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Lower Coquille Strategic Implementation Area (SIA) Water Quality Monitoring Summary and Update

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October 2021



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Introduction

Coos Soil and Water Conservation District (Coos SWCD) has implemented a 10-year water quality monitoring project in the Lower Coquille River Strategic Implementation Area (SIA) to collect data on water temperature and bacteria. The water quality monitoring is intended to identify areas where riparian vegetation conditions and livestock activity affect water quality. The data collected and associated trends will be used by Coos SWCD and partner organizations to prioritize restoration locations and actions that will improve water quality within the SIA. The data will also provide a baseline to compare with future monitoring results after restoration projects are implemented. This document describes data collected after eight months of monitoring and discusses future monitoring plans.

Water temperature and *E. coli* bacteria were chosen as monitoring parameters because they are potential limiting factors for fish health, shellfish health, and human recreation within the SIA and downstream. Sampling sites were selected on Bear Creek, Lampa Creek, and Hatchet Slough based on stream reaches with varying qualities of riparian buffers and styles of livestock management (see Figures 1 & 2).

Our hypothesis was that *E. coli* concentrations would be higher downstream of reaches with little to no riparian buffers or where livestock had access to the stream channel and riparian areas for watering and grazing. *E. coli* concentrations were expected to be high during summer and early fall, when streamflow is low, and livestock spend time in stream channels to drink and cool off. Conversely, *E. coli* concentrations were expected to be low during late fall, winter, and spring, when high precipitation increases stream flow and washes bacterial pollution downstream. Summer water temperatures were expected to be higher downstream of reaches with little to no riparian buffers.

Due to turnover of the Water Quality Program Manager position at Coos SWCD and time lost while the position was filled, the temperature monitoring component was postponed until 2022, instead of 2021 as planned. It will continue for two years before restoration implementation and then be replicated on the 8th, 9th, and 10th years of the project. *E. coli* monitoring has been implemented in 2021 with a gap of two months while the Water Quality Program Manager position was vacant. *E. coli* monitoring will continue through the end of 2022 and be implemented again on the 8th, 9th, and 10th years of the project. Because temperature monitoring has been postponed, the methods, results, and discussion sections of this document will focus on the *E. coli* monitoring component of the project.

Monitoring Site Selection

E. coli monitoring sites were selected on Bear Creek, Lampa Creek, and Hatchet Slough within the SIA (see Figures 1 & 2). The following location types were prioritized for site selection:

- The upstream extent of agricultural land use in each subbasin to differentiate the water quality impact that agriculture has on downstream sampling sites
- The lowest accessible location above the reach of tidal influence (estimated with LiDAR imagery) to determine the cumulative effects of upstream agriculture

- The lowest accessible tidally influenced location on the stream (estimated with LiDAR imagery) to determine how water quality in Bear Creek affects water quality in Lower Coquille River tidewater.
- At each significant change in riparian condition to measure how riparian vegetation shades the stream channel and filters and bacteria from adjacent agricultural land
- Upstream and downstream of potential restoration properties with interested landowners to capture baseline data before restoration actions

A total of 13 sites were selected for *E. coli* monitoring (see figure 1). Photos of the selected sites are listed in Appendix A of this document.

E1	Hatchet Slough	43.1806	-124.3017	Hidden Canyon Ranch, Hatchet Slough (upper reach)
E2	Hatchet Slough	43.1663	-124.2946	Pearce, Hatchet mid-creek site
E3	Hatchet Slough	43.1586	-124.2956	Pearce, Hatchet "Trib A"
E4	Lampa Creek	43.1161	-124.2923	Lower Lampa Creek
E5	Lampa Creek	43.1062	-124.2828	Wintz, Mid-Lampa Creek
E6	Lampa Creek	43.0875	-124.2732	Suppes, Lampa Creek
E7	Bear Creek	43.1239	-124.3466	Tigard, Bridge
E8	Bear Creek	43.1014	-124.5279	Aitchison, Bridge
E9	Bear Creek	43.0989	-124.3274	Kudo/VanderHeyden, Bridge
E10	Bear Creek	43.0950	-124.3301	Jolly Hibbits, Bridge
E11	Bear Creek	43.0788	-124.3308	Johnston, Collapsed Bridge
E12 A	Bear Creek	43.0690	-124.3052	Johnston, upstream of Monroe Cr Confluence
E12B	Bear Creek	43.06865	-124.30709	Johnston, Cattle Crossing (downstream of Monroe Cr)

