

MEMORANDUM

TO: Sol Brich, Jeremy Zumberg, Lindsay Patterson, Jillian Scott, Jennifer Zygmunt
FROM: Ron Steg
DATE: July 16, 2019

SUBJECT: Recreation Use Support Determination for Flat and Fish Creeks, Teton County, WY

The Wyoming Department of Environmental Quality's (WYDEQ) Lander field team evaluated *E. coli* concentrations during the recreation season in Flat Creek, Fish Creek, and the Snake River in 2017 to determine whether applicable recreation criteria are attained. The results are presented in Attachment A. Documentation regarding a Recreation Use Support Determination is provided below for Flat Creek and Fish Creek. Insufficient spatial representation was provided by the single sample site in the Snake River to provide a Use Support Determination for that large waterbody¹.

Flat Creek

The State of Wyoming currently has two designations for recreational use of surface waters: primary contact recreation and secondary contact recreation. Flat Creek is designated for primary contact recreation. Eight separate *E. coli* samples were collected from three sites on Flat Creek from May 9th – August 10th, 2017 (see Figure 1 and Attachment A). Four separate geometric means at each site were calculated from the sample results (Attachment A). A single geometric mean exceeded the primary contact recreation criterion of 126 organisms/100 mL at the downstream-most sample site in Flat Creek (FLC-3). There were no exceedances of the criterion at the other two sample sites (FLC-1 and FLC-2). As a result, the designated Recreation use is supported at FLC-1 and FLC-2, but, is not supported at FLC-3.

The Aquatic Life Other Than Fish use in an 11.1 mile segment of Flat Creek, from the confluence with Cache Creek to the confluence with the Snake River, was listed as threatened due to physical substrate habitat alteration in 2002. Assessment Unit WYSR170401030205_01 was created at that time to represent the threatened reach (Figure 1). To accommodate the results of the Recreation use support determination described herein, the existing segment will be split, and a new segment will be created as described in Table 1 and shown in Figure 2.

¹ Grab samples from the single sample site adjacent to the south bank of the Snake River is not representative of the entire cross-section or reach of this relatively large river.

Table 1. Flat Creek assessment unit segmentation and rationale.

Description	Location	AUID	Segment Length (miles)	Segmentation Rationale	Assessed Use	IR Category	Cause
Lower Flat Creek	High School Road downstream to the confluence with the Snake River	WYSR170401030205_01	8.0	There is a distinct land use change from urban upstream of High School Road, to mixed agriculture/residential downstream and there were no <i>E. coli</i> geomean exceedances at FLC-2, immediately upstream from High School Road.	Aquatic Life Other Than Fish ¹	5	Physical Substrate Habitat Alteration
					Recreation ²	5	<i>E. coli</i>
Middle Flat Creek	High School Road to the confluence with Cache Creek	WYSR170401030205_02	3.4	This segment has been defined to represent the upper portion of the segment listed for Physical Substrate Habitat Alteration in 2002.	Aquatic Life Other Than Fish ¹	5	Physical Substrate Habitat Alteration
					Recreation ²	2	NA
Upper Flat Creek	Cache Creek to headwaters	WYSR170401030205_03	21.4	There were no <i>E. coli</i> geomean exceedances at FLC-1 near the lower extent of this segment and there are no land use changes or anthropogenic inputs that would be expected to change the use support determination for the segment upstream.	Recreation ²	2	NA

¹ This represents the original 2002 listing.

² These are new listings for 2020.

Fish Creek

Fish Creek is also designated for primary contact recreation. Eight separate *E. coli* samples were collected from two sites on Fish Creek from May 9th – August 10th, 2017 (see Figure 3 and Attachment A). *E. coli* concentrations at all sites ranged from 1.0 to 648.8 MPN/100 mL. Four separate geometric means at each site were calculated from the sample results, and three of the four at each site exceeded the primary contact recreation criterion of 126 organisms/100 mL (Attachment A). As a result, the designated Recreation use is not supported at these sites. WDEQ is recommending that the entirety of Fish Creek (from the confluence with the Snake River upstream 18.96 miles) be placed in Category 5 in the 2020 Water Quality Integrated Report (Figure 3). This approach is recommended given the high level of recreational use on Fish Creek and acknowledgement that a watershed scale approach will likely be needed in the future to reduce *E. coli* concentrations.

An AUID has not previously been assigned to Fish Creek. The 18.96 mile segment will be assigned the following AUID in accordance with *Wyoming's Methods for Determining Surface Water Quality Condition* (WDEQ, 2017): WYSR170401030101_01.

References

WDEQ. 2017. *Wyoming's Methods for Determining Surface Water Quality Condition*. Wyoming Department of Environmental Quality. Water Quality Division. Watershed Protection Program. Document # 17-0865.

