample Acceptance Criteria

External QA Sample Acceptance Criteria					
Parameters	Reporting Limit (RL)*	Accuracy	Precision (RPD)	Completeness	Corrective Actions
*Total Nitrogen	0.060 mg/L	80%-120%	[>5x RL] = 0%-20% [≤ 5x RL] difference within ± RL	80%	Re-analyze sample and if not confirmed Re-analyze the batch
*Total Phosphorus	0.018 mg/L				
*Ammonia	0.012 mg/L				
*Nitrate + Nitrite - N	0.016 mg/L				
*Nitrite	0.002 mg/L				
*Orthophosphate (SRP)	0.006 mg/L				
*Silica	0.040 mg/L				
Suspended Sediment Concentration (SSC)	1.6 mg/L				
Chlorophyll - a	1.0 µg/L				
Total Suspended Solids	2.0 mg/L				
Turbidity	0.2 NTU	90%-110%			
Phaeophyton - a	1.0 µg/L	---	----	---	----
Microcystins	0.30 ppb	70-130%	0%-200%	---	----

* - (2xMDL)

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Klamath Tribes Quality Assurance Project Plan (QAPP)

Attachment 5 - Analytical Methods for Parameters

Laboratory Analytical Methods for Parameters		
Parameters	Method(s)	TAT*
Ammonia	USGS I-2525-89 / 90	10
Nitrate+Nitrite	USGS I-2547-11; I-2548-11	10
Nitrite	USGS I-2542-89 / 90	10
Total Nitrogen	USGS I-2650-03	10
Ortho-Phosphate	USGS I-2606-89; I-2601-90	10
Total Phosphorus	USGS I-4650-03	10
Silica	USGS I-2700-85	10
Total Suspended Solids (TSS)	EPA 160.2	10
Turbidity	EPA 180.1	10
Suspended Sediment Concentration (SSC)	ASTM D3977	45
Chlorophyll -a	EPA 445.0 (Modified); USGS:Parameter Code-70953, Method Code-00050	10
Phaeophyton -a	EPA 445.0 (Modified); USGS:Parameter Code-62360, Method Code-00050	10
Microcystins	Abraxis ELISA, EPA 546	15
Zooplankton Speciation	SM 10200, PhytoTech Inc.	N/A
Algae Speciation	SM 10300, PhytoTech Inc.	N/A

* Business Days

YSI Sonde Parameter Measurements	
Parameters	Method(s)
pH	SM 4500-H+ B-2000; USGS Method I-1586-85
Specific Conductivity	EPA 120.1; SM 2510 B-1997
Dissolved Oxygen	ASTM D888-09(C)
Temperature	SM 2550 B-2000
Oxidation Reduction Potential	ASTM D1498-76

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Klamath Tribes Quality Assurance Project Plan (QAPP)

Attachment 6 – Container and Holding Times

Test	Filtered	Container	Preservatives	Hold Time
Chlorophyll-a	Y	500 mL amber HDPE	filtered within 24 hours; -20°C	28 days
Total N, Total P	N	1.0 L HPDE, 125 mL amber HDPE	1 mL 4.5 N H ₂ SO ₄ ; ≤ 6°C	28 days
SRP, NO ₃ +NO ₃ , NH ₄ , NO ₂ silica	Y	1.0 L HPDE, 125 mL amber HDPE	Filtered ¹ ; ≤ 6°C	28 days ¹
TSS	N	1.0 L HPDE	≤ 6°C	7 days
SSC	N	1.0 L HPDE	Room Temperature	30 days
Turbidity	N	60 ml HDPE	≤ 6°C	48 hrs
Microcystins	N	50 mL amber Glass	≤ 6°C	15 days
Zooplankton Speciation	N	125 mL amber HDPE	90% ethanol	---
Algae Speciation	N	250 mL amber HDPE	2.5 mL Glutaraldehyde	---

¹ - Patton, Charles J., Gilroy, Edward J., U.S. Geological Survey Nutrient Preservation Experiment – Experimental Design, Statistical Analysis, and Interpretation of Analytical Results. Water-Resources Investigation Report 98-4118.



Klamath Tribes Quality Assurance Project Plan (QAPP)

Attachment 7 – Chain-of-Custody (COC) Form (Facsimile) [Reference 3.1.6]

Client:	COC Number:
Project:	Contact(s):
Sampled By:	Date Sampled:
Comments:	Time Sample(s) Received:

Sample Matrix: Water (W); Soil (S); Other (O) -

QC Type: Equipment Blank (EB); Trip Blank (TB); Blank (Blk); Replicate (Rep); Replicate Split (Spt); Other (O):