Figure 1. List of *E. coli* monitoring locations

SIA Bacteria Monitoring Sites

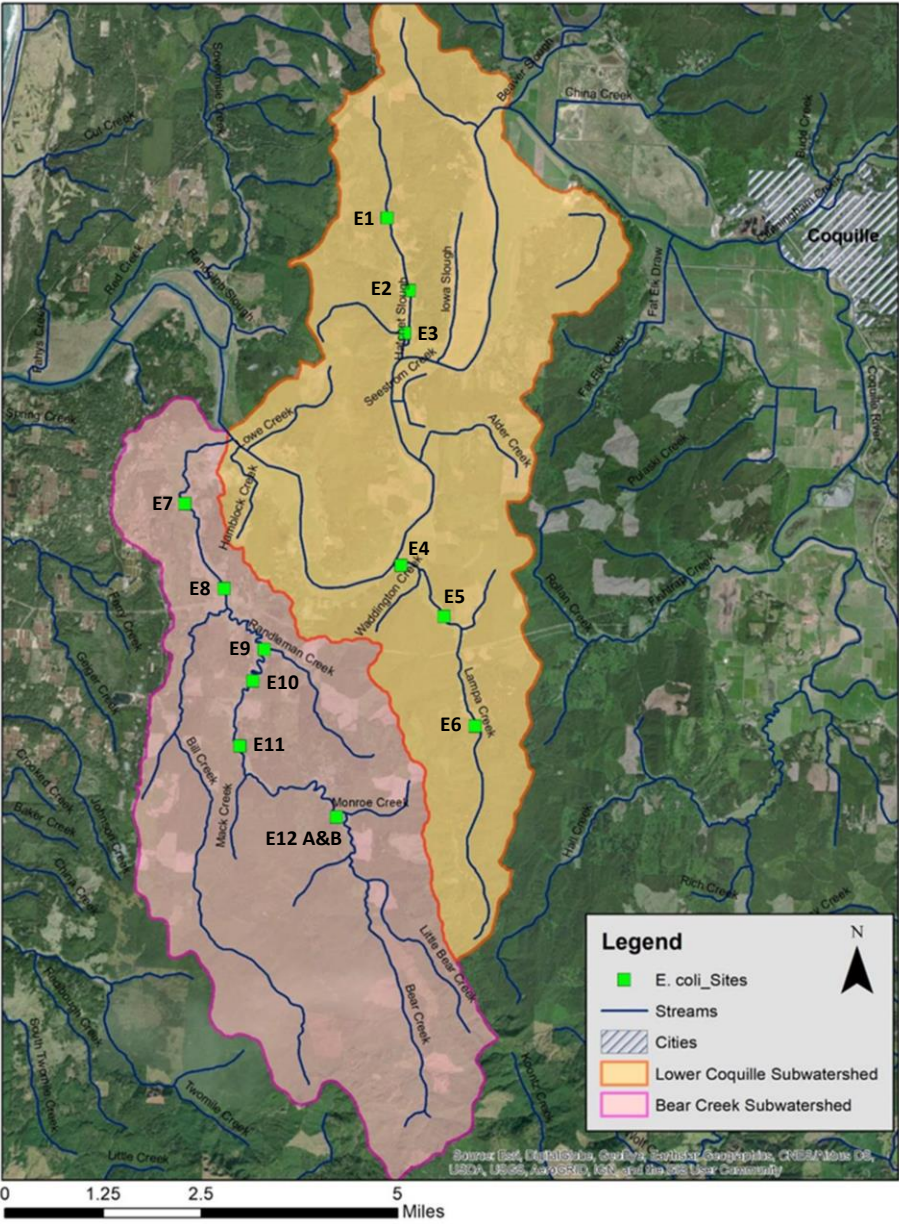


Figure 2. Map of E. coli monitoring locations

Methods

E. coli Sample Collection and Analysis

E. coli sampling events were planned once per month. Sampling dates were scheduled as soon as possible following High Volume Precipitation Events, which were defined as 1.55” of rainfall in a 24-hour period using the Coquille Low Impact Development Tool. Sampling took place near the end of the month if a High-Volume Precipitation Event was not experienced.

E. coli samples and Quality Assurance (QA) samples were collected and analyzed according to the methods outlined in ODEQ’s *Watershed Assessment Mode of Operations Manual, Chapter 3: Surface water Sampling Methods* and *Quality Assurance Project Plan: Volunteer Water Quality Monitoring*. Analysis was done by Curry Watersheds Partnership at their laboratory. Measurements were recorded as the Most Probable Number (MPN) of E. coli organisms per 100mL of sample water.

Water Quality Standards

Standards for bacteria levels in Oregon waters are outlined by Oregon Administrative Rule (OAR) 340-041-0009. The concentration of E. coli organisms in a single water sample from an Oregon stream may not exceed 406 E. coli organisms per 100 mL of water. The study design compared E. coli measurements to this single sample standard.