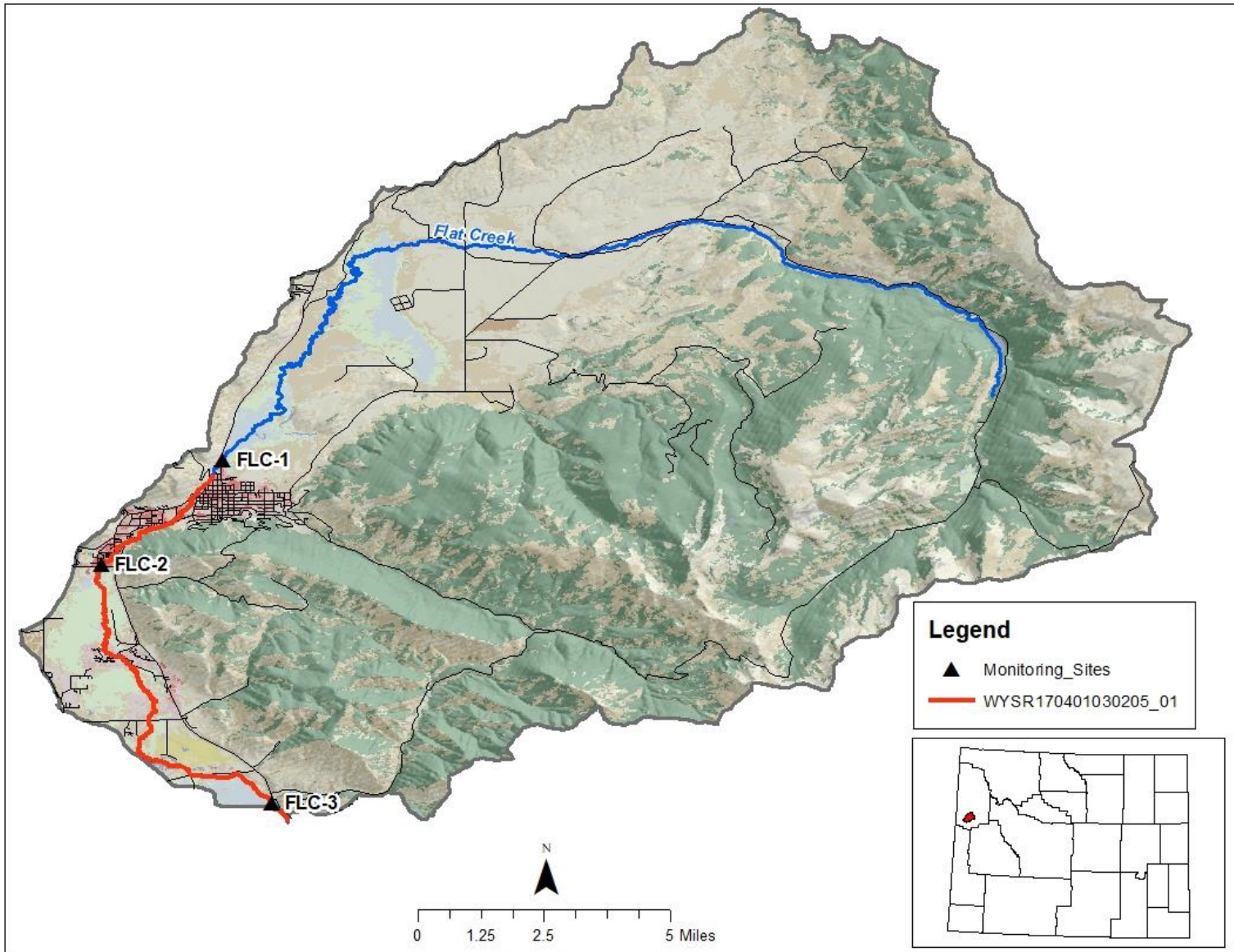


Figure 1. Flat Creek showing the 2002 impaired segment and 2017 sample sites. .

