DRAFT: *Escherichia coli* Patterns in the South Fork Clearwater River Subbasin

Hydrologic Unit Code 17060305

State of Idaho
Department of Environmental Quality
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Acknowledgments

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Abbreviations, Acronyms, and Symbols

§	section (usually a section of federal or state rules or statutes)
AU	assessment unit
BURP	Beneficial Use Reconnaissance Program
cfs	cubic feet per second
cfu	colony forming unit
CWA	Clean Water Act
DEQ	Idaho Department of Environmental Quality
E. coli	*Escherichia coli*
EPA	United States Environmental Protection Agency
HUC	hydrologic unit code
IDAPA	refers to citations of Idaho administrative rules
mL	milliliter
mpn	most probable number
NHD	National Hydrography Dataset
PCR	primary contact recreation
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
SCR	secondary contact recreation
TMDL	total maximum daily load
WWTP	wastewater treatment plant

Executive Summary

Idaho's "Water Quality Standards" require that all Idaho waters have water quality that enables recreation (IDAPA 58.01.02). Waters must be protected for either primary contact recreation, activities such as swimming where immersion in water or ingestion of water is likely; or for secondary contact recreation, activities such as fishing or boating where immersion in water or ingestion of water is not likely. Idaho's water quality standards include an *Escherichia coli* (*E. coli*) criterion developed to protect people recreating in or on water. The criterion is defined as a geometric mean *E. coli* concentration of 126 colony forming units per 100 milliliters and requires collecting at least five samples spaced every 3–7 days over a 30-day period (IDAPA 58.01.02.251.01a). If the criterion is exceeded, people are more likely to become ill, and DEQ classifies water quality as not supporting contact recreation uses under the Clean Water Act in Idaho's biannual Integrated Report.

This report documents 2017–2019 *E. coli* data collected by DEQ in the South Fork Clearwater River subbasin (hydrologic unit code [HUC] 17060305). Data are used to assess if contact recreation use is supported at sampled stream sites. In addition, DEQ data are combined with data collected by Nez Perce Tribe Water Resources and Idaho Association of Soil Conservation Districts to document *E. coli* patterns within and across years at several sites. DEQ only collected data and assessed contact recreation use support for waters outside the Nez Perce Reservation boundary, consistent with DEQ's tribal waters policy (DEQ 2018), which was developed in coordination with the United States Environmental Protection Agency (EPA) based on requests from Idaho's Indian tribes. However, to assist with interagency efforts to improve water quality, this report summarizes spatial and temporal *E. coli* patterns both inside and outside the reservation boundary.

Between 2017 and 2019, DEQ collected *E. coli* data at 72 sites across 62 assessment units (AUs) within the South Fork Clearwater River subbasin. Based on that data, DEQ determined six AUs do not support contact recreation, 51 support contact recreation, and 5 could not be assessed. Four of the non-supporting AUs were located on the Camas Prairie and already have bacteria total maximum daily loads (TMDLs) developed. For five AUs, DEQ determined contact recreation support could not be assessed because the AUs are intermittent and do not meet IDAPA 58.01.02.010.54 and 58.01.02.251.01 requirements for applying the *E. coli* water quality criterion. DEQ's contact recreation use support decisions were documented, made available for public comment, and submitted to EPA for approval through Idaho's upcoming draft 2018/2020 Integrated Report (DEQ 2020).

Across all available data (i.e., DEQ and external), 86 unique sites have *E. coli* data in HUC 17060305. Multiple years of data are available at several locations in the Cottonwood Creek and Threemile Creek watersheds. In these watersheds, *E. coli* concentrations peak during spring high flows at most sites, or peak in late summer, or do not show a clear seasonal pattern. Available data suggest patterns are of similar magnitude across subwatersheds within the Cottonwood Creek and Threemile Creek watersheds, and there is not a clear trend across years at most sites; however, limited recent data are available.

1 Introduction

Idaho's "Water Quality Standards" require that all Idaho waters have water quality that enables recreation (IDAPA 58.01.02). Waters must be protected for either primary contact recreation, activities such as swimming where immersion in water or ingestion of water is likely; or for secondary contact recreation, activities such as fishing or boating where immersion in water or ingestion of water is not likely. Idaho's water quality standards include an *Escherichia coli* (*E. coli*) criterion developed to protect people recreating in or on water. The criterion is defined as a geometric mean *E. coli* concentration of 126 colony forming units per 100 milliliters and requires collecting at least five samples spaced every 3–7 days over a 30-day period (IDAPA 58.01.02.251.01a). If the criterion is exceeded, people are more likely to become ill, and DEQ classifies water quality as supporting or not supporting contact recreation uses under the Clean Water Act in Idaho's biannual Integrated Report.

This report documents 2017–2019 *E. coli* data collected by DEQ in the South Fork Clearwater River subbasin (hydrologic unit code [HUC] 17060305) (Figure 1). Data were used to assess if contact recreation use is supported at sampled stream sites. In addition, DEQ data were combined with data collected by Nez Perce Tribe Water Resources (NPT 2014) and Idaho Association of Soil Conservation Districts (IASCD 2007) to document *E. coli* patterns within and across years at several sites. DEQ only collected data and assessed contact recreation use support for waters outside the Nez Perce Reservation boundary, consistent with DEQ's tribal waters policy, which was developed in coordination with the United States Environmental Protection Agency (EPA) based on requests from Idaho Indian tribes (DEQ 2018). This report summarizes spatial and temporal *E. coli* patterns inside and outside the reservation boundary to assist with interagency efforts to improve water quality.

1.1 Assessment Units

To assess if state water quality criteria are met, beneficial uses are supported, and to fulfill CWA §303(d) and §305(b) reporting requirements, DEQ divides water bodies into assessment units (AUs). AUs are groups of stream segments with similar Strahler stream order, land use practices, ownership, and land management. AUs are defined primarily based on Strahler stream order, although additional factors such as land use, landscape physical characteristics, and local knowledge may be considered. A detailed description of how DEQ subdivides state waters into AUs is provided in *Idaho's 2016 Integrated Report* (DEQ 2018), which is the most recent EPA-approved Integrated Report for Idaho.

There are 119 AUs outside the Nez Perce Reservation boundary in HUC 17060305; this report addresses 62 of those AUs outside the reservation boundary. All AUs in HUC 17060305 begin with ID17060305CL (ex: ID17060305CL010_02). In this document, AU numbers are shortened to include only the portion after 'CL' for easier reading. For example, AU ID17060305CL010_02 is referred to as 010_02.

1.2 Total Maximum Daily Loads

The CWA requires states to publish a biannual list of waters that do not meet state water quality standards (i.e., §303(d) list). For these waters, states must develop a water quality improvement plan called a total maximum daily load (TMDL), which is submitted to EPA for approval. In HUC 17060305, DEQ previously identified 18 AUs as impaired due to bacteria (either fecal coliform or *E. coli*) and developed TMDLs (DEQ 2000; DEQ 2004). Eleven of these AUs are located outside the Nez Perce Reservation boundary. TMDLs in HUC 17060305 were jointly developed under a memorandum of agreement between DEQ, EPA, and the Nez Perce Tribe, and were approved by EPA (EPA 2000; EPA 2004). This report evaluates recreation use support for 11 AUs with existing bacteria TMDLs and 51 AUs where contact recreation was either unassessed or fully supporting in Idaho's 2016 Integrated Report (DEQ 2018), which is the most recent EPA-approved Integrated Report for Idaho. The AUs where DEQ assessed contact recreation support in this report are all located outside the reservation boundary.

1.3 Project Database

DEQ is developing a public database of water quality data collected in the South Fork Clearwater subbasin, the SF-CLEAR database. The database is intended to promote monitoring coordination among agencies, and facilitate stakeholder data access during the SF Clearwater WAG process. SF-CLEAR data can be accessed through the SF Clearwater WAG web page: *http://www.deq.idaho.gov/regional-offices-issues/lewiston/southfork-clearwater-wag/* All *E. coli* data described in this report, including DEQ and external data, are included in the SF-CLEAR database.

