Sampling and Analysis Plan

Volunteer Water Quality Monitoring

Upper Yaquina Strategic Implementation Area

May 2024

State of Oregon
DEQ Department of Environmental Quality

This document was prepared by:
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State of Oregon
DEQ Department of Environmental Quality

Project approvals

Prepared by:

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Watersheds Program Specialist

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Approved by:

_____ Date: _____

Nick Haxton Evans, Volunteer Monitoring Coordinator

Signed copy on file

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1. Project Management

1.1. Distribution List

The following personnel will be emailed regarding all aspects of this sampling and analysis plan (SAP). Deviations from this SAP must be communicated in writing (email is acceptable) to all individuals identified in Table 1. Final reports from the DEQ Laboratory will be emailed or mailed to the project manager, regional monitoring coordinator and laboratory monitoring coordinator/data manager.

Table 1 Distribution List

Name	Phone	Email
Tyler Clouse, Organization Project Manager	541-265-2631	tyler@lincolnswcd.org
Nick Haxton-Evans, DEQ Volunteer Monitoring Program Coordinator	503-693-5731	nick.haxton-evans@deq.oregon.gov
Ben Hamilton, DEQ Field QAO	503-839-6551	benjamin.t.hamilton@deq.oregon.gov
Rob Hibbs, ODA Water Quality Monitoring Specialist	971-719-1576	rob.hibbs@oda.oregon.gov
David Waltz	503-432-7196	David.waltz@deq.oregon.gov

1.2. Project/task organization

Sampling Organization(s): Lincoln Soil & Water Conservation District (LSWCD)

Analytical Organization: Cooperative Chemical Analytical Laboratory (CCAL)
3015 Western Blvd
Corvallis, OR 97331
Ph: 541-737-5120 or 541-737-0826

Lincoln Soil & Water Conservation District/Surfrider
2820 SE Ferry Slip Rd
Newport, OR 97365
Ph: 541-265-2631

1.3. Problem definition/background

The purpose of this monitoring is to assess for changes in water quality in the Little Elk Creek and Upper Yaquina watersheds since these water bodies were last assessed in 2016/2018, identify parameters of concern within each reach to better target outreach efforts, and provide updated baseline data as future restoration efforts are implemented within the watershed. We intend to conduct this monitoring over a four year timeline.

The Strategic Implementation Area (SIA) is located in the eastern portion of Lincoln County and encompasses the Upper Yaquina watershed. The sub-areas within the Upper Yaquina Watershed included in the SIA are Bales Creek-Upper Yaquina and Little Elk Creek. These water bodies have both been identified as Oregon DEQ 303(d) listed for impairments concerning dissolved oxygen, temperature, and bacteria (fecal coliform and E. coli). Excessive sedimentation and lack of riparian vegetation, or replacement of native vegetation with

invasive species such as Himalayan blackberry (Rubus armeniacus) and reed canary grass (Phalaris arundinacea), are also common concerns in these watersheds. Six DEQ monitoring stations are already present within these watersheds, providing baseline water quality data.

Lincoln SWCD staff will analyze collected data to confirm impairment for any of the target parameters, and use this information to make targeted outreach decisions. Lincoln SWCD will also use this data as baseline information on stream conditions to compare against future conditions as restoration efforts are implemented throughout the watershed. Data will also support DEQ's TMDL development for the Yaquina River.

The landscape within this SIA's portion of the watershed consists of steep rugged slopes used primarily by private and public forestry, with lowland valleys dominated by private forestry, agriculture, and residential land use. Approximately 41% of the riparian acreage within 100 feet of impaired freshwater assessment units in the watershed is zoned for agricultural use.

An assessment of the SIA by the Oregon Department of Agriculture (ODA) identified several locations with a lack of riparian vegetation or completely bare ground, and locations where livestock access to the stream may be impacting water quality. Additionally, this assessment identified agricultural properties near the river as potential improvement opportunities.