Results

During spring 2021, all E. coli concentrations measured were lower than the ODEQ single sample standard of 406 E. coli organisms per 100mL sample water. Concentrations during summer 2021 were higher than in spring, with several samples exceeding the ODEQ single sample standard (see Figures 3-5). Four sites at Bear Creek (E7, E11, E12 A, and E12 B) and two sites at Hatchet Slough (E1 and E2) exceeded the single sample standard at least once so far during 2021. No sites at Lampa Creek have exceeded the single sample standard so far.

During June 2021, two sites (E2 on Hatchet Slough and E12A on Bear Creek) measured extraordinarily high *E. coli* concentrations of 2419.2 and 1732.9 organisms per 100mL of water, respectively (see Figures 3 & 5). Duplicate QA samples were subsequently collected at site E2 (Hatchet Slough) during September. This was done to test sampling precision at that site in case high measurements were recorded again. All E. coli duplicate samples analyzed so far in 2021 were close enough to the original samples to qualify as “A” level data by ODEQ (see Figure 6). For duplicate samples to qualify as “A” level data, the difference between the log of the standard sample and the log of the duplicate sample at a site must be ≤ 0.6 log units.

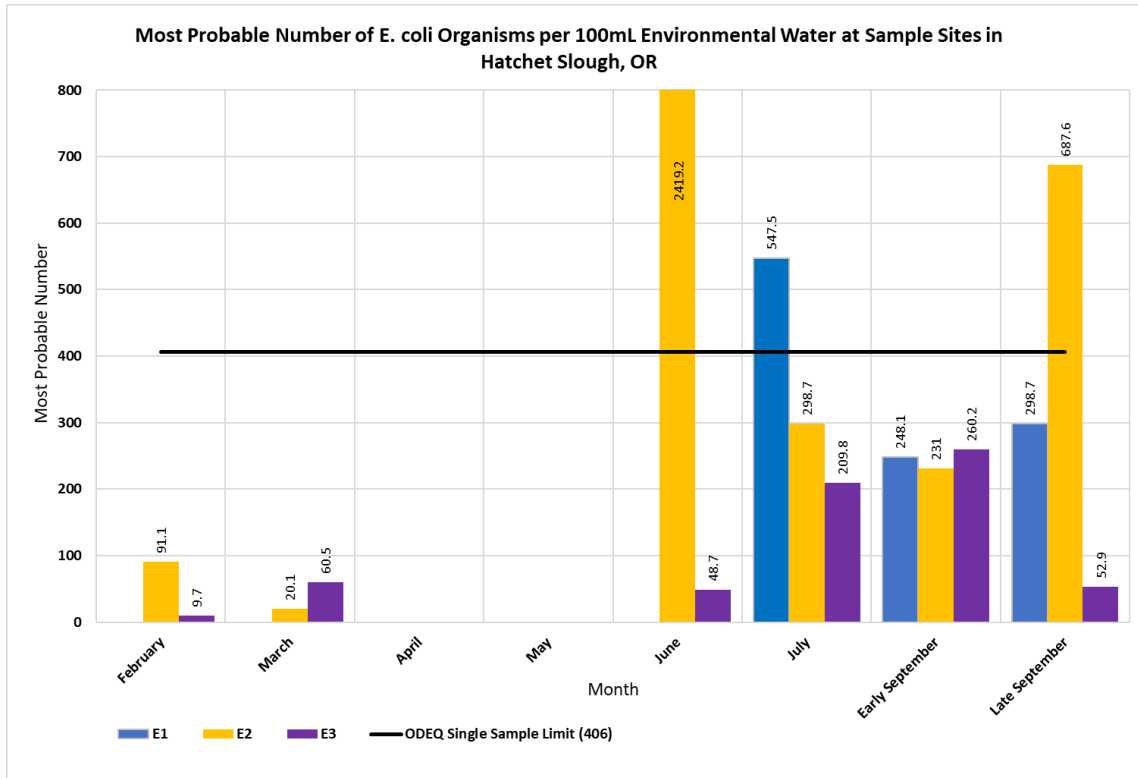


Figure 3. Results from *E. coli* monitoring on Hatchet Slough during 2021

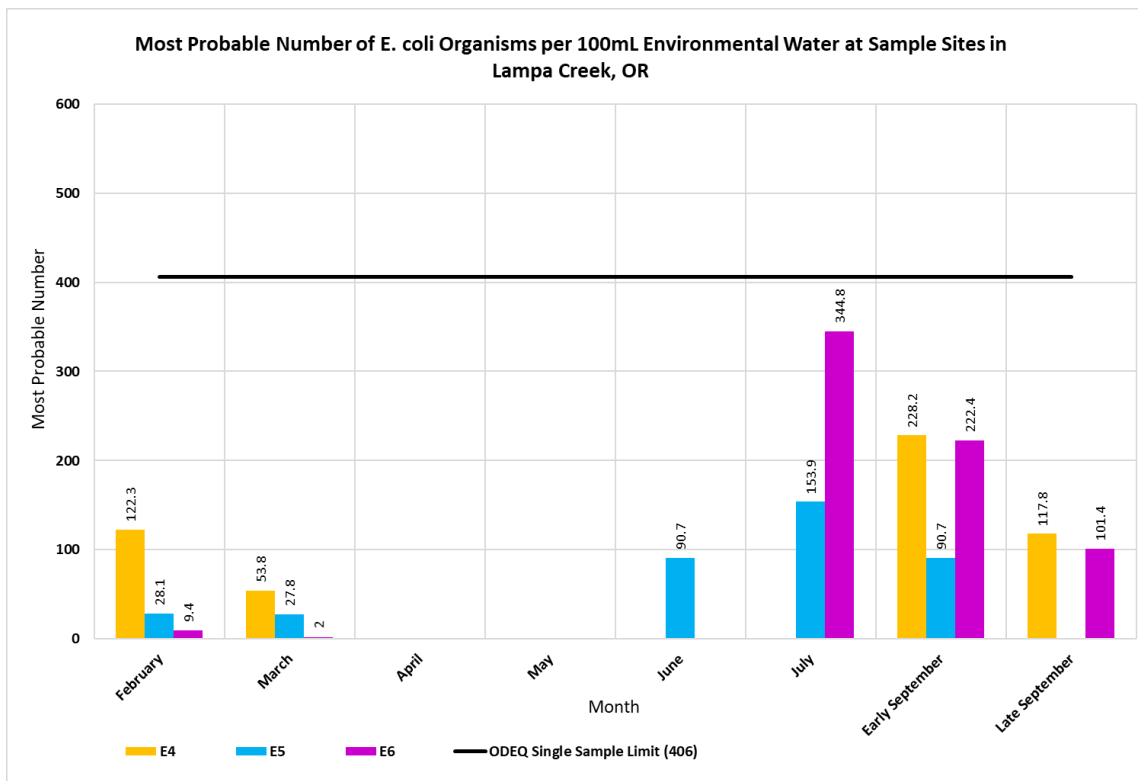


Figure 4. Results from *E. coli* monitoring on Lampa Creek during 2021

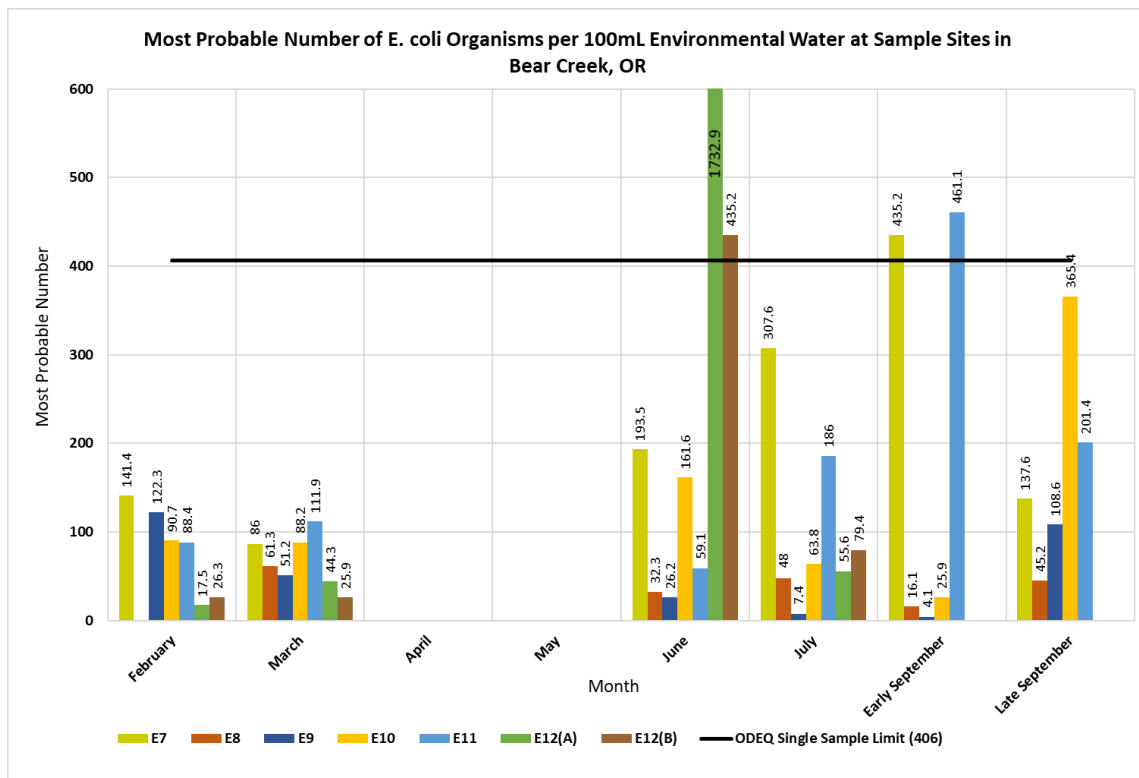


Figure 5. Results from *E. coli* monitoring on Bear Creek during 2021

Date	ID	Location	Standard Sample (MPN)	Duplicate Sample (MPN)	Difference Betw. Logs of Values	"A" Grade Data (≤ 0.6)?
2/14/2021	E12 B	Bear	26.3	16	0.215835766	Y
3/19/2021	E6	Lampa	2	1	0.301029996	Y
3/19/2021	E12 B	Bear	25.9	35	-0.13076828	Y