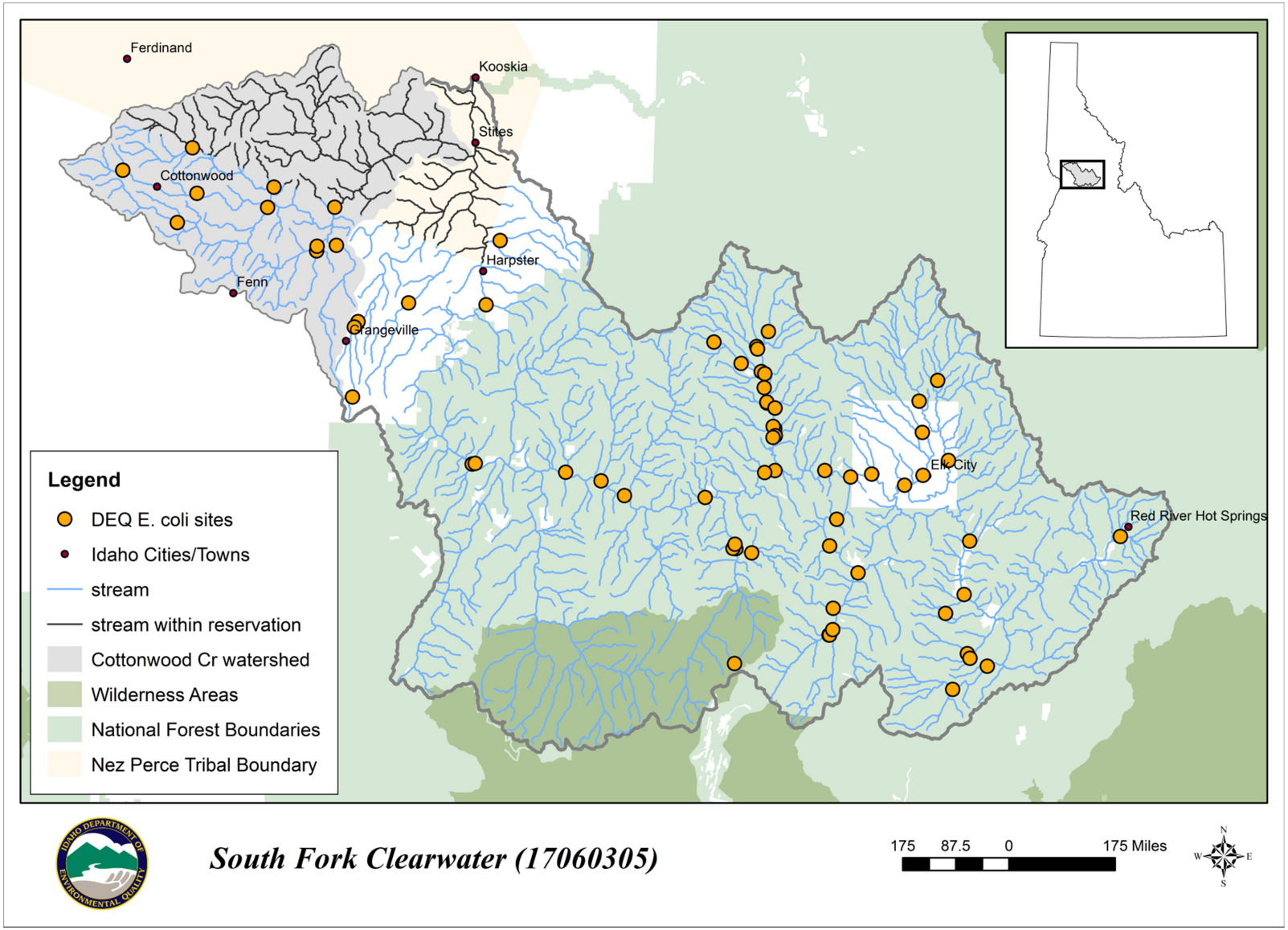

Figure 1. South Fork Clearwater River subbasin and 2017–2019 DEQ *E. coli* sample sites.

2 Methods

Between 2017 and 2019, DEQ measured *E. coli* concentrations at 72 sites across 62 AUs within the South Fork Clearwater River watershed (Figure 1 and Table 1). At some sites, DEQ measured instantaneous stream flow when *E. coli* samples were collected, or during Beneficial Use Reconnaissance Program (BURP) sampling. Before sampling, field and laboratory methodology, quality assurance and quality control (QA/QC) procedures, and data quality objectives were defined in the *Statewide Generic Quality Assurance Project Plan: Monitoring Surface Water for Escherichia coli for Assessing Beneficial Use Support* (DEQ 2014), *Quality Assurance Project Plan: Multi Parameter Region Wide Monitoring QAPP for the Lewiston Regional Office* (DEQ 2019b), and *Field Sampling Plan: 2019 South Fork Clearwater HUC Escherichia coli and Stream Flow Monitoring* (DEQ 2019a). A summary of data QA/QC procedures is provided in Appendix A.

2.1 Escherichia coli

Grab *E. coli* samples were collected by submerging a sample bottle below the stream surface at the thalweg, the section of the stream channel that carries the greatest portion of flow. Samples were collected in 150 mL plastic containers pre-preserved with sodium thiosulfate provided by Anatek Labs. Samples were delivered to Anatek Labs on ice and were analyzed within 24 hours of collection using standard method 9223B (NEMI 2019). At least one field duplicate and one field blank sample were collected for every 20 regular samples (Appendix A).

At each site, DEQ either collected a single sample, or 5 samples spaced 3–7 days apart over a 30-day period (Figure 2). Within AUs where contact recreation was not listed as impaired by bacteria (*E. coli* or fecal coliform) in the 2016 Integrated Report (DEQ 2018), DEQ collected a single *E. coli* sample to determine if further monitoring was needed (Figure 2). DEQ's *Water Body Assessment Guidance* (DEQ 2016) outlines a protocol for applying the results of a single *E. coli* sample. Results are compared to a threshold value to determine if additional monitoring is needed. Thresholds are 406 most probable number (mpn) per 100 mL for streams with PCR use and 576 mpn/100 mL for streams with SCR use (DEQ 2016). If the relevant threshold is not exceeded, DEQ assumes *E. coli* does not impair contact recreation use within the AU (DEQ 2016). If the sample result exceeds the relevant threshold, additional samples are needed to calculate a geometric mean *E. coli* concentration (Figure 2).

Within AUs where recreation use was listed as impaired by bacteria and at sites where a single sample result exceeded the relevant threshold, DEQ collected at least five *E. coli* samples over a 30-day period, sampling every 3 to 7 days. Data were used to calculate a geometric mean *E. coli* concentration for comparison to Idaho's *E. coli* water quality criterion (IDAPA 58.01.02.251.01a). At some sites, samples were collected in spring during high flows and in late summer during low flows to calculate season-specific geometric means. Section 2.3 provides additional details.