Another non-agricultural concern within this portion of the watershed is transportation infrastructure. Railroads and highways run directly adjacent to the Yaquina and Little Elk Creek for much of their length within these watersheds, limiting the ability to establish riparian vegetation and potentially contributing sediment and other chemical pollutants in runoff to adjacent waterways. Aging culverts and roads increase the likelihood of sediment entering the waterway due to failure, need for repair, or improper slope stabilization. Industrial timber practices are another major component of concern for water quality of the SIA.

1.4. Project/task description

The Lincoln SWCD will collect grab samples of the following parameters: turbidity, total suspended solids (TSS), total nitrogen and phosphorus (TN/TP), and E. coli. These grab samples will be collected on a bimonthly basis by two Lincoln SWCD monitoring team members from each of the six DEQ-recommended monitoring stations selected for this project; five in the upper Yaquina River and one in Little Elk Creek. Continuous temperature and dissolved oxygen (DO) data will also be collected at these stations using HOBO loggers.

Due to travel time from the LSWCD office to the SIA and between each monitoring station, grab samples will be brought to the laboratory facility for analysis on the following day. When possible, E. coli samples will be taken to the Oregon Coast Aquarium laboratory on the same day as collection in an effort to comply with the DEQ recommended eight-hour maximum holding time. However, collection from all sampling sites, travel to the lab facility, and preparation of samples for testing may not be possible within a 10-hour workday. As such, if same-day testing is not possible on a given day, E. coli samples will never be held longer than 24 hours post-collection and samples will be tested the morning following collection. District staff will conduct their own testing of E. coli samples using laboratory equipment provided by Surfrider, housed at the Oregon Coast Aquarium.

During winter months, efforts will be made to adjust the sampling schedule to allow for sampling at least two storm events during the season. In May, if streamflow allows, District staff will place an in-stream continuous

temperature and dissolved oxygen logger. During the bimonthly grab sampling staff will check on the loggers to ensure no adjustments or replacements need to be made. A mid-season audit will be performed in August and loggers will be retrieved in October.

Summary statistics used depend on parameters (grab or continuous) and data distribution. Generally, grab statistics will use the methods used in generating boxplots from DEQ's AWQMS database or other appropriate methods (mean, median, distribution) and also compared using methods in DEQ's Integrated Report methodology (https://www.oregon.gov/deq/wq/Documents/IR22AssessMethod.pdf). Temperature data will be analyzed with focus on number of days in exceedance of 17.8 °F, and the District has arranged for assistance from David Waltz from DEQ in analyzing dissolved oxygen data. Analysis of Variance (ANOVA) will be used to determine the existence of any longitudinal patterns of change from upstream to downstream stations for all parameters.

The main constraint on this project is the availability of funding to carry out monitoring on the full four-year timeline, conduct twice monthly samples at all six monitoring stations. The duration of the project, number of monthly excursions, or number of stations monitored may have to be reduced if sufficient funding is not awarded.

Table 2 Project Gantt Chart

Tasks to be completed	**Months for year 2023-2026**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
HOBO logger quality control testing					x			x			x	
Continuous temperature and DO data collection					x	x	x	x	x	x		
TSS/Turbidity, TN/TP, and E. coli sampling	x	x	x	x		x	x	x	x	x	x	x
Transport of samples to CCAL	x	x	x	x		x	x	x	x	x	x	x
Data entry	x	x	x	x	x	x	x	x	x	x	x	x
Data analysis and reporting											x	x

Note: Data analysis and reporting will be conducted annually.

1.5. Quality objectives and criteria

Specific QA Objectives for this monitoring project include:

- Collect a sufficient number of samples, sample duplicates, and field blanks to evaluate the sampling and measurement error. A duplicate sample will be taken at one site per sampling excursion. The site selected for duplicate sampling will be cycled through so that all duplicates from all sites are taken at an equal rate; after 12 weeks of sampling once every other week, each site should have one duplicate sample taken. One blank sample will be tested along with each sampling batch, with a batch defined as samples collected from all six monitoring stations within a single day's excursion. Blanks included in sample batches analyzed by CCAL will consist of deionized water provided by the lab, while those included in sample batches analyzed by District staff at the Oregon Coast Aquarium will consist of distilled water.