Container Codes	Preservation Codes
RWA – Reused, Washed 1000 mL HDPE RWB – Reused, Washed 1000 mL amber HDPE RWC – Reused, Washed 500 mL HDPE RWD – Reused, Washed 500 mL amber HDPE RWE – Reused, Washed 125 mL amber HDPE RWF – Reused, Washed 50/60 mL HDPE RWG – Reused, Washed 50/60 mL amber HDPE OC (Other Container): –	NA – New 1000 mL HDPE NB – New 1000 mL amber HDPE NC – New 500 mL HDPE ND – New 500 mL amber HDPE NE – New 125 mL amber HDPE NF – New 50/60 mL HDPE A – No preservation, refrigerate @ 4 ±2 °C B – Filtered in Lab (0.45µm, 47 mm) & refrigerated @4 ±2 °C C – Filtered in Field, kept on ice then refrigerated @4 ±2 °C. D – Acidified in Lab (1 mL of 4.5 N H ₂ SO ₄ /100 mL) & refrigerated @4 ±2 °C E – Acidified in Field (1 mL of 4.5 N H ₂ SO ₄ /100 mL), kept on ice then refrigerated @4 ±2 °C. F – No preservation, Filtered in lab (0.7 µm, 47 mm) refrigerate @ -20°C OP (Other Preservation): –

Item #	Date	Site	LIMS Work Order Sample ID	Time Sampled	Container Code	Sample Matrix	QC Type	Preservation Code	Preservation Check	Analysis Parameters																		
										Total Nitrogen	Total Phosphorous	SRP	NH ₄	NO ₂₊₃	NO ₃	SiO ₂	NO ₃	TSS	Turbidity	Chlorophyll "a"	Phaeophytin "a"	SSC	BOD/CBOD	pH	Temperature (°C)			
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ORIGINAL to Laboratory – **COPY** to Client

Relinquished by (Print Name):		Date:		Time:	
Relinquished by (Signature):					
Received by (Print Name):		Date:		Time:	
Received by (Signature):					

Author(s):	Craig Spoonemore (CS)	Contact: Travis Bartholomew
Effective Date:	1/1/2013	Amended Date: 7/18/2019
Revised By:	Travis Bartholomew, Mark Buettner	



Klamath Tribes Quality Assurance Project Plan (QAPP)

Attachment 8 - Chain of Custody (COC) Offsite Phytoplankton/Zooplankton Analysis Form (Facsimile) [Reference 3.1.6]

Offsite Analysis Laboratory:									
Shipped by:									
Project:									
Contact(s):									
Sampled By:						Temperature:			
Date Sampled:		Time Sample(s) Received:							
Sample Collection Process:		<p>② All samples collected in a 30 Liter Schindler-Patalas plankton trap. Duplicates are produced using a plankton splitter. The original sample includes 1 or 2 hauls of the S-P trap listed here</p> <p>① All samples were collected in an integrated tube sampler and composited into a chum splitter and preserved with Glutaraldehyde solution.</p>							
Date	Site/Label	Time Sampled	Phytoplankton ①		Zooplankton ②		Other:	Analysis to be performed	
			1 Haul	2 Haul	1 Haul	2 Haul			
								<p>① Reliable abundance, biomass, and fecundity estimates for the crustacean zooplankton</p> <p>② Species Composition, density, biovolume, cell size (dimensions for biovolume)</p>	
Relinquished by: (Print Name):						Date:		Time:	
Relinquished by: (Signature):									
Received by (Print Name):						Date:		Time:	
Received by (Signature):									

ORIGINAL to Laboratory – COPY to Client

Author(s):	Craig Spoonemore (CS)	Contact:	Travis Bartholomew
Effective Date:	1/1/2013	Amended Date:	7/18/2019
		Revised By:	Travis Bartholomew, Mark Buettner



Klamath Tribes Quality Assurance Project Plan (QAPP)

Attachment 9 – Klamath Tribes Quality Assurance Project Plan (QAPP) Training Record**

Trainee:		Initials:		Trainer:		Initials:	
Training Description							
Read and Reviewed Current Procedure Revision				<i>Trainee's Initials:</i>		Date:	

Task	Initial Training <i>Trainer's Initial</i>	Date	<input type="checkbox"/> Qualification <input type="checkbox"/> Re-Training <input type="checkbox"/> Certification <input type="checkbox"/> Re-Certification <input type="checkbox"/> Demonstration of Capability (DOC) <input type="checkbox"/> Other:	Trainer's Initial	Date
1	Performed all prerequisites		<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT* <input type="checkbox"/> N/A		
2	Observes Precautions		<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT* <input type="checkbox"/> N/A		
	Other:		<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT* <input type="checkbox"/> N/A		
			<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT* <input type="checkbox"/> N/A		
			<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT* <input type="checkbox"/> N/A		
			<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT* <input type="checkbox"/> N/A		
			<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT* <input type="checkbox"/> N/A		
			<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT* <input type="checkbox"/> N/A		
			<input type="checkbox"/> SAT <input type="checkbox"/> UNSAT* <input type="checkbox"/> N/A		

Comments:

Completed "Klamath Tribes Quality Assurance Project Plan (QAPP)" Training Record			
Trainee's Signature		Date	
Trainers Signature		Date	
Supervisor's Name & Signature		Date	

“SAT” – to be performed without prompting or giving direction.
 * “UNSAT” must be re-scheduled
 ** To be Filed in Employee Training File when completed

Author(s):	Craig Spoonemore (CS)	Contact:	Travis Bartholomew
Effective Date:	1/1/2013	Amended Date:	7/18/2019
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