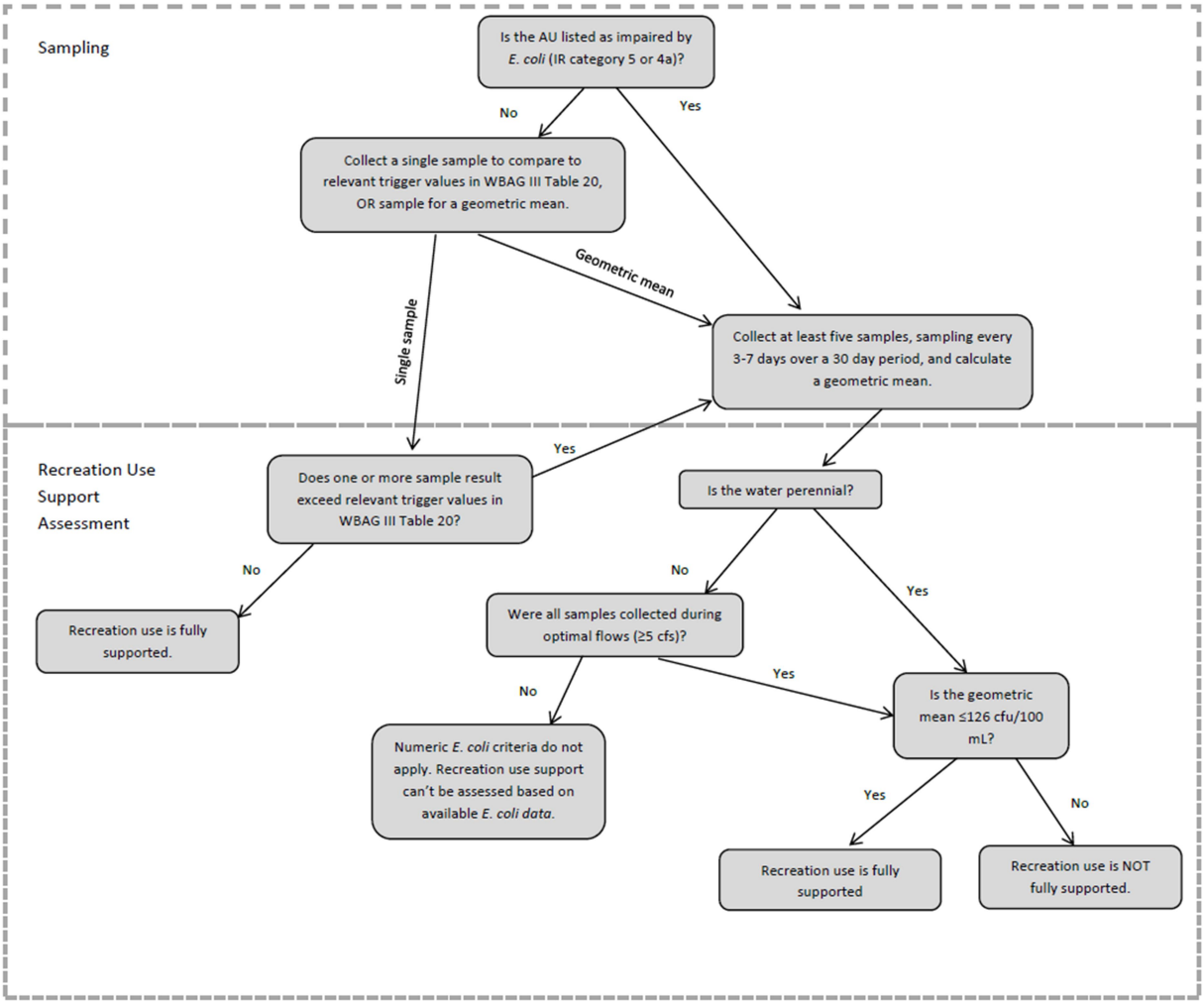

Figure 2. *E. coli* sampling and assessment approach.

2.2 Stream Flow

Instantaneous stream flow was measured using a portable electromagnetic velocity meter and the velocity-area method. A stream transect was established perpendicular to stream flow. The transect was divided into equal-width cells and water depth and velocity were measured within each cell. Instantaneous stream flow was calculated by summing the product of velocity and area measurements calculated from each cell. In some cases, stream flow was measured when an *E. coli* sample was collected. In other cases, stream flow was measured separately during BURP sampling, which occurs in July or August. If flowing water was present, flow was measured as described above; otherwise, sites were recorded as *no flow* or *dry* and photographed.

2.3 Site Flow Type Classification

DEQ classified stream flow at each sampled site as perennial or intermittent. Perennial waters have water throughout the year, while intermittent waters contain water for only part of the year but more than just after rainstorms and snowmelt. Ephemeral waters contain with water only

shortly after precipitation (Rea and Skinner 2009). For intermittent and ephemeral waters, Idaho's *E. coli* criterion only applies when flow is greater than 5 cubic feet per second (cfs) (IDAPA 58.01.02.070.06). Idaho water quality standards define intermittent waters as:

> A stream, reach, or water body which naturally has a period of zero (0) flow for at least one (1) week during most years. Where flow records are available, a stream with 7Q2 hydrologically-based unregulated flow of less than one-tenth (0.1) cubic feet per second (cfs) is considered intermittent. Streams with natural perennial pools containing significant aquatic life uses are not intermittent (IDAPA 58.01.02.010.54).

Continuous flow records are not available for streams addressed in this report, so site visit records and geospatial data were used to evaluate if sampled sites meet the IDAPA 58.01.02.010.54 intermittent definition.

- **Site Visits—**DEQ gathered available site visit information from 1996 to present: DEQ BURP monitoring, Nez Perce Tribe Water Resources Division monitoring in Cottonwood, Butcher, and Threemile Creeks (2001, 2005, 2011–2012) (NPTWRD 2014), and DEQ 2017–2019 monitoring (flow measurements, photographs, and records of no flow or dry site observations).
- **National Hydrography Dataset Plus High Resolution (NHDPlus HR) 1:24,000-mile scale—**NHDPlus HR classifies the flow type for each ReachCode. Idaho's AUs and CWA §303(d) and 305(b) maps in its 2016 Integrated Report (DEQ 2018) are based on the NHDPlus version 2 1:100,000-mile scale data. NHDPlus HR data were used because they represent the most up-to-date available geospatial information.
- **Rea and Skinner (2009)—**Based on 10-meter resolution digital elevation models and 1:24,000 scale NHD data, Rea and Skinner (2009) estimated flow type for most NHD reach codes in Idaho. Regression models from Hortness (2006) were modified to estimate 7Q2 flows for each NHDPlus reach code in Idaho. Reaches with predicted 7Q2 flow > 0.1 cfs were classified as perennial. Methods, results, and associated geospatial data are documented in the United States Geological Survey Data Series Report 412 (Rea and Skinner 2009).

DEQ used professional judgement to assign each sampled site to a flow category (perennial or intermittent). When available, records from site visits were given greater weight than flow predictions from geospatial data. The precipitation conditions (wet year versus dry year) associated with observed flow conditions was also considered. Sites observed with no flow or dry in 2019 were assumed to be dry in most years and meet the IDAPA 58.01.02.010.45 intermittent definition. For each site, Appendix B documents information gathered from the site visit records and geospatial data outlined above. Flow type conclusions for each site are documented in Table 1.

2.4 Recreation Use Support Assessment

Figure 2 documents the logic applied to assess if each sampled site supports contact recreation use based on Idaho's *E. coli* water quality standard (IDAPA 58.01.02.251.01), *Water Body Assessment Guidance* (DEQ 2016), and stream flow requirements for applying numeric water quality criteria in intermittent waters (IDAPA 58.01.02.010.54, IDAPA 58.01.02.070.06).

2.5 *E. coli* Patterns

SF-CLEAR data were used to document spatial and temporal *E. coli* patterns. At locations where more than one *E. coli* sample was collected, *E. coli* summary statistics were calculated. *E. coli* concentration patterns were evaluated for selected locations with multiple years of data in the Cottonwood Creek and Threemile Creek subwatersheds. *E. coli* patterns upstream and downstream of wastewater treatment plants (WWTPs) on Cottonwood and Threemile Creeks were also evaluated.

3 Results

3.1 Contact Recreation Support Assessment

Table 1 documents *E. coli* results and contact recreation support assessment conclusions made based on the assessment approach in Figure 2.

Out of 63 AUs evaluated, six AUs outside the reservation boundary were assessed as not supporting contact recreation use based on *E. coli* geometric mean results exceeding the Idaho *E. coli* criterion. Three of these AUs (Cottonwood Creek, 03_04; Stockney Creek, 06_03; Shebang Creek, 07_03) are located in the Cottonwood Creek watershed and have fecal coliform TMDLs (DEQ 2000). Threemile Creek (AU 10_02) has an *E. coli* TMDL (DEQ 2004). Sally Ann Creek (AU 81_02, 81_03) was previously unassessed for contact recreation. In Idaho's 2018/2020 Integrated Report, DEQ will keep Threemile Creek in Category 4a for *E. coli* and place the other four AUs in Category 5 for *E. coli* until DEQ develops and EPA approves *E. coli* TMDLs.

DEQ assessed South Fork Cottonwood Creek AU (08_03) as fully supporting contact recreation based on geometric mean concentrations quantified in both spring and summer that were less than the *E. coli* criterion. This AU has a fecal coliform TMDL (DEQ 2000), and in the 2018 Integrated Report (DEQ 2020), DEQ will propose to move contact recreation from Category 4a to fully supporting.

DEQ assessed 51 AUs as fully supporting contact recreation use based on one or more single *E. coli* samples (Figure 2). Thirty-two of these AUs were previously unassessed, and 19 were previously fully supporting contact recreation.

