The Story of Fish Creek
November 2025

Written by Matt Bambach and David Gonzales

Abstract

Fish Creek, a vital trout stream in Teton County, Wyoming, has experienced significant ecological decline over the past few decades, harming recreation and ecosystem health. This white paper traces the last half-century's history of water quality concerns in the watershed, beginning with regulatory disputes in the 1970's and progressing through contemporary research to today's community planning efforts. Studies by the United States Geological Survey (USGS), University of Wyoming, and local organizations have focused on hydrology, nutrient loading, algal blooms and excessive bacterial levels. Groundwater-driven hydrology makes Fish Creek particularly vulnerable to nutrient pollution from septic systems, livestock waste, and lawn fertilizers.

Fall trout population surveys fell by over 50% between 2017 and 2022. [1]Its *Recreational* designated use was listed as impaired over the entire length in 2020 due to exceedances of Wyoming's *E. coli* criteria. The *Aquatic Life Other than Fish*, *Cold Water Fish* , and *Nongame Fish* designated uses between Teton Village and Wilson are listed as impaired due to nutrients in the 2022/2024 Integrated 305(b) and 303(d) Report. [2] Teton Conservation District (TCD) and Wyoming Department of Environmental Quality (WDEQ) are developing an Advanced Restoration Plan to address both impairments with a tentative completion date in 2026.

[1]"Fish Creek's cutthroat trout are disappearing. Is nutrient pollution to blame?" *Jackson Hole News and Guide*, 12 Sept., 2024, Pg. 1.
[2]Wyoming's 2022/2024 Integrated 305(b) and 303(d) Report

Introduction

The Fish Creek watershed lies along the base of the Tetons and consists of federal, state, local and privately-owned land. Fish Creek's flow regime is that of a groundwater-fed stream under influence of water diverted from the Snake River and its largest tributary, Lake Creek. Its groundwater is primarily influenced by flood irrigation recharge and the Snake River. [3] Please refer to **Figure A1** in the Appendix for a map of watershed land use.

The fight over Fish Creek's water quality stretches back to the mid 1970's. Due to Wilson's high water table and frequent spring flooding, sewage and septic systems have always been problematic, and residents pushed for the more stringent WDEQ classification for Fish Creek to protect it from anthropogenic pollution. Bacteria and nutrients are two of the most commonly detected contaminants found in feces, but it can carry many other problematic pollutants like viruses, antibiotics, and other endocrine-disrupting chemicals as well. Urine is also high in nitrogen and phosphorus, (the two nutrients most commonly associated with algal blooms) as well as other macronutrients key to plant growth. [4]

In 1979 the Jackson Hole Ski Corporation (JHSC) and Teton Village Sewer District fought the reclassification of Fish Creek to WDEQ's most protective – a Class 1 stream. [5] JHSC's suit failed, and Teton Village upgraded its wastewater treatment ponds to a more effective mechanical treatment plant to improve effluent quality. At the time, residents were more concerned with their increasing sewer bills than they were Fish Creek's water quality and sued JHSC in response. Despite the pushback, Fish Creek's Class 1 status endured and it has become one of Teton County's most cherished resources.

Research, Impairments, and Advocacy

Fish Creek is a spawning ground for the aquatic icon of the Greater Yellowstone, the Snake River fine-spotted cutthroat trout. In the late 90's and early 2000's, residents and anglers began raising an alarm over readily visible changes in aquatic plant life (algae green accumulation) and lower populations of smaller fish. [6]In the fall of 1999, TCD initiated a pilot watershed monitoring program to collect samples at seven different points along the creek.

Monitoring for nutrients and bacteria in surface waters improves our understanding of how anthropogenic pollution like wastewater (from sanitary sewer and septic systems) and stormwater (from residential and agricultural lands) are impacting a watershed. In 2003, both Fish Creek and Flat Creek were sampled for *Escherichia coli* ("*E. coli*"; a fecal indicator bacteria) by TCD. See **Figure A2** in the Appendix for sampling locations. Sampling was conducted from March - November 2003. The author postulated that stream temperatures below 10 °C likely inhibited *E. coli* colony growth during fall, winter, and spring months and that precipitation patterns could have had a significant impact on *E. coli* loading into the basin (which was not evaluated in the study). Though the study produced no specific spatial or temporal trends, its found that wildlife sources (deer, bear, raccoon, coyote, feline, avian, rodent, deer/elk, canine) contributed 73.4% of bacteria tested,

[3] WATER RESOURCES OF TETON COUNTY, WYOMING, EXCLUSIVE OF YELLOWSTONE NATIONAL PARK
[4] Technologies for the recovery of nutrients, water and energy from human urine: A review
[5] "Village Contests Fish Creek Status." *Jackson Hole News*, 21 May 1979, p. 1.

whereas domestic sources (sewage, human, dog, horse, bovine) contributed 21% (5.6% was unknown). Of domestic sources, dogs contributed the most (8.8% total), followed by sewage (6.5%) and bovine (2.3%).