- Analyze a sufficient number of QC standards, blanks and duplicates during analysis to effectively evaluate results against numerical QA goals established for precision and accuracy.
- Implement sampling techniques in such a way that the analytical results are representative of the media and conditions being sampled.

The data collected from this monitoring project will be used to inform agency partners and potentially develop area rules, therefore it is the objective of LSWCD to provide data that meets Level A standards based on DEQ's Field Data Quality Matrix (DEQ04-LAB-0003-QAG, Version 5.0).

Analytical method sensitivity for a parameter can generally be determined by comparing the CCAL's lowest reporting ability to existing data in the watershed or other similar watersheds. The DEQ data management system, AWQMS (https://orwater.deq.state.or.us/Login.aspx), can be used to estimate the general magnitude of expected results in the project region. If the analytical facility's methods are not sensitive enough, then many samples will be reported as below the reporting limit. If it will be a problem to have many non-detects, then it may be appropriate to look for a different indicator or method.

Most results are reported to three significant figures. All results will be rounded according to standard rounding rules and then compared to the LOQ.

Samples must be collected to most accurately represent the population defined in the SAP. Generally, in stream studies where ambient conditions are targeted, samples should be collected at or near the center of the stream channel where the water is well-mixed. The sample collection team shall record the date and time when the grab container is removed from the stream to the nearest five minutes. The location of the sample will be referenced to latitude and longitude coordinates.

This monitoring program will ensure comparability with similar projects by following the standardized sampling protocols and procedures outlined in this plan. CBO's will follow procedures defined in the DEQ MOMS Version 3.0. Data quality determinations by DEQ will be determined following the Data Quality Classification for Volunteer Monitoring Grab Water Quality standard operating procedures (DEQ06-LAB-0027-SOP).

LSWCD will sample six locations provided by Oregon DEQ twice a month for eleven months over the next 4 years. Over this period, at least two samples shall be taken during winter storm events each year, which will be defined as more than two inches of rain within a 24-hour period for the purposes of our monitoring.

1.6. Training Requirements and Certification

Tyler Clouse and Katie Saaty have each been employees of the District for 1.5 years and have previously conducted continuous water temperature monitoring for DEQ's Volunteer Water Quality Monitoring program, including pre-deployment, post-deployment, and mid-season HOBO logger audits and formatting data for submission to DEQ.

1.7. Documentation and Records

The DEQ quality assurance officer will distribute this SAP and any subsequent revisions and amendments to those listed in Table 1.

Table 3 Controlled Documents

Document or Record Name and Description	Storage Location	Storage Time
DEQ Quality Assurance Project Plan (QAPP) (3.0)- DEQ04-LAB-0047-QAPP project description and assurance procedures.	DEQ Internet Page	10 years
Upper Yaquina/Little Elk Creek Sampling Analysis Plan - specific sampling information for each groups activities.	DEQ Laboratory and LSWCD Google Drive	10 years
DEQ Laboratory Mode of Operations Manual - Methods manual	LSWCD Google Drive	10 years
Equipment Notebooks - records of quality control checks, calibrations and maintenance.	DEQ equipment case and LSWCD Google Drive	10 years
Field Data or Chain of Custody Sheets/Electronic Files – Field forms containing sampling meta data and raw field data.	LSWCD Google Drive	10 years

2. Data Generation and Acquisition

2.1. Sampling Process Design

Sampling design, collection, methods and handling will be managed by the sampling organization identified in section 1.2. The sampling organization will ensure that all samples will be collected in the appropriate sample containers, preserved as identified in the appropriate reference methods, and transported to the analytical organization within the appropriate sample holding times, with the appropriate documentation, and under the appropriate sample transport conditions. Analytical laboratories assume no responsibility for the quality of data resulting from samples that were collected, shipped, or stored under inappropriate conditions.

Our sampling site selection was provided by DEQ, and each site has been historically used for monitoring. Our sampling parameters and frequency were also chosen through recommendations by DEQ partner David Waltz, who is the TMDL Coordinator for the Yaquina Basin. As such, parameters were chosen that would best help inform TMDL development for the area. Bacteria and dissolved oxygen are currently identified as important limited parameters for the basin, with E. coli, total phosphorus, and solar radiation identified as key pollutants. Monitoring turbidity and total suspended solids is critical in informing management of the basin’s limited parameters as soil erosion and runoff increases phosphorus deposition in waterways and amplifies the effects of solar radiation. Data obtained by monitoring these parameters at our chosen field stations will be used to inform targeted outreach efforts for our ODA Strategic Implementation Area technical assistance program by identifying which parameters are most impaired within each stream reach.