Five AUs within the Cottonwood Creek watershed (03_02, 06_02, 07_02, 08_02, and 09_02) were intermittent and did not meet conditions necessary to apply the *E. coli* criterion and evaluate exceedances. For intermittent streams, numeric water quality criteria for protecting recreation uses only apply during *optimal* flows (≥ 5 cfs) (IDAPA 58.01.02.070.06 and 58.01.02.010.54). In addition, the *E. coli* criterion requires at least five samples collected every 3 to 7 days over a 30-day period (IDAPA 58.01.02.251.01). Thus, for intermittent streams, flows must be ≥ 5 cfs during the entire geometric mean sampling period (a minimum of 15 days).

During spring 2019 high flows, which included an all-time record high water level on the South Fork Clearwater River at Stites, these five AUs did not have ≥ 5 cfs during the geometric mean sampling period (one sample per week, April 16 to May 14). Flows were ≥ 5 cfs during the first

sample event, and at some sites, also during the second or third sample event. Flows were ≤ 5 cfs during subsequent sample events and were 0.1–1.85 cfs by the end of the geometric mean sampling period. These sites were subsequently documented with no flow or dry in summer 2019, and in some cases, also in previous years (Appendix B).

For these five AUs, DEQ proposed to change contact recreation from not supporting (Category 4a) to not assessed (Category 3) in the 2018/2020 Integrated Report (DEQ 2020). For available *E. coli* data, requirements for applying the *E. coli* criterion and evaluating criterion exceedances were not met in these AUs. Stream flow data were not available at the time the Cottonwood Creek TMDL was developed; the TMDL identified stream flow as a data gap (DEQ 2000, Table 21). Subsequent flow measurements demonstrate flows are ≥ 5 cfs only briefly during spring high flows, and not long enough to quantify a geometric mean. Until data can be collected that meets IDAPA 58.01.02.010.54 and IDAPA 58.01.02.251.01a, contact recreation will remain unassessed.

Table 1. E. coli results and recommended recreation use support status for the 2018/2020 Integrated Report. Monitoring locations correspond to the Water Quality Portal (www.waterqualitydata.us) where the data are publically available.

Site Information						*E. coli* Result					Recreation Support Status	
AU	Use	Use Type	Monitoring Location ID	Location Description	Flow Class	Type	N	Start	End	mpn/ 100 mL	2016 Integrated Report	2018 Integrated Report
03_02	PCR	DES	2019LEWSC3_02d	Cottonwood Creek downstream of WWTP	I	Geometric mean	5	4/17/19	5/14/19	109.9	NS (Category 4a–FC)	Delist (UA)
			2019LEWSC3_02h	Cottonwood Creek headwaters	I	Geometric mean	5	4/17/19	5/14/19	43.3		
03_04	PCR	DES	2019LEWSC3_04	Cottonwood Creek at tribal boundary	P	Geometric mean	5	4/16/19	5/13/19	88.1	NS (Category 4a–FC)	NS (Category 5–*E. coli*)
						Geometric mean	5	8/20/19	9/16/19	210.9		
06_02	SCR	PRE	2019LEWSC6_02	Stockney Creek at Greencreek Road	I	Geometric mean	5	4/16/19	5/14/19	97.6	NS (Category 4a–FC)	Delist (UA)
06_03	SCR	PRE	2019LEWSC6_03	Stockney Creek at Kube Road	P	Geometric mean	5	4/16/19	5/13/19	149.8	NS (Category 4a–FC)	NS (Category 5–*E. coli*)
07_02	SCR	PRE	2019LEWSC7_02	Shebang Creek at Twin House Road	I	Geometric mean	5	4/16/19	5/14/19	252.8	NS (Category 4a–FC)	Delist (UA)
07_03	SCR	PRE	2019LEWSC7_03	Shebang Creek at Kube Road	P	Geometric mean	5	4/16/19	5/13/19	519.8	NS (Category 4a–FC)	NS (Category 5–*E. coli*)
08_02	SCR	PRE	2019LEWSC8_02	SF Cottonwood Creek 2nd order	I	Geometric mean	5	4/16/19	5/13/19	146.7	NS (Category 4a–FC)	Delist (UA)
08_03	SCR	PRE	2019LEWSC8_03	SF Cottonwood Creek 3rd order	P	Geometric mean	5	4/16/19	5/13/19	123.6	NS (Category 4a–FC)	Delist (FS)
						Geometric mean	5	8/20/19	9/16/19	42.3		
09_02	SCR	PRE	2019LEWSC9_02	Long Haul Creek at Day Road	I	Geometric mean	5	4/17/19	5/13/19	103.7	NS (Category 4a–FC)	Delist (UA)
10_02	SCR	DES	2019LEWSC10_2d	Threemile Creek downstream of WWTP	P	Geometric mean	5	4/16/19	5/13/19	1146.6	NS (Category 4a–*E. coli*)	NS (Category 4a–*E. coli*)
			2019LEWSC10_2h	Threemile Creek headwaters	P	Geometric mean	5	4/16/19	5/13/19	2.3		
						Geometric	5	8/20/19	9/16/19	5.0		

Site Information						*E. coli* Result					Recreation Support Status	
AU	Use	Use Type	Monitoring Location ID	Location Description	Flow Class	Type	N	Start	End	mpn/ 100 mL	2016 Integrated Report	2018 Integrated Report
						mean						
			2019LEWSC10_2u	Threemile Creek upstream of WWTP	P	Geometric mean	5	4/16/19	5/13/19	566.4		
11b_02	SCR	DES	2019SLEWA003	Butcher Creek	P	Single	1	8/14/19	—	61.3	UA	FS
12_02	PCR	DES	2018SLEWSFCEC041	Grouse Creek	P	Single	1	9/6/18	—	3.1	UA	FS
			2018SLEWSFCEC046	Castle Creek	P	Single	1	8/9/18	—	151.5		
12_02a	PCR	DES	2019SLEWA017	Green Creek	P	Single	1	8/14/19	—	59.7	FS	FS
22_02	PCR	DES	2019SLEWA006	Reed Creek	P	Single	1	8/14/19	—	14.6	FS	FS
25_04	SCR	PRE	2018SLEWSFCEC033	Tenmile Creek	P	Single	1	8/27/18	—	58.3	FS	FS
26_02	SCR	DES	2018SLEWSFCEC031	Unnamed tributary to Tenmile Creek	P	Single	1	8/27/18	—	125.9	FS	FS
26_03	SCR	DES	2018SLEWSFCEC029	Tenmile Creek	P	Single	1	8/27/18	—	81.6	FS	FS
29_02	SCR	PRE	2018SLEWSFCEC032	Sixmile Creek	P	Single	1	8/27/18	—	198.9	FS	FS
29_03	SCR	PRE	2018SLEWSFCEC030	Sixmile Creek	P	Single	1	8/27/18	—	148.3	UA	FS
30_02	PCR	DES	2018SLEWSFCEC013	Dutch Oven Creek	P	Single	1	8/20/18	—	21.6	FS	FS
31_02	SCR	DES	2018SLEWSFCEC031	Unnamed tributary to Crooked River	P	Single	1	8/22/18	—	5.1	UA	FS
31_03	SCR	DES	2018SLEWSFCEC026	Crooked River	P	Single	1	8/22/18	—	14.5	UA	FS
32_02	SCR	DES	2018SLEWSFCEC023	Fivemile Creek	P	Single	1	8/22/18	—	7.5	UA	FS
32_03	SCR	DES	2018SLEWSFCEC024	Crooked River	P	Single	1	8/22/18	—	8.6	UA	FS
33_02	SCR	PRE	2018SLEWSFCEC018	WF Crooked River	P	Single	1	8/22/18	—	3.1	UA	FS
			2017LEWSC33_02	WF Crooked River	P	Single	1	6/5/17	—	1		
34_02	SCR	PRE	2017LEWSC34_02	EF Crooked River	P	Single	1	6/5/17	—	1	UA	FS
			2018SLEWSFCEC019	EF Crooked River	P	Single	1	8/22/18	—	6.3		
35_02	SCR	PRE	2018SLEWSFCEC025	Relief Creek	P	Single	1	8/22/18	—	12.1	UA	FS
36_02	PCR	DES	2018SLEWSFCEC014	Unnamed tributary to SF Clearwater	P	Single	1	8/20/18	—	45.5	UA	FS
38_02	PCR	DES	2017LEWSC38_02	Dawson Creek	P	Single	1	6/6/17	—	6.3	UA	FS
38_02a	PCR	DES	2018SLEWSFCEC034	Little Moose Creek	P	Single	1	8/20/18	—	8.6	UA	FS