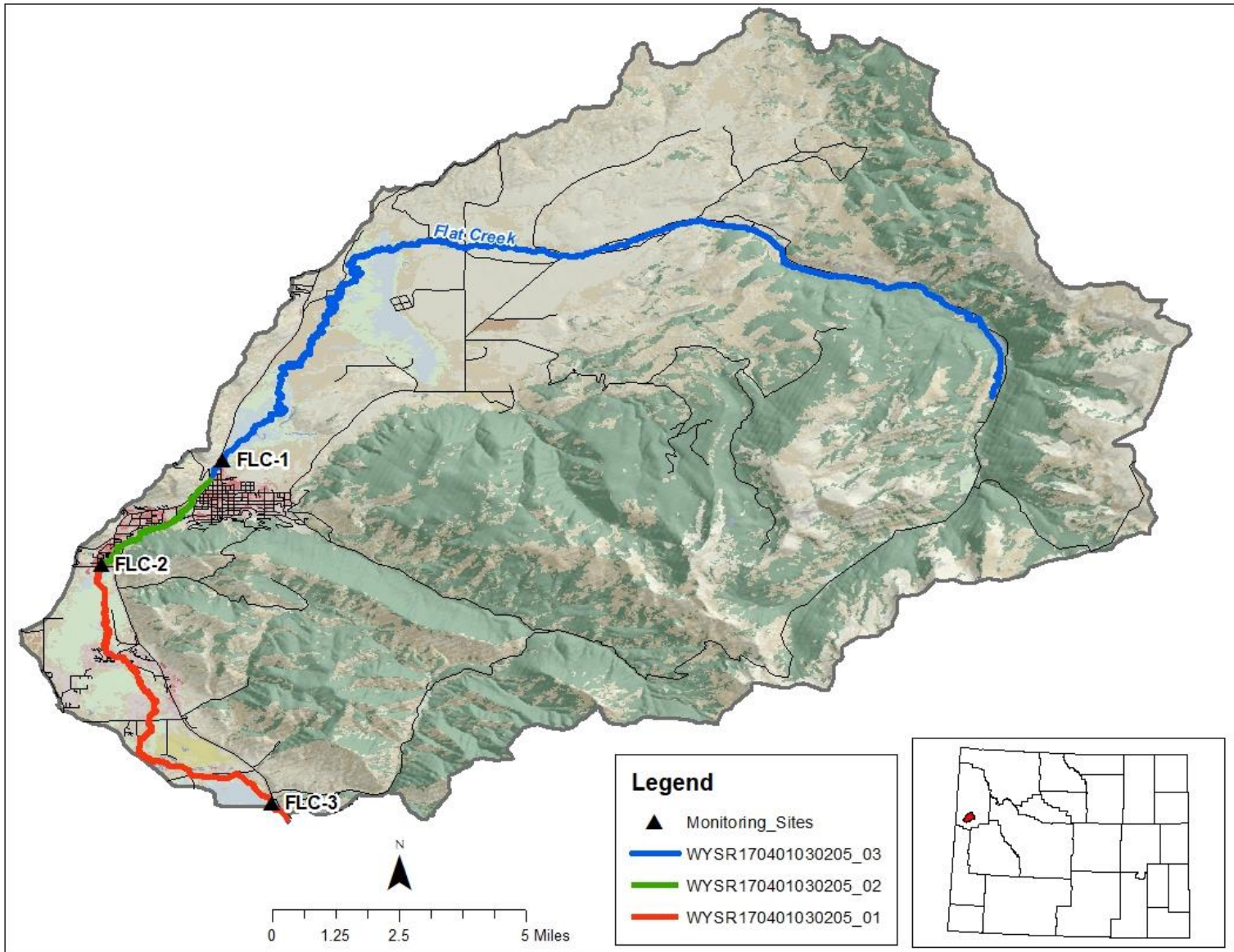


Figure 2. Flat Creek showing proposed segmentation for the 2020 Integrated Report.

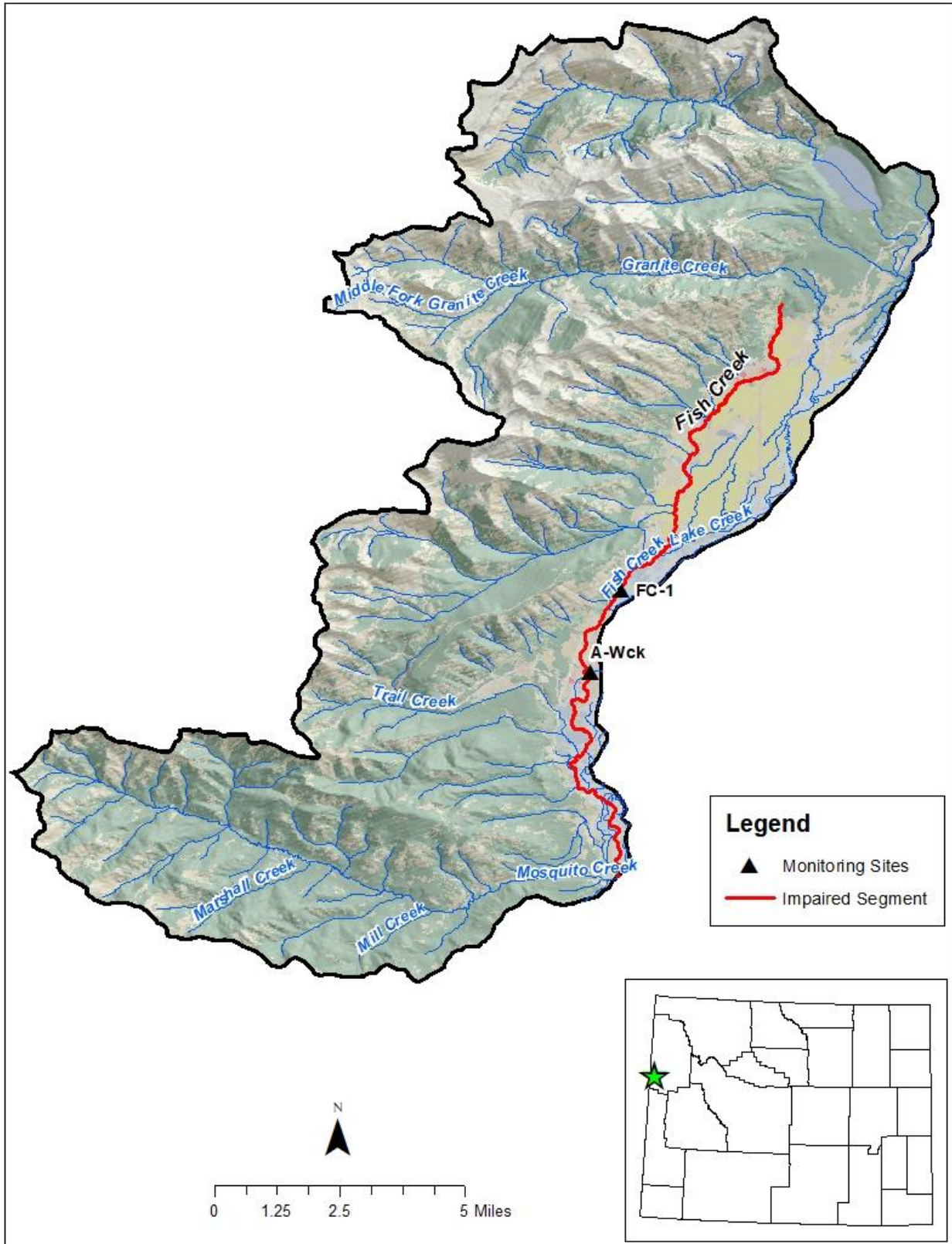


Figure 3. Fish Creek.