A 2010 USGS fact sheet summarizes three studies from the early 2000's. These studies determined that the creek has particularly high year-round inputs from groundwater, [7] not just in the fall and winter as is typical of streams originating in the alpine. It is also heavily influenced by snowmelt runoff and irrigation flows. The large influence of groundwater reduces winter ice cover, which allows for photosynthesis to occur more days throughout the year. The groundwater also has higher nutrient concentrations than the creek itself, and thus acts as a source of nutrient enrichment.

Between 2010 and 2012, WGFD's spawning cutthroat numbers dipped significantly from 73 to 41 redds, or breeding beds, per mile.[8] In 2013, another USGS study showed that Fish Creek harbored 13 to 180 times more algae than other regional rivers and creeks, due to its lack of ice cover and ideal gravel/cobble substrate.[9] Evaluating the creek's nitrate isotopes, the authors determined that "nitrate was entering Fish Creek from groundwater, and that the source of nitrate was commonly a septic/sewage effluent or manure source, or multiple sources, potentially including artificial nitrogen fertilizers, natural soil organic matter, and mixtures of source."

Homeowners on the West Bank were growing increasingly wary of the changing water quality in Fish Creek. In 2013, the Crescent H HOA Streams and Trails Committee commissioned Applied Environmental Design and Research, Inc. to prepare a report to summarize the USGS studies, assess the condition of Fish Creek, and identify implications for management and restoration efforts. The report analyzed available results, interpreted the studies' conclusions in a national context, and recommended next steps. It found that the four USGS studies suggest *"not only impairment of the resource, but cause for concern that early warning signs may signal increased impairment in the future."* In the study's final comments, the authors state that they *"hope to guide the Committee to … continue the process of protection and begin the process of restoring Fish Creek."*[10]

After receiving the report, the Streams and Trails Committee then decided to create a 501(c)3 organization, Friends of Fish Creek (FOFC) in early 2014. Once established, FOFC commissioned a report called the Situation Assessment of Fish Creek by Flitner Strategies. With the interest of engaging stakeholders in a collaborative problem-solving approach to this challenge, the Assessment identified public interests, highlighted specific issues, recommended methods for improving the situation, and established a basis for ongoing transparency and collaborative problem solving.[11] Overall, people who participated in the study preferred voluntary initiatives over more regulation, and the Fish Creek Stakeholders Group was therefore established to develop an agreed-upon approach towards increasing watershed stewardship, implementing necessary research and monitoring, and ultimately creating and promoting science-based best management practices (BMPs) through 2018. FOFC then began working more closely with Trout Unlimited and TCD, a group that would grow into the Jackson Hole Clean Water Coalition

[7] Characterization of Fish Creek, Teton County, Wyoming, 2004–08
[8] "Algae Blooms in Prized Creek." *Jackson Hole News and Guide*, 6 November 2013, p. 1. [9] Characterization of Water Quality and Biological Communities, Fish Creek, Teton County, Wyoming, 2007–2011
[10] Report to Crescent H Stream and Trail Committee
[11] Fish Creek: A Situation Assessment

(JHCWC). The JHCWC had better reach and eventually drew in more partner organizations to share messaging. Later in 2018, the JHCWC launched the Trout Friendly Lawns program, a voluntary set of guidelines to help residents and businesses create and maintain quality lawns and gardens while also limiting impacts on water from fertilizer and pesticide runoff. This program still operates today under the management of TCD.

Another USGS study was commissioned and finalized in 2016, which was designed to be used as a general guide to assist efforts aimed at reducing anthropogenic nitrogen and phosphorus inputs to Fish Creek. The authors determined that the largest estimated sources of anthropogenic nitrogen from within the watershed were livestock waste and fertilizers applied to lawns (28 and 11 %, respectively).[12] Human waste from individual septic systems contributed 4 percent of the nitrogen in the system, with inputs from sewage treatment plants significantly below that, at 1.3 %. The largest source of phosphorus was livestock (cattle and horses) waste (57 %). Human waste (both from treatment plants and individual septic systems) accounted for about 11 % of phosphorus inputs.