Site Information						*E. coli* Result					Recreation Support Status	
AU	Use	Use Type	Monitoring Location ID	Location Description	Flow Class	Type	N	Start	End	mpn/ 100 mL	2016 Integrated Report	2018 Integrated Report
39_02	SCR	PRE	2017LEWSC39_02	Moose Butte Creek	P	Single	1	6/7/17	—	9.7	UA	FS
			2019SLEWA007	Hays Creek	P	Single	1	8/14/19	—	2.0		
41_02	SCR	DES	2018SLEWSFCEC017	Deer Creek	P	Single	1	8/20/18	—	95.9	UA	FS
43_02	SCR	DES	2018SLEWSFCEC016	SF Red River	P	Single	1	8/20/18	—	21.8	UA	FS
47_02	SCR	DES	2017LEWSC47_02	Bridge Creek	P	Single	1	6/7/17	—	1	UA	FS
50_02	SCR	DES	2019SLEWA008	Siegel Creek	P	Single	1	8/14/19	—	18.5	UA	FS
52_02	PCR	DES	2018SLEWSFCEC027	Box Sing Creek	P	Single	1	8/14/18	—	5.2	UA	FS
54_02	SCR	PRE	2017LEWSC54_02	Flint Creek	P	Single	1	8/24/17	—	119.8	UA	FS
55_03	PCR	DES	2018SLEWSFCEC028	American River	P	Single	1	8/14/18	—	3	FS	FS
56_03	SCR	PRE	2018SLEWSFCEC020	Elk Creek	P	Single	1	6/11/18	—	71.7	FS	FS
57_02	SCR	DES	2018SLEWSFCEC008	Little Elk Creek	P	Single	1	6/11/18	—	43.5	UA	FS
59_02	SCR	PRE	2018SLEWSFCEC042	Buffalo Gulch	P	Single	1	6/11/18	—	131.4	FS	FS
60_02	SCR	DES	2018SLEWSFCEC011	Whiskey Creek	P	Single	1	6/11/18	—	8.4	UA	FS
61_02	SCR	PRE	2018SLEWSFCEC009	Maurice Creek	P	Single	1	8/14/18	—	1	UA	FS
62_02	SCR	PRE	2018SLEWSFCEC035	Victory Creek	P	Single	1	8/21/18	—	16	UA	FS
62_04	SCR	PRE	2017LEWSC62_04	Newsome Creek	P	Single	1	6/5/17	—	6.3	UA	FS
			2018SLEWSFCEC036	Newsome Creek	P	Single	1	6/11/18	—	64.4		
63_02	SCR	PRE	2019SLEWCEC007	Bear Creek	P	Single	1	8/9/18	—	4.1	FS	FS
64_02	SCR	PRE	2017LEWSC64_02	Nugget Creek	P	Single	1	6/5/17	—	17.5	UA	FS
			2018SLEWSFCEC015	Nugget Creek	P	Single	1	8/9/18	—	2		
65_02	SCR	PRE	2018SLEWSFCEC012	Beaver Creek	P	Single	1	8/9/18	—	17.5	FS	FS
66_04	SCR	PRE	2018SLEWSFCEC045	Newsome Creek	P	Single	1	8/9/18	—	68.3	FS	FS
67_02	SCR	DES	2018SLEWSFCEC002	Mule Creek	P	Single	1	8/9/18	—	2	UA	FS
68_02	SCR	PRE	2017LEWSC68_02	Newsome Creek	P	Single	1	8/22/17	—	19.9	UA	FS
68_03	SCR	PRE	2017LEWSC68_03	Newsome Creek	P	Single	1	8/22/17	—	12.1	UA	FS
70_02	SCR	DES	2018SLEWSFCEC004	Baldy Creek	P	Single	1	8/9/18	—	7.5	FS	FS
71_02	SCR	PRE	2018SLEWSFCEC001	Pilot Creek	P	Single	1	8/21/18	—	4.1	UA	FS
71_03	SCR	PRE	2018SLEWSFCEC047	Pilot Creek	P	Single	1	8/21/18	—	7.5	FS	FS

Site Information						*E. coli* Result					Recreation Support Status	
AU	**Use**	**Use Type**	**Monitoring Location ID**	**Location Description**	**Flow Class**	**Type**	**N**	**Start**	**End**	**mpn/ 100 mL**	**2016 Integrated Report**	**2018 Integrated Report**
73_02	SCR	PRE	2017LEWSC73_02	Sing Lee Creek	P	Single	1	6/5/17	—	9.7	UA	FS
			2018SLEWSFCEC003	Sing Lee Creek	P	Single	1	8/9/18	—	1		
74_02	SCR	PRE	2018SLEWSFCEC010	WF Newsome Creek	P	Single	1	8/9/18	—	365.4	FS	FS
75_02	SCR	PRE	2018SLEWSFCEC040	Legget Creek	P	Single	1	6/11/18	—	21.3	FS	FS
77_03	SCR	DES	2018SLEWSFCEC044	Silver Creek	P	Single	1	6/11/18	—	5	FS	FS
78_02	SCR	PRE	2018SLEWSFCEC043	Peasley Creek	P	Single	1	6/11/18	—	8.6	FS	FS
79_02	SCR	PRE	2018SLEWSFCEC005	Cougar Creek	P	Single	1	6/11/18	—	98.8	FS	FS
81_03	SCR	PRE	Nez Perce Tribe site	Sally Ann Creek	P	Geometric Mean	5	1/22/20	2/10/20	222	US	NS NS (Category 5–*E. coli*)
81_02	SCR	PRE	2017LEWSC81_02	Sally Ann Creek	P	Single	1	5/31/17	—	2419.6	UA	NS (Category 5–*E. coli*)
			2017LEWSC81_02	Sally Ann Creek	P	Geometric mean	5	7/6/17	7/20/17	1019.5		

Notes: SCR = secondary contact recreation; PCR = primary contact recreation; DES = designated, PRE = presumed; P = perennial; I = intermittent; UA = contact recreation unassessed; FS = fully supporting contact recreation; NS = not supporting contact recreation; FC = fecal coliform.

3.2 *E. coli* Patterns

The SF-CLEAR database contains *E. coli* data collected by DEQ, Nez Perce Tribe Water Resources Division (NPT 2012), and the Idaho Association of Soil Conservation Districts (IASCD 2007). In some cases, multiple agencies collected data at the same location using agency-specific monitoring location IDs. In these cases, multiple monitoring location IDs were grouped into one unique Site ID in the SF-CLEAR database. There were 86 unique Site IDs with *E. coli* data in the SF CLEAR database. The number of sites with *E. coli* data may increase in the future as more *E. coli* data are collected and added to the database.

Table 2 summarizes available *E. coli* data for 23 Site IDs where more than one sample was collected; all of these except Sally Ann Creek and South Fork Clearwater River at Stites are located on the Camas Prairie (Figure 3).

Multiple years of data are available at several locations in the Cottonwood Creek and Threemile Creek watershed (Figure 3). In these watersheds, *E. coli* concentrations peak during spring high flows at most sites, or peak in late summer, or do not show a clear seasonal pattern (Figure 4 and Figure 5). Available data suggest patterns are similar across subwatersheds within the Cottonwood Creek and Threemile Creek watersheds (Figure 4 and Figure 5); however, limited recent data are available.

In 2019, geometric mean *E. coli* concentrations were 43.3 mpn/100 mL near the headwaters of Cottonwood Creek and 109.9 mpn/100 mL downstream of the City of Cottonwood WWTP (Table 1 and Figure 6). Both of these geometric mean concentrations would be less than the *E. coli* criterion if IDAPA requirements for criteria application had been met.

In Threemile Creek, geometric mean *E. coli* concentrations exceeded the *E. coli* criterion both upstream (566.4 mpn/100 mL) and downstream of the City of Grangeville WWTP (1146.6 mpn/100 mL) (Table 1 and Figure 6). Across years, concentrations were consistently low near the headwaters of Threemile Creek (Figure 5).