Attachment A

MEMO: Teton County *E. coli* Study 2017 Results

To: Ron Steg, Watershed Protection Program/Water Quality Assessment

From: Tavis Eddy & Mike Wachtendonk, Watershed Protection Program/Surface Water Monitoring

February 5, 2019

The purpose of this memorandum is to summarize the results from an *Escherichia coli* (*E. coli*) bacteria monitoring study conducted at six sites on Fish Creek, Flat Creek, and the Snake River (Table 1) near Jackson and Wilson, Wyoming (Figure 1). Fish Creek is a Class 1 water, while the Snake River below Highway 22 and Flat Creek are both Class 2AB waters. Fish Creek, Flat Creek, and the Snake River are protected for primary contact recreation. Section 27 (*E. coli* Bacteria), Chapter 1 of the Wyoming Water Quality Rules and Regulations states in all waters designated for primary contact recreation, during the summer recreation season (May 1 through September 30), concentrations of *E. coli* bacteria shall not exceed a geometric mean of 126 organisms per 100 milliliters during any consecutive 60-day period. The objectives of this study were to —at aforementioned sites on Fish Creek, Flat Creek, and the Snake River— 1) collect *E. coli* samples throughout the 2017 primary recreational season, and 2) determine whether WDEQ's primary recreational criterion is exceeded using data from a geometric mean analysis.

E. coli results are reported in Most Probable Number (MPN) values, which are equivalent to colony forming units (cfu) or 'organisms' per 100 milliliters (mL). Eight separate *E. coli* samples were collected at each site from May 9th – August 10th, 2017 (Table 2). *E. coli* concentrations at all sites ranged from 1.0 – 866.4 MPN/100 mL (Table 2). Four separate geometric means at each site were calculated from the sample results. Seven out of the twenty-four total geometric means exceeded the primary contact recreation criterion of 126 organisms/100 mL (Table 3). These exceedances occurred at sites on Flat Creek (FLC-3) and Fish Creek (FC-1 and A-Wck). The highest geometric mean (340.6 MPN/100 mL) was found at FC-1, while the lowest (22.1 MPN/100 mL) was observed at FLC-1. Geometric means at FLC-1, FLC-2, and SNR-1 were in compliance with the criterion. *E. coli* concentration and geometric mean results for all sites are displayed in Figures 2 and 3.

Discharge measurements were paired with *E. coli* concentrations as often as possible during this study to monitor how concentrations varied with hydrologic condition. Instantaneous discharge measurements were made on-site at FLC-1, FLC-3, and FC-1 using a Marsh McBirney Flo-Mate 2000 during wadeable conditions, and a Sontek Surveyor S5 Acoustic Doppler Profiler during high flow, non-wadeable conditions. Flow-gaged data recorded at USGS stations 13018350 (Flat Creek below Cache Creek near Jackson WY), 13018750 (Snake River below Flat Creek near Jackson WY) and 13016450 (Fish Creek at Wilson WY) were accessed to obtain the discharge recorded at the date and times *E. coli* samples were collected at FLC-2, SNR-1, and A-Wck, respectively. Discharge data are summarized in Table 4.

Field quality control samples during this study included field duplicates, field blanks, and lab blanks. Results from these samples are summarized in Table 5. All data collected during this study were reviewed and approved for water quality evaluation purposes (Attachments A and B).

The results of this study indicate the following segments on Fish Creek and Flat Creek do not attain Section 27 (*E. coli* Bacteria), Chapter 1 of the Wyoming Water Quality Rules and Regulations for: 1) an undetermined distance on Fish Creek upstream of FC-1 to an undetermined distance downstream of A-Wck, and 2) an undetermined distance on Flat Creek upstream of FLC-3 to its downstream confluence with the Snake River. The results of this study also indicate the following segments on Flat Creek and the Snake River attain Section 27 (*E. coli* Bacteria), Chapter 1 of the Wyoming Water Quality Rules and Regulations for: 1) an undetermined distance on the Snake River upstream and downstream of SNR-1, and 2) an undetermined distance on Flat Creek upstream of FLC-1 to an undetermined distance downstream of FLC-2.

Table 1. Study site location information.

Site Identifier	Waterbody	Latitude/Longitude	Location Description	Land Ownership
FC-1	Fish Creek	43.525/-110.862	Fish Creek adjacent to Fish Creek Road on USFS Property	USFS
A-Wck	Fish Creek	43.501/-110.871	Fish Creek downstream of Wilson Bridge	Private
FLC-1	Flat Creek	43.4890/-110.7621	On upstream side of US Highway 89 bridge	USFWS
FLC-2	Flat Creek	43.4592/-110.7969	On upstream side of High School Road Bridge	Private
FLC-3	Flat Creek	43.391/-110.748	Below unnamed tributary to Flat Creek; adjacent to US Highway 189	WGFD
SNR-1	Snake River	43.384/-110.744	Approximately 1.3 miles upstream of US Highway 189	WGFD

Table 2. *E. coli* results (MPN/100 mL) from all sites and sampling dates.