With regards to the time of day samples are collected, no difference in results is expected to be evident in TSS, turbidity, TN/TP, or E. coli grab samples due to changes in the timing of collection during the day, as these parameters are not known to be subject to fluctuations directly related to the day/night cycle. The specific timing of grab sample collection is expected to only have an influence on results for storm event sampling, for which we plan to time our collection during active storm conditions, before increased flow levels subside, in order to account for changes in water conditions during such events.

No plans are currently in place to add new sampling stations over the life of this project, but if additional stations are chosen, they will be evaluated by LSWCD staff and monitoring partners for added value to sampling efforts, location, and ease of travel. If additional funding is secured additional locations in Little Elk Creek will be added.

Some sampling locations require a considerable walk from the roadside and may not be safely accessible during severe weather conditions. Staff will use best judgment to determine safety of access and plan accordingly if a revisit is necessary.
The locations to be sampled are summarized in Table 4.

Table 4 Summary of the sampling locations

DEQ Station ID *	Latitude/Longitude	Station Description	Parameters
11476	44.65756552 -123.8389062	Yaquina River at Trapp Road (Chitwood)	TSS, TN, TP, Turbidity, E. Coli Continuous DO/Temp
12301	44.63507826 -123.774764	Yaquina River at Eddyville	TSS, TN, TP, Turbidity, E. Coli Continuous DO/Temp
33112	44.65548745 -123.755686	Yaquina Mainstem at Nashville Road Hwy 180	TSS, TN, TP, Turbidity, E. Coli Continuous DO/Temp
34454	44.64789056 -123.6263431	Yaquina River at Clem Road bridge	TSS, TN, TP, Turbidity, E. Coli Continuous DO/Temp
36912	44.63340909 -123.7767875	Little Elk Cr near mouth	TSS, TN, TP, Turbidity, E. Coli Continuous DO/Temp
36451	44.679267 -123.608912	Yaquina River above Little Yaquina River	TSS, TN, TP, Turbidity, E. Coli Continuous DO/Temp

*If a Station ID number is not available during QAPP/SAP development, the DEQ Laboratory will generate the unique identifier prior to data processing.

2.2. Sampling methods

Describe the procedures for collecting samples and identify the sampling methods and equipment.

- Grab samples will be collected by wading or from the top of a bridge using a pole tool to fill water containers.
- Collection containers, holding times, and preservation methods are not expected to deviate from those outlined in the QAPP.
- HOBO loggers will be secured in a fashion and location in the stream that complies with official guidelines to ensure that readings are as accurate as possible.

- Sterile 100 ml collection bottles will be provided by CCAL and replaced during each sample drop-off. Sterile collection bottles will be used from the Oregon Coast Aquarium for E. coli and sanitized after each use.
- HOBO loggers used in this project will be set to 30-minute recording intervals.

2.3. Sample handling and custody

Each sample bottle will be labeled with the collection station ID, the date and time of collection, type of sample, and sampler's name. Samples for TSS, turbidity, and TN/TP will be driven to CCAL at Oregon State University on the day of collection, and samples for E. coli will be driven to the Oregon Coast Aquarium laboratory for same-day analysis, if possible, but no more than 24 hours later. Laboratory drop-offs and E. coli analysis will be completed by the sampling team whenever possible but may need to be completed by other LSWCD staff when time constraints arise.