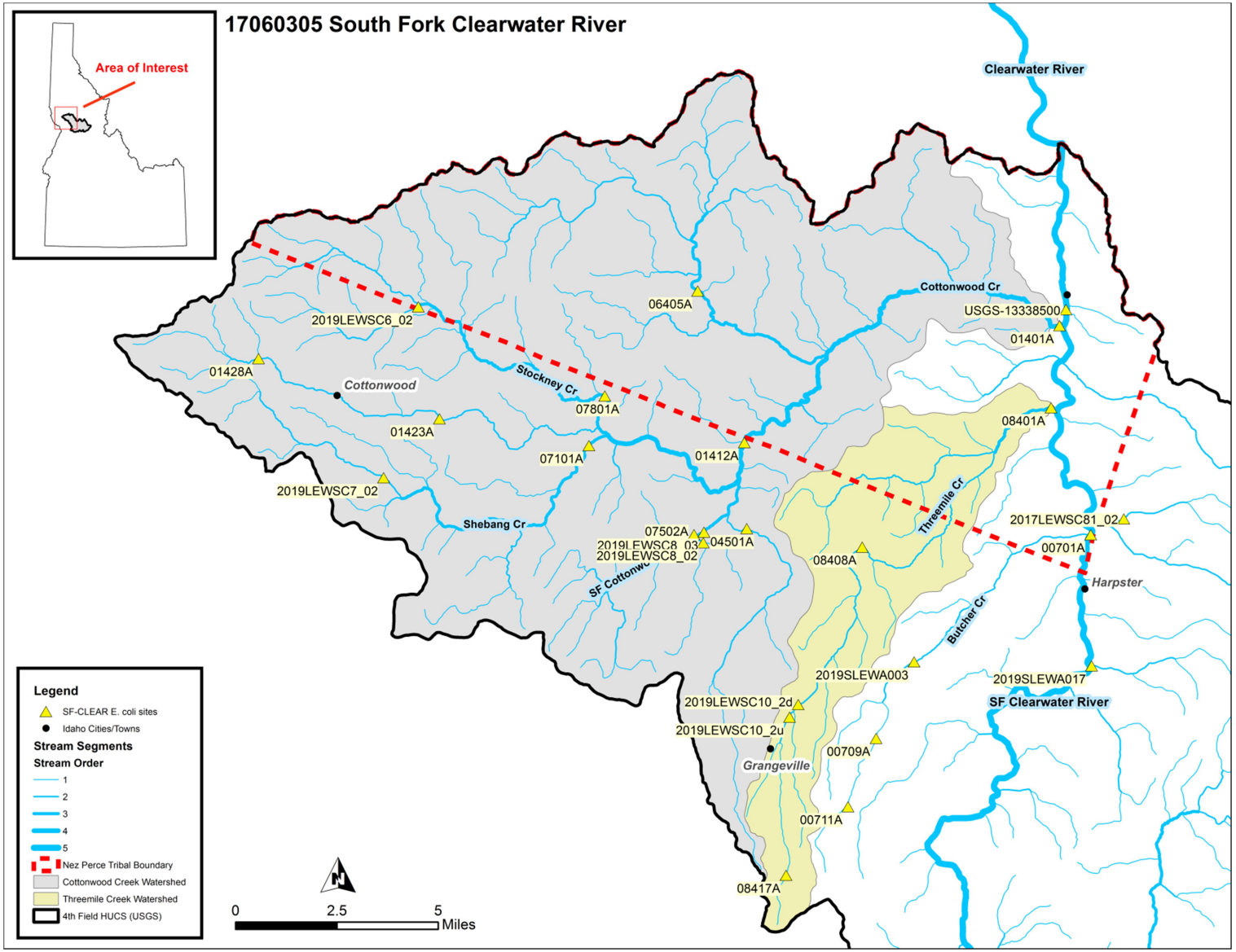

Figure 3. *E. coli* sites on the Camas Prairie in the SF-CLEAR database. Table 2 provides the site data summaries.

Table 2. Summary of available data for selected sites where multiple *E. coli* samples have been collected. Site IDs correspond to those used in the SF CLEAR database.

Site ID	Site Name	N	Minimum Year	Maximum Year	Minimum (mpn/100 mL)	Maximum (mpn/100 mL)	Mean (mpn/100 mL)
00701A	Butcher Creek mouth	6	2012	2012	3.1	40.8	17.2
00709A	Butcher Creek at Case Road	10	2011	2012	1.0	1986.3	362.1
00711A	Butcher Creek at Mt Idaho Grade Road	12	2011	2012	2.0	1299.7	266.1
01401A	Cottonwood Creek mouth	43	2005	2012	2.0	2419.2	223.2
01412A	Cottonwood Creek at Reservation boundary	41	2005	2019	1.0	1986.3	245.3
01423A	Cottonwood Creek downstream of WWTP	32	2005	2019	1.0	2419.6	231.6
01428A	Cottonwood Creek at Reservoir Road	26	2005	2019	9.7	2419.6	486.6
04501A	Long Haul Creek at Day Road	35	2005	2019	1.0	2419.6	380.8
06405A	Red Rock Creek above canyon	30	2005	2012	1.0	2419.2	568.6
07101A	Shebang Creek at Kube Road	30	2005	2019	1.0	2419.6	389.2
2019LEWSC7_02	Shebang Creek at Twin House Road crossing	5	2019	2019	101.4	1986.3	522.1
07502A	SF Cottonwood Creek 3rd order at Hwy 7	26	2005	2012	1.0	2419.6	258.3
2019LEWSC8_02	SF Cottonwood Creek 2nd order near Old Hwy 7	5	2019	2019	67.0	686.7	219.7
2019LEWSC8_03	SF Cottonwood Creek 3rd order downstream of Hwy 7	10	2019	2019	12.1	2419.6	298.8
07801A	Stockney Creek at Kube Road	32	2005	2019	2.0	1046.2	196.9
2019LEWSC6_02	Stockney Creek at Greencreek Road crossing	5	2019	2019	25.9	547.5	173.2
08401A	Threemile Creek mouth at Luke's Gulch Road	45	2000	2012	1.0	1300.0	182.5
08408A	Threemile Creek at Fairview Road	12	2011	2012	17.5	2419.6	408.3
08417A	Threemile Creek at Grangeville Salmon Road bend	28	2006	2019	1.0	161.6	17.1
2019LEWSC10_2d	Threemile Creek downstream of WWTP	31	2000	2019	1.0	2419.6	907.9
2019LEWSC10_2u	Threemile Creek upstream of WWTP	31	2000	2019	28.0	2419.2	838.3
2017LEWSC81_02	Sally Ann Creek	6	2017	2017	172.3	2419.6	1530.4
USGS-13338500	SF Clearwater River at Stites	25	2005	2009	11.0	1800	159.3

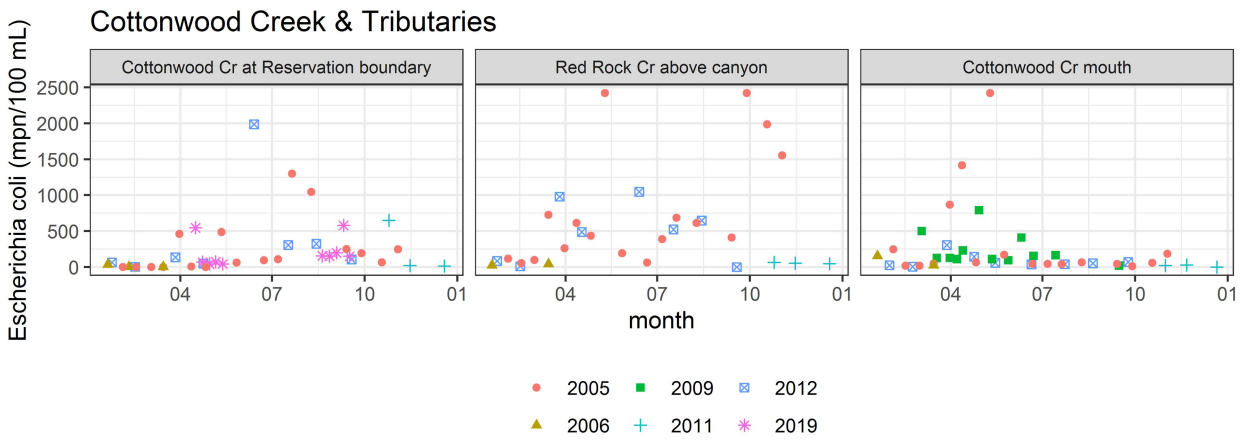

Figure 4. *E. coli* concentration patterns at selected points in the Cottonwood Creek watershed.