	Flat Creek			Snake River	Fish Creek	
	FLC-1	FLC-2	FLC-3	SNR-1	FC-1	A-Wck
May 9	6.3	14.6	29.2	36.8	25.9	72.3
May 23	14.8	17.3	866.4	17.1	1.0	3.0
June 7	125	17.1	248.1	231	435.2	517.2
June 19	11	18.7	35.9	61.3	579.4	410.6
July 5	40.8	81.3	90.5	45.7	275.5	224.7
July 18	40.4	35.9	90.9	71.7	648.8	344.8
July 31	22.7	23.3	26.2	56.5	101.7	98.8
August 10	166.4	41.4	22.6	56.5	275.5	161.6

Table 3. Geometric mean results (MPN/100 mL) from all sites.

	Flat Creek			Snake River	Fish Creek	
	FLC-1	FLC-2	FLC-3	SNR-1	FC-1	A-Wck
May 9 – July 5	22.1	23.1	115.3	52.7	71.0	100.7
May 23 – July 18	32.0	27.6	144.7	60.2	135.1	137.6
June 7 – July 31	34.9	29.3	71.9	76.5	340.6	276.8
June 19 – August 10	36.9	35.0	44.5	57.7	310.8	219.4

-Values in red exceed the primary contact recreation criterion of 126 organisms/100 mL.

Table 4. Discharge measurement results (cubic feet/second) from all sites and sampling dates.

	Flat Creek			Snake River	Fish Creek	
	FLC-1	FLC-2	FLC-3	SNR-1	FC-1	A-Wck
May 9	54.6	111	94	9,660	231.1	237
May 23	143.1	201	134	8,730	210.3	215
June 7	248.1	354	296.8	25,700	780.5	761
June 19	231.4	311	285.8	19,000	993.8	997
July 5	282.7	290	259.4	11,800	533.6	537
July 18	NM	263	NM	8,090	NM	549
July 31	201	197	173.8	5,250	397.4	453
August 10	NM	143	NM	4,290	NM	480

-NM = not measured

Table 5. Summary of field quality control samples.

	Field Duplicate Site	Sample Result (MPN/100 mL)	Duplicate Sample Result (MPN/100 mL)	Duplicate Relative Percent Difference	Field Blank <i>E. coli</i> (MPN/100 mL)	Lab Blank <i>E. coli</i> (MPN/100 mL)
May 9	FLC-2	14.6	21.6	38.7%	<1.0	<1.0
May 23	A-Wck	3.0	1.0	100%	<1.0	<1.0
June 7	FC-1	435.2	325.5	28.8%	<1.0	<1.0
June 19	SNR-1	61.3	70.6	14.1%	<1.0	<1.0
July 5	FLC-2	81.3	88.2	8.1%	<1.0	<1.0
July 18	FLC-2	35.9	34.1	5.1%	<1.0	<1.0
July 31	FC-1	101.7	135.4	28.4%	<1.0	<1.0
August 10	FLC-3	22.6	33.7	39.0%	<1.0	<1.0

-The WDEQ Manual of SOPs identifies a precision/accuracy data quality objective (DQO) of <50% relative percent difference for *E. coli* samples. However, this DQO does not apply to sample results less than 100 MPN/100 mL.

Figure 1. Sampling sites on Fish Creek, Flat Creek, and the Snake River (from Project SAP).