6/18/2021	E12 B	Bear	435.2	648.8	-0.173421955	Y
6/18/2021	E3	Hatchet	48.7	63.1	-0.112500398	Y
7/29/2021	E6	Lampa	344.8	307.6	0.049580926	Y
7/29/2021	E12 B	Bear	79.4	48.8	0.21140068	Y
9/10/2021	E2	Hatchet	231	285.1	-0.091385237	Y
9/10/2021	E4	Lampa	228.2	222.4	0.011180857	Y
9/30/2021	E2	Hatchet	687.6	547.5	0.098951745	Y

Figure 6. Results from analysis of duplicate samples collected in 2021

Discussion

E. coli concentrations between different sites varied widely from June through September, even between sites on the same stream. Concentrations were more similar to other sites in the same stream during the early spring (see Figures 3-5). This may suggest that localized conditions affect *E. coli* concentration in project area streams during low flows in the summer and early fall. Individually, most sites exhibited a trend of higher *E. coli* concentrations from June through September. All exceedances of

the ODEQ single sample limit (two sites in Hatchet Slough and four sites in Bear Creek) occurred during this time period (see Figures 3-5). This supports the hypothesis that *E. coli* concentration is higher in the summer and early fall. Cattle spend more time in stream channels drinking and cooling off and in riparian areas grazing during this time period. Flows in all three study streams were very low from June through September. Some Pools in Bear Creek were even observed to be separated by dry riffles. Because water quantity was low during this time period, the study sites could have been more susceptible to high *E. coli* concentrations.

When comparing streams, Bear Creek and Hatchet Slough appear to be more impacted by *E. coli* pollution than Lampa Creek (see Figures 3-5). Livestock have access to the stream channel at, or just upstream of, all three monitoring sites on Hatchet Slough and at all but one site on Bear