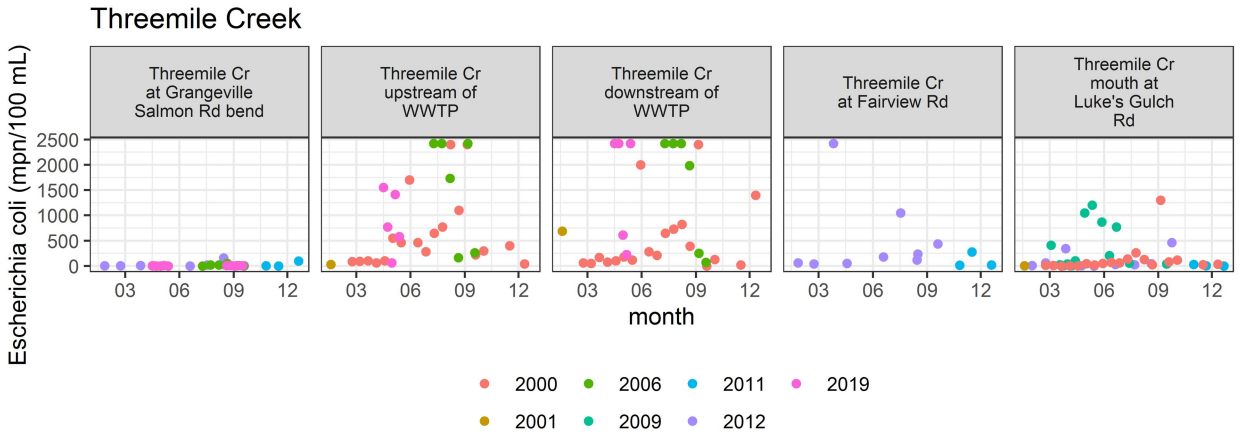

Figure 5. *E. coli* concentration patterns at selected sites in the Threemile Creek watershed.

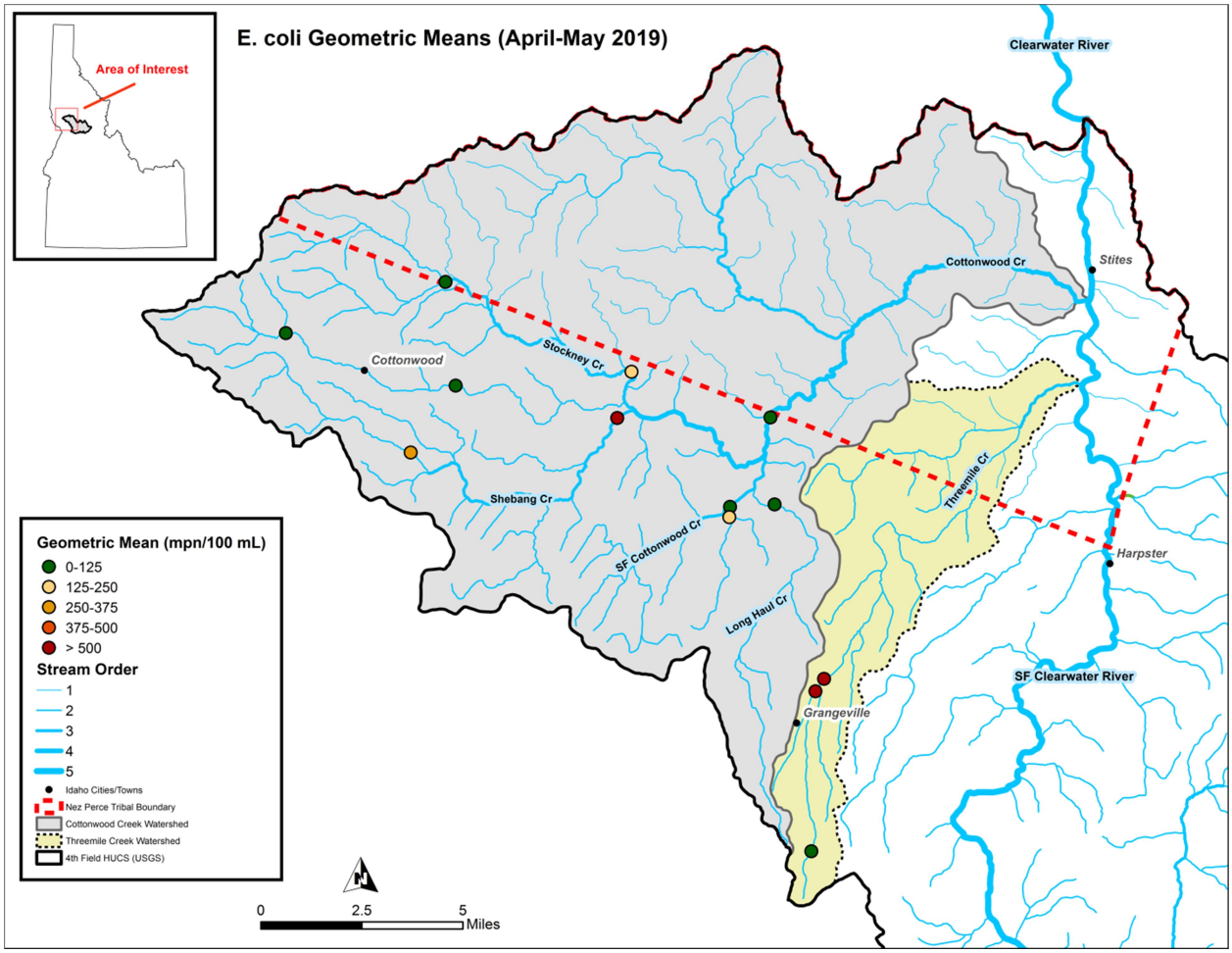

Figure 6. Geometric mean *E. coli* concentrations, calculated at each site based on five samples collected April 16–May 14, 2019.

4 Data Availability

DEQ *E. coli* data in this report are publically available through the Water Quality Portal (*www.waterqualitydata.us*), a national repository for water quality data. All DEQ data from HUC 17060305 uploaded to Water Quality Portal can be accessed at *https://www.waterqualitydata.us/portal/#organization=IDEQ_WQX&huc=17060305&mimeType=csv*. All data in this report are also included in the SF-CLEAR database described above (Section 1.3).

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Appendix A. Quality Assurance/Quality Control

1 Background and Purpose

This appendix reviews quality assurance data collected by the Idaho Department of Environmental Quality (DEQ) during the project and evaluates if data quality objectives were met. Before sampling, field and laboratory methodology, quality assurance and quality control (QA/QC) procedures, and data quality objectives were defined. QA/QC information for 2019 sampling was defined in the *Quality Assurance Project Plan: Multi Parameter Region Wide Monitoring QAPP for the Lewiston Regional Office* (DEQ 2019b) and *Field Sampling Plan: 2019 South Fork Clearwater HUC Escherichia coli and Stream Flow Monitoring* (DEQ 2019a). For data collected through DEQ's Beneficial Use Reconnaissance Program (BURP), QA/QC information was defined in the *Statewide Generic Quality Assurance Project Plan: Monitoring Surface Water for Escherichia coli for Assessing Beneficial Use Support* (DEQ 2014).

2 Precision

Precision is a measure of agreement between two measurements of the same property under prescribed conditions. Overall *Escherichia coli* (*E. coli)* precision was evaluated by calculating the relative percent difference (RPD) of field duplicate samples. A RPD goal of ± 50% was defined for project *E. coli* data (DEQ 2014; DEQ 2019b). RPD goals were met for all project field duplicates, except for two cases with original and field duplicate results near the practical quantitation limit (1 most probable number per 100 milliliters [mpn/100 mL]) (Table A1). Although RPD values exceeded the ± 50% target for 2018SLEWSFCEC028 and 2018SLEWSFCEC041, no results were qualified. When results are near the practical quantitation limit, RPD values can be large, but there is no danger of precision confounding the criteria exceedance determinations.

Table A1. Field duplicate results.

Site	Date	Original Result	Duplicate Result	RPD (%)
		mpn/100 mL		
2019LEWSC7_03	4/16/19	2419.6	2419.6	0
2019LEWSC7_03	4/23/19	63.8	82	-25
2019LEWSC7_02	4/30/19	101.4	110.6	-9
2019LEWSC3_04	5/6/19	74.4	57.7	25
2019LEWSC7_03	5/13/19	1299.7	1203.3	8
2019LEWSC10_2h	8/27/19	11	15.8	-36
2017LEWSC81_02	7/12/17	1203.3	1299.7	-8
2018SLEWSFCEC028	8/14/18	3	1	100
2018SLEWSFCEC029	8/27/18	81.6	52.9	43
2018SLEWSFCEC041	9/6/18	3.1	6.3	-68

3 Accuracy

Accuracy is a measure of agreement between a known *true* reference value and the associated measure value. The analytical laboratory evaluated laboratory accuracy based on laboratory

control samples or matrix spike samples as required by associated analytical methods. Because the laboratory did not qualify any results based on laboratory quality control samples, DEQ assumed laboratory accuracy requirements were met.

To evaluate overall accuracy, DEQ used field blanks, which are samples of a blank matrix, typically deionized water or distilled water, prepared in the field under identical conditions, processed the same, and included for analysis as a regular sample. Field blanks check for possible contamination during sample collection and processing. A total of 10 field blank samples were collected. All field blank sample results were below detection and met project data quality objectives.

Table A2. Field blank results.

Site	Date	Result (mpn/100 mL)
2019LEWSC7_03	4/16/19	< 1
2019LEWSC7_03	4/23/19	< 1
2019LEWSC7_02	4/30/19	< 1
2019LEWSC3_04	5/6/19	< 1
2019LEWSC7_03	5/13/19	< 1
2019LEWSC10_2h	8/27/19	< 1
2017LEWSC81_02	7/12/2017	< 1
2018LEWSFCEC028	8/14/2018	< 1
2018LEWSFCEC029	8/27/2018	< 1
2018LEWSFCEC041	9/6/2018	< 1

4 Sample Preservation and Holding Time Requirements

All samples were collected in 150 mL plastic containers pre-preserved with sodium thiosulfate, which were provided by Anatek Labs. Samples were placed on ice immediately after collection. The project QAPPs required samples to be analyzed within 24 hours of collection (DEQ 2014; DEQ 2019b). This holding time requirement was not met for two samples (samples collected on 5/6/19 at 2019LEWSC10_2d and 2019LEWSC10_2h). Samples were collected between 9:20 and 10:15 a.m. on 5/6/19, delivered to the lab on 5/7/19 at 9:00 a.m., and analyzed at 10:36 a.m. on 5/7/19. These sample results were still used in data analyses. Both of these samples were part of a five-sample geometric mean. Results were very similar across the five samples collected at each site. For both sites, even if results for the 5/6/19 samples were substituted with the maximum (2419.6 mpn/100 mL) or minimum (1 mpn/100 mL) detectable *E. coli* concentration, the criteria exceedance outcome in Table 1 would not have changed. The four other results at 2019LEWSC10_2d were high (228–2419.6 mpn/100 mL), and the four other results at 2019LEWSC10_2h were low (< 1–8.5 mpn/100 mL). Except for these two samples, preservation and holding requirements were met for all project samples.

5 Representativeness

Representativeness is the degree to which the sample data accurately and precisely represent site conditions. The project QAPP did not provide specific data representativeness criteria but provided general guidelines for evaluating representativeness. Because field sampling and analysis followed standard procedures, procedures were consistent across years, accuracy and

precision requirements were met, and there were no issues with laboratory QA review, all project data satisfied representativeness requirements.

6 Comparability

Comparability is the confidence that one data set can be compared to another data set. The project quality assurance project plan did not provide specific comparability criteria but provided general guidelines for evaluating comparability. Because standard sampling and laboratory procedures were followed, procedures were consistent across years and with previous sampling, and no issues were identified during data verification and validation, all project data satisfied comparability requirements.

7 Completeness

Completeness is the percentage of valid data relative to the total possible valid data points. The QAPP defined a completeness project objective of 80%. Data quality objectives were met for 90 out of 92 project *E. coli* samples; holding times were exceeded for two samples. The project data completeness goal of 80% was met.

8 External Data

DEQ obtained external *E. coli* data collected by Nez Perce Tribe Water Resources (NPTWR 2014) and Idaho Association of Soil Conservation Districts (IASCD 2007). Both data sets were provided by Nez Perce Tribe Water Resources staff. Data from *Cottonwood Creek, Butcher Creek, and Threemile Creek Water Quality Monitoring Report 2011-2012* (NPTWR 2014) are publically available in the Water Quality Portal (*https://www.waterqualitydata.us/*). DEQ used data from Excel files provided by tribal staff because DEQ and NPTWR determined through a QA/QC screening that some 2011–2012 Nez Perce Tribe *E. coli* results in the Water Quality Portal were uploaded incorrectly.

DEQ determined that all external data used in this project meet DEQ Tier II data quality standards (DEQ 2016). They are suitable for documenting patterns and trends and for evaluating if TMDL targets have been achieved. Because the data are more than 5-years old, it does not meet DEQ's Tier I standard and are not suitable for use in Clean Water Act §303(d) listing decisions or §305(b) reports (DEQ 2016). External data were used only for evaluating patterns and trends and were not used for assessing beneficial use support status.

8 Conclusion

DEQ requires several internal QA procedures. Procedures include consulting with DEQ's QA manager, registering the project in a tracking spreadsheet, completing three standardized QA checklists, and reviewing all QA data points. DEQ considers all project data to be adequate for use in this project.

Appendix B. Stream Type Classification

For AUs where a geometric mean was collected, methods described in section 2.3 were used to determine stream flow type (Table B1). Sites where only a single sample was collected were assumed to be perennial because samples were collected in summer (June–August).

Table B1. Stream type (perennial versus intermittent) for each site where an *E. coli* geometric mean was calculated. Conclusions are specific to the sample site not to the AU; AU information is provided for reference purposes.

Site ID	Stream Name	Assessment Unit Number	Use	Use Type	NHD Reach Code[a]	NHD Stream Type [b]	USGS Stream Type [c]	BURP Data[d]	NPT Data [e]	2019 Flows [f]	Conclusion
2019LEWSC10_2d	Threemile Creek	10_02	SCR	DES	17060305000067	P	P	Sampled 2013	—	P	Perennial
2019LEWSC10_2h	Threemile Creek	10_02	SCR	DES	17060305000069	P	P	Sampled 2000, 2013	P	P	Perennial
2019LEWSC10_2u	Threemile Creek	10_02	SCR	DES	17060305000068	P	P	—	—	P	Perennial
2019LEWSC3_02d	Cottonwood Creek	03_02	PCR	DES	17060305000053	P	P	Sampled 1998, 2006; Dry 2001; No flow 2015	P	No flow	Intermittent
2019LEWSC3_02u	Cottonwood Creek	03_02	PCR	DES	17060305000055	I	P	—	I	No flow	Intermittent
2019LEWSC3_04	Cottonwood Creek	03_04	PCR	DES	17060305000044	P	P	Sampled 2006	P	P	Perennial
2019LEWSC6_02	Stockney Creek	06_02	SCR	PRE	17060305000566	I	P	—	—	No flow	Intermittent
2019LEWSC6_03	Stockney Creek	06_03	SCR	PRE	17060305000608	I	P	—	P	P	Perennial
2019LEWSC7_02	Shebang Creek	07_02	SCR	PRE	17060305000642	I	P	No flow 2006	—	I	Intermittent
2019LEWSC7_03	Shebang Creek	07_03	SCR	PRE	17060305000638	I	P	No flow 2006	P	P	Perennial
2019LEWSC8_02	SF Cottonwood Creek	08_02	SCR	PRE	17060305000665	I	P	Dry 2018	—	I	Intermittent
2019LEWSC8_03	SF Cottonwood Creek	08_03	SCR	PRE	17060305000440	I	P	Sampled 2006	P	P	Perennial
2019LEWSC9_02	Long Haul Creek	09_02	SCR	PRE	17060305000666	P	P	Sampled 2006	P	I	Intermittent
2017LEWSC81_02	Sally Ann	81_02	SCR	PRE	17060305000499	P	P	—	—	—	Perennial

Notes: SCR = secondary contact recreation; PCR = primary contact recreation; DES = designated, PRE = presumed; P = perennial; I = intermittent; [a] = NHDPlus v1 100K; [b]= National Hydrgraphy dataset stream type classification; [c]= Rea and Skinner 2009 classification; [d]= site visits July-August, 'sampled' indicates water was present and flowing; [e] = based on NPT (2014), IASCD (2007) flow measurements; [f]= based on 2019 DEQ site visits and flow data