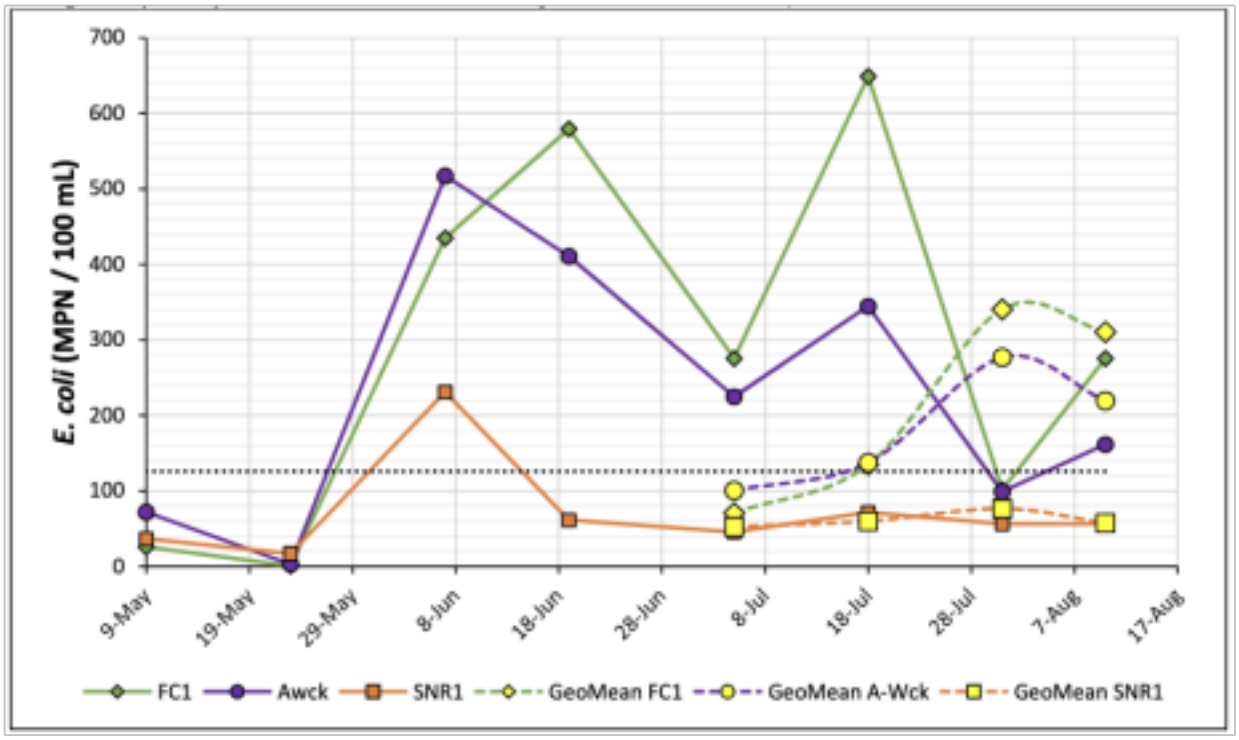
It is important to understand how the study was designed to properly contextualize its results. First, the authors described sources of nitrogen input within the watershed boundary, not sources of nitrogen entering the groundwater and surface waters. With this approach, atmospheric deposition was identified as the largest source of nitrogen and second-largest source of phosphorus (46 and 23% respectively) with the caveat that " *in forested areas most of these nutrients from atmospheric deposition are likely used by the canopy vegetation before it reaches Fish Creek.* " In other words, atmospheric nitrogen and phosphorus deposition is a natural process supplying essential nutrients to plants, not one driven by human activity within the watershed. To again quote the authors: "*Determination of the amount of nitrogen and phosphorusfrom atmospheric deposition that istransported and contributesto nutrient loadsin Fish Creek is outside the scope of this study.*" The same statement was made for livestock waste.

Lastly, it is important to understand how septic system nutrient inputs were calculated for this study. In locations with a high water table, nutrients introduced by septic systems are sent straight into the groundwater (without the same opportunity for uptake by terrestrial plants). The study also used nutrient loading estimates from another research project on the Virginia Coastal Plain.[13] Lower temperatures inhibit nitrogen reduction from wastewater.[14] The Virginia Coastal Plain is Zone 8, whereas Teton County is Zone 4; [15] a roughly 20°C mean difference. Accordingly, the 2016 study likely under-represents actual nutrient loading contributions from septic systems.

In 2017, WDEQ tested two sites on Fish Creek for *E. coli* and found that concentrations exceeded the primary contact recreation standard of 126 organisms/100 mL over the course of five sampling events spread over sixty days. [16] See **Figure 1** below for results. It took a few years, but in response, Fish Creek was added to Wyoming's 2020 Integrated 305(b) and 303(d) Report as officially impaired for Recreation (one of its designated uses) by *E. coli* bacteria. Concurrently, Flat

[12] "Estimated Nitrogen and Phosphorus Inputs to the Fish Creek Watershed, Teton County, Wyoming, 2009–15"
[13] Septic Tank Impacts on Ground