Creek. There is no livestock access to the stream channel at the properties with monitoring sites on Lampa Creek. The Lampa Creek properties also seem to have fewer livestock grazing than properties on Bear Creek and Hatchet Slough, so this could explain the lower *E. coli* measurements. If this trend continues, Bear Creek and Hatchet Slough should be prioritized for restorative actions. However, Lampa Creek would still benefit from riparian planting and fencing to increase riparian shade and prevent future livestock access to the stream channel.

A trend is not yet apparent between reaches with different levels of riparian vegetation. When water temperature monitoring begins in 2022 and two variables are available for analysis (both temperature and *E. coli*), we will better ascertain overall water quality between different reaches.

Going forward, *E. coli* sampling will continue monthly through the end of 2022 with the addition of “blank” samples to increase quality assurance. Water temperature monitoring will begin in May 2022 now that the Project Manager position at Coos SWCD has been filled. It will continue for two years to collect sufficient baseline data in the project area. After habitat restoration within the project area, monitoring will occur during the 8th, 9th, and 10th years of the 10-year monitoring project, and data collected will be compared with baseline data.

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Appendix A: Site Photos



Figure 7. Site E3 is on "Trib A" of Hatchet Slough on the Pearce property.



Figure 8. Site E4 is on lower Lampa Creek on Coos County property.



Figure 9. Site E5 is midway up the Lampa Creek valley on the Wintz property.



Figure 10. Site E6 is at the upper end of agricultural influence on Lampa Creek on the Suppes property.



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