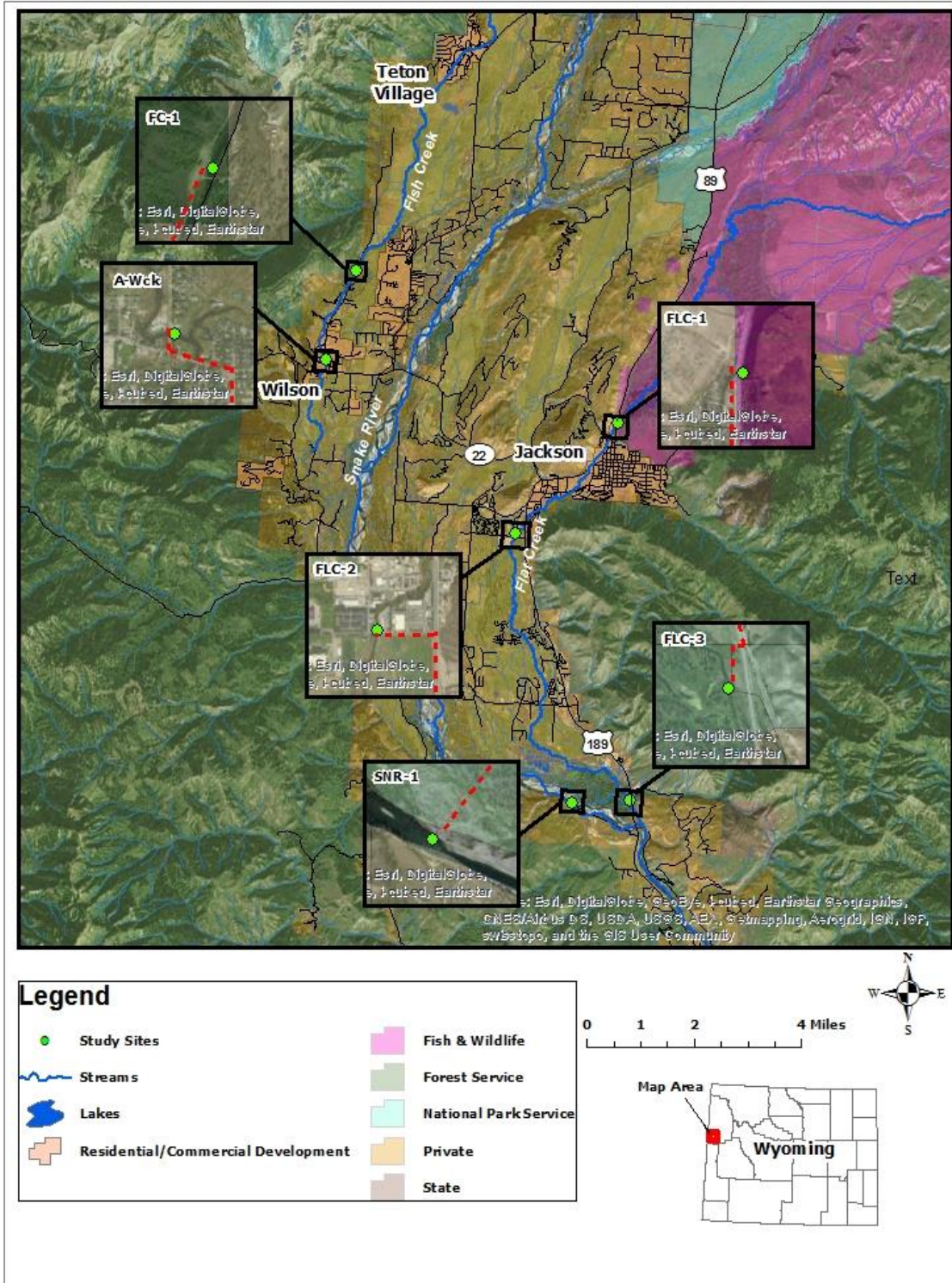


Figure 2. Single-sample *E. coli* concentrations and geometric means at sites in Flat Creek during 2017 primary recreation season. Reference line is 126 MPN/100 mL.