Table 5 Summary of sampling parameters

Sample Type	Container	Preservation	Holding Time
TSS/Turbidity	Sterile 1000 mL plastic bottle	Ice/Cooler, Freezer	Kept on ice, then frozen within 48 hours of collection until analysis
TN	Sterile 1000 mL plastic bottle	Ice/Cooler, Freezer	Kept on ice, then frozen within 48 hours of collection until analysis
TP	Sterile 1000 mL plastic bottle	Ice/Cooler, Freezer	Kept on ice, then frozen within 48 hours of collection until analysis
E. coli	Sterile 100 mL glass bottle	Ice/Cooler	≤8 hrs when possible; 24 hrs maximum
Continuous Temperature	In situ	N/A	6 months

2.4. Analytical methods

Analytical methods for our monitoring parameters will conform with standard methods defined in Table 14 of the DEQ QAPP. All results will be analyzed in a laboratory setting. Samples being processed by CCAL will be analyzed according to the standards outlined in their Quality Assurance Plan (https://ccal.oregonstate.edu/sites/ccal/files/pdf/QAP%20Rev%204%202018.pdf).

Table 6 Summary of analytical parameters and methods

Sample Type	Parameter	Reference Method (required)
Surface water sample	E. coli	NEMI Method SM 9223B
Surface water sample	Total Suspended Solids	CCAL 12A.3
Surface water sample	Turbidity	CCAL 16A.1
Surface water sample	Total Phosphorus	CCAL 35B.3
Surface water sample	Total Nitrogen	CCAL 33A.5
Surface water sample	Dissolved Oxygen	NFM 6.2.1
Surface water sample	Temperature	EPA 170.1

2.5. Quality control

As per Section 2.5, accuracy checks will be employed for continuous temperature and DO logging equipment during pre-deployment, field deployment, field retrieval, and post-deployment audits, as well as mid-season audits. IDEXX Colilert reagents will be tested with IDEXX Quanti-Cult culture to test the media at the start and end of the monitoring year. Incubator temperatures will be checked at the beginning and end of each incubation period and recorded in a logbook kept with the incubator along with the date, time, and who completed the equipment check.

- CCAL is ORELAP accredited for the analysis being requested.
- If sampling quality issues become apparent over the course of our monitoring, LSWCD staff will review our sampling collection, handling, and analysis protocol and work with our DEQ and ODA partners to develop a higher quality procedure.

2.6. Instrument/equipment testing, inspection, and maintenance requirements

The LSWCD agrees to follow Section 2.6 of the QAPP in regard to testing, inspection, and maintenance of the instruments and equipment used in this project.

2.7. Instrument calibration and frequency

The LSWCD agrees to follow Section 2.7 of the QAPP in regard to calibration of the instruments used in this project.

2.8. Non-direct measurements

The LSWCD agrees to follow Section 2.9 of the QAPP in regard to usage of non-direct measurements.

2.9. Data management

- Field data will be recorded on Rite-in-Rain data sheets, organized by date and site, and will be reviewed/digitally scanned the day following sampling. Digital scans of field data sheets will be stored in LSWCD's Google Drive, and data will be transcribed into a digital spreadsheet. The QAO will review field sheets for completeness, reasonableness, and accuracy. The PM will review for transcription and calculation errors.
- Data will be formatted to meet DEQ Volunteer Monitoring Program needs using provided data submission templates Completed submission forms will be emailed to DEQ annually to be reviewed and uploaded to AWQMS.
- Staff will use statistical software and ArcGIS Pro to analyze the data geospatially.

3. Assessment and Oversight

Project assessment and oversight, including field activities, will be the responsibility of the project manager.

3.1. Assessment and response actions

Accuracy

The District will conduct pre- and post-accuracy checks for continuous data. Lab results will be assigned accuracy based on control samples, blanks, and matrix spikes as appropriate for the methods.

Precision

Duplicate sample results will be used by CBO's to determine the precision of grab water quality measurements by each sampling team. Field and lab personnel will compare differences between duplicate values against precision requirements outlined in the DQM (DEQ04-LAB-0003-QAG) to assign data precision classifications.

Precision of grab samples shall be evaluated by measuring the difference in duplicate samples-samples collected within 15 feet and 15 minutes of each other. Each sampling team collects duplicates for all grab water quality measurements at a minimum of 10% of the total number of monitoring sites (1 duplicate for every 10 sites) during each sampling survey.