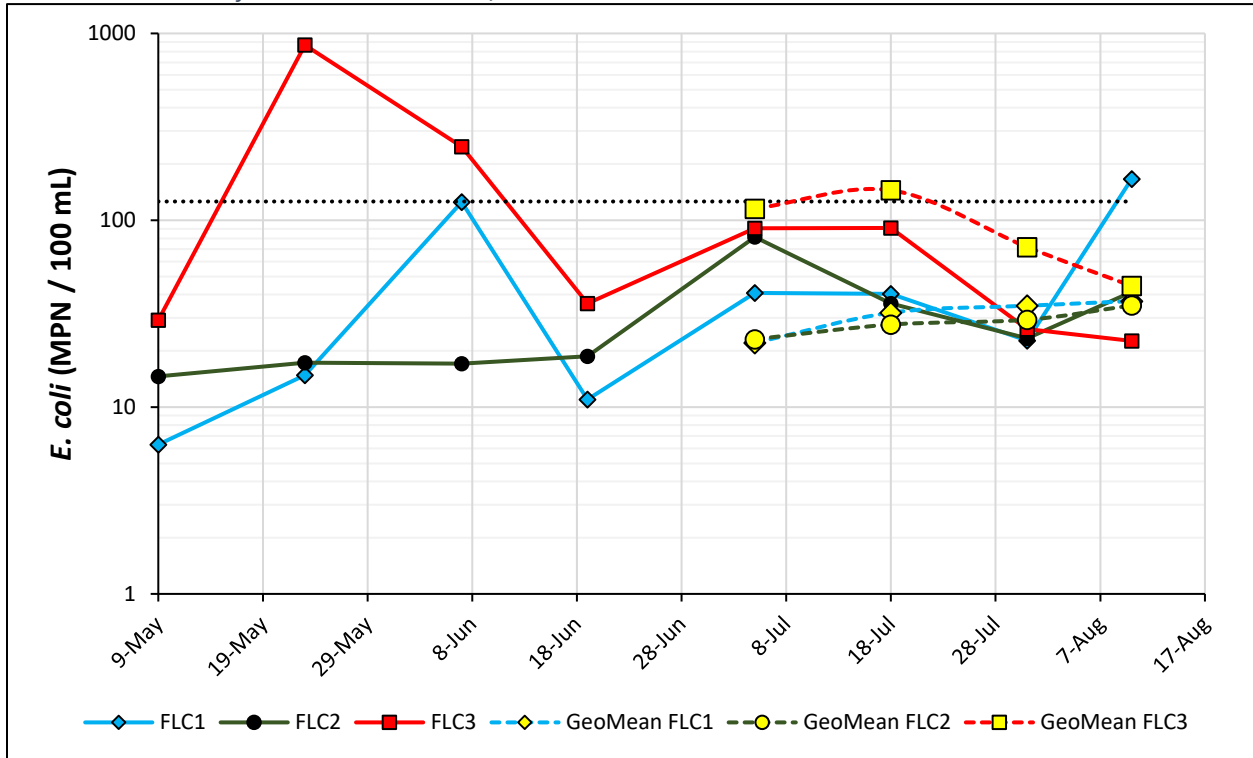
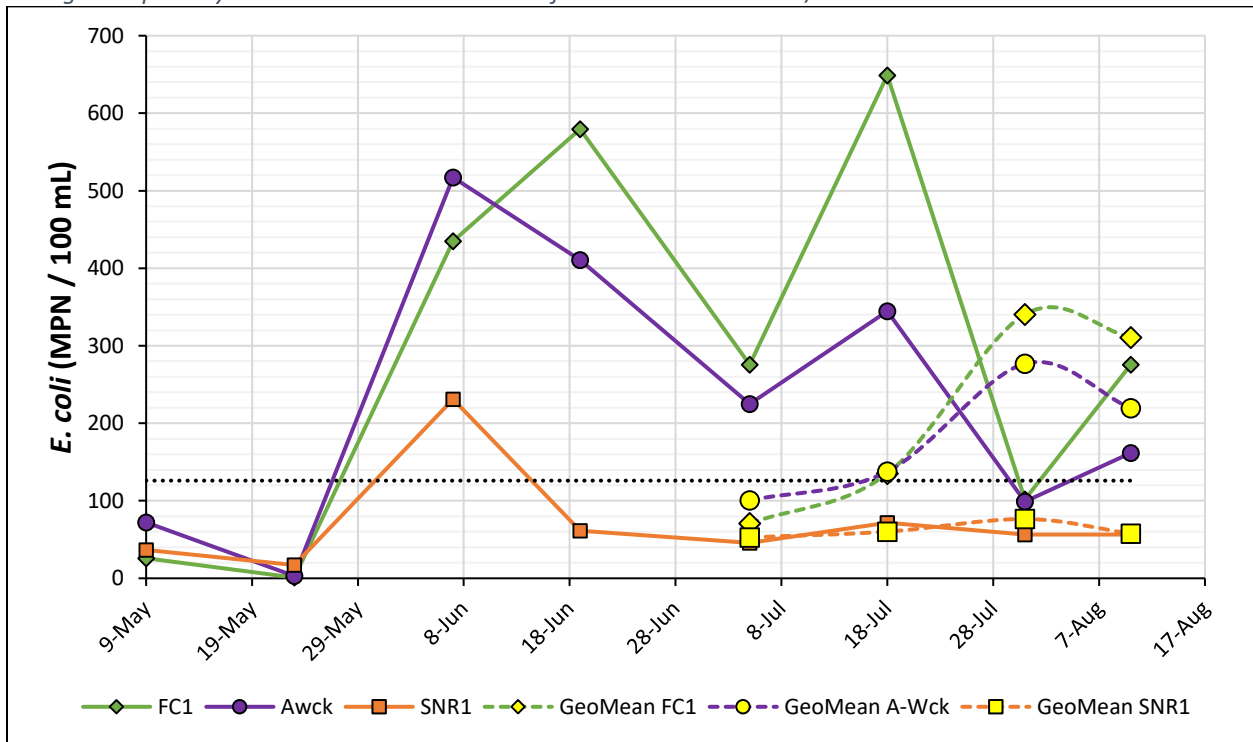


Figure 3. Single-sample *E. coli* concentrations and geometric means at sites on Fish Creek and the Snake River during 2017 primary contact recreation season. Reference line is 126 MPN/100 mL.



Attachment A

MEMO

TO: David Waterstreet, Program Manager
FROM: Cathy Norris, QA Officer
DATE: 8/17/2017
RE: Teton County *E. coli* Exceedances

I received *E. coli* data from the WDEQ/WQD/WPP Lander Field Office today, 8/17/2017.
All data passed the QA/QC review.

Geometric mean for 5/23/2017 – 7/18/2017, Site **Fish Creek - A-Wck** **137.62 MPN**

Geometric mean for 6/7/2017 – 7/31/2017, Site **Fish Creek - A-Wck** **276.82 MPN**

Geometric mean for 6/19/2017 – 8/10/2017, Site **Fish Creek - A-Wck** **219.36 MPN**

Geometric mean for 5/23/2017 – 7/18/2017, Site **Fish Creek - FC-1** **135.14 MPN**

Geometric mean for 6/7/2017 – 7/31/2017, Site **Fish Creek - FC-1** **340.60 MPN**

Geometric mean for 6/19/2017 – 8/10/2017, Site **Fish Creek - FC-1** **310.84 MPN**

Geometric mean for 5/23/2017 – 7/18/2017, Site **Flat Creek - FLC-3** **144.72 MPN**

These are exceedances of the E. coli standard of 126 organisms per 100 mL (MPN) during any consecutive 60-day period. The other sites sampled during this 60-day period did not have exceedances.

Single sample for **Flat Creek - FLC-3** on 5/23/2017 **866.4 MPN**

Single sample for **Flat Creek - FLC-3** on 6/7/2017 **248.1 MPN**

These exceed the maximum allowable concentration (235 MPN) for high use swimming areas.

Attachment B

Checklist Data QA/QC for Expedited Data Validation for Fish Creek, Flat Creek, and the Snake River (Monitoring still in progress)

Mike Wachtendonk

Reviewed by Cathy Norris

Date(s) Reviewed: 8/17/17

Required Item	Satisfactory/ Unsatisfactory/NA	Location (Page, Table, and/or Section #)	Comments
Were the Objectives restated and the same as in the SAP?	NA		
Is the Narrative of actual activities completed the same as outlined in the SAP?	NA		
Is all Raw Data provided, including:			
Completed field data forms or field logs?	Satisfactory	8/17/17 electronic files	Information provided
Completed calibration logs?	NA		
Completed chain of custody forms?	NA		
All laboratory results?	Satisfactory	8/17/17 electronic files	Information provided
Do field data forms or field logs contain consistent and sufficient information on:			
Names of samplers?	Satisfactory	8/17/17 electronic files	Information provided
Date and time?	Satisfactory	8/17/17 electronic files	Information provided
Weather conditions?	Satisfactory	8/17/17 electronic files	Information provided
General observations of environment?	Satisfactory	8/17/17 electronic files	Information provided
Notes on working condition of equipment?	Satisfactory	8/17/17 electronic files	Information provided
Notes and justification on the need to modify any aspect of the SAP or a specific SOP?	Satisfactory	8/17/17 electronic files	Information provided
Are other items outlined in the SAP (GPS readings, site photographs, model results, etc.) present in the package?	NA		

Was the permission status documented in the SAP to sample at sites and use all sample site access routes on National Park Service, State, or private lands changed in any way?	Satisfactory	8/17/17 electronic files	No change noted.
Is a review of QA and data quality objectives and reconciliation included and summarized?	NA		
Was the number of blanks adequate (as outlined in the SAP)?	Satisfactory	8/17/17 electronic files	Sufficient blanks were collected.
Were all of the blanks free of contamination?	Satisfactory	8/17/17 electronic files	All blanks were free of contamination.
Was the number of duplicates adequate (as outlined in the SAP)?	Satisfactory	8/17/17 electronic files	Sufficient duplicates were collected.
Did all of the duplicates indicate variability inside the acceptable limits contained in the SAP or QAPP?	Satisfactory	8/17/17 electronic files	All RPDs were below the limit.
If the preparation of spikes was included in the SAP, was the number of spikes prepared adequate, as outlined in the SAP?	NA		
If the preparation of spikes was included in the SAP, did all of the spikes indicate variability inside the acceptable limits contained in the SAP or QAPP?	NA		
Are the field instruments and equipment used the same as described in the SAP, or, if not, is an explanation provided?	Satisfactory	8/17/17 electronic files	Information provided
Is a Summary and Conclusions section included?	NA		
Did the samplers identified as being trained and qualified in the SAP conduct the monitoring?	Satisfactory	8/17/17 electronic files	Information provided
Are the parties involved in the data interpretation the same as outlined in the SAP?	Satisfactory	8/17/17 electronic files	Information provided
If a field audit was conducted, is it included?	NA		
Were the same analytical procedures used; or, if different procedures were used, were they similar in accuracy and precision to the procedures outlined in SAP and was justification for the change included?	Satisfactory	8/17/17 electronic files	Information provided
Were all holding times met?	Satisfactory	8/17/17 electronic files	All holding times were met.

Was proper sample preservation used?	Satisfactory	8/17/17 electronic files	Appropriate preservation used.
Were proper sample containers used?	NA		
Do the exact sample locations match the goals and design of the study and justify the interpretation of the results?	Satisfactory	8/17/17 electronic files	Information provided
Did the sample times (day, hydrograph, or season) match the goals and design of the study and justify the interpretation of the results?	Satisfactory	8/17/17 electronic files	Description provided and is consistent with study design.
Were the samples collected in the proper location in the water body in order to match the goals and design of the study and justify the interpretation of the results?	NA		
Do different pieces of data correlate to one another as would be expected?	Satisfactory	8/17/17 electronic files	Correlation as expected.
Were data evaluated with historic or expected data?	Satisfactory	8/17/17 electronic files	Evaluated with standards.
Do individual pieces of data fit into the range of expected values for that system? If not, is there an explanation?	Satisfactory	8/17/17 electronic files	Data within expected range.
Per the study design established in the SAP, are there adequate samples to characterize an acute or chronic condition?	NA		
For <i>E. coli</i> monitoring, are there adequate samples to characterize a 60-day exposure period for contact recreation?	Satisfactory	8/17/17 electronic files	Adequate samples collected.
Are all data reported and identified as validated, qualified, or rejected?	Satisfactory	8/17/17 electronic files	All data provided, all validated.
Have sufficient data been validated to justify a use support determination?	Satisfactory	8/17/17 electronic files	Sufficient data validated.
If supporting data is required for evaluation against numeric criteria (i.e. temperature and pH data for an ammonia determination or hardness data for certain metals determination) is that data provided? (<i>Supporting Data</i>)	NA		
Per the study design established in the SAP, if supporting information and a weight of evidence approach is needed to make a use support determination for a numeric criterion (e.g. temperature, DO, pH), is that information provided? (<i>Supporting Data</i>)	NA		

Are there adequate physical, chemical, and biological data as outlined in the SAP? (<i>Narrative Criteria Use</i>)	NA		
Are there adequate supporting information (consideration of soil, geology, hydrology, geomorphology, climate, stream succession, and the influences of man) utilized and discussed? (<i>Narrative Criteria Use</i>)	NA		
Were all the data and supporting information used in a weight-of-evidence approach? (<i>Narrative Criteria Use</i>)	NA		