Laboratory Analytical Data

Samples analyzed by laboratories should report results to the CBO with a minimum of a method blank and laboratory control sample (LCS) results for each batch of data analyzed. Method blanks should be less than the method reporting limit, and LCS results should be within the control limits identified in the CBO's approved SAP. Analytical reports submitted to the CBO should be reviewed immediately by the project manager or QA officer to make sure that the laboratory is meeting the project's data quality objectives. Data not within the control limits should be downgraded to "B" level data.

3.2. Reports to management

District field staff conducting accuracy and precision tests each day of sampling will report the results on the field sheet. Performance assessment results conducted by the District will be communicated to field staff by the project manager. All data will be submitted to the DEQ Volunteer Monitoring Specialist annually with bi-annual check-ins.

4. Data validation and usability

Data quality levels (DQL) will be assigned in accordance to DEQ guidance document *Data Validation and Qualification* (DEQ09-LAB-0006-QAG). Generally, only targeted DQLs of "A", or "B" will be acceptable unless the basis for the data acceptability is approved and documented by the project manager and DEQ Volunteer Monitoring Coordinator. All data verification, validation, and assessment activities for project purposes are the responsibility of the project manager.

4.1. Data review, validation, and verification

The LSWCD agrees to follow Section 4.1 of the QAPP in regard to accepting, rejecting, or qualifying data collected during the course of this project.

4.2. Validation and verification methods

The QAO, who will also be responsible for data collection, will review field data sheets twice monthly, on the day following data collection. The QAO will assess field data sheets for completeness, reasonableness, and accuracy. After review, the QAO will digitally scan all field data sheets and upload them to the LSWCD Google Drive. Data from field sheets will also be transcribed by the QAO into a Google Sheets file at least once per month. Laboratory results for E. coli testing carried out by LSWCD staff will be reviewed the same week they are received. All data will be reviewed monthly and given a data quality level by the PM.

4.3. Reconciliation with data quality objectives

The LSWCD agrees to follow Section 4.3 of the QAPP in regard to reconciliation with data quality objectives.

5. Revision History

Table 7 Revision History

Revision	Date	Changes	Editor
1.0	5/16/2024	Initial document	Katie Saaty

Figure 1 Sample E. coli Data Form

Date/Time Collected	Date/Time Incubated	Date/Time Counted	# Large Wells Yellow	# Small Wells Yellow	# Large Wells Fluoresced	# Small Wells Fluoresced	MPN	Notes

Figure 2 Sample Continuous Monitoring Log Sheet (example parameters are temperature and dissolved oxygen)

000000ODA Stream Temperature Monitoring Program_x000D_MONITORING LOG 2017

Lincoln Soil & Water Conservation District - Deployment 2023

SITE

Stream: _____ **Site ID:** _____ **Site Name:** _____

LASAR ID: NA **Latitude (dec deg):** _____ **Longitude (dec deg):** _____

Analyst(s): _____

Location info should enable anyone to find the logger on a map and in the field

Site Description:

DETAILED DESCRIPTION OF LOGGER LOCATION: easily identified nearby features (map on back of sheet)

PHOTOS TAKEN OF: ☐ Upstream Area ☐ Downstream Area ☐ Logger location

LOGGER

Serial #: _____ **Type:** U22 ProV2 **Comments:** Logging at 15 minute intervals

Loggers should be set to collect 1-hour readings (i.e. logging interval) in degrees CELSIUS, starting on an hour mark.

AUDIT METER

Type: YSI Pro DSS **ID:** #53135

DEPLOYMENT

Date: _____ **Time (24 hr):** _____ **Logger Depth (m):** _____

Describe housing materials: _____

Describe how logger was secured at site (e.g. staked into streambed, tethered to nearby tree, cabled to T-post, etc.):

INITIAL AUDIT

Conducted at: ☐ deployed logger ☐ main channel ☐ secondary

Time	Temp (°C)	Baro. Press (mmHg)	DO (% Sat)	DO (mg/L	SPC (µs/cm)	pH	NO3- (mg/L)	NO3- (mV)

Representative of site (thalweg, upstream, downstream)?

CONDITIONS

Weather: _____ **Precip in past 24 hrs?** _____

Stage (feet): **Flow (cfs):** **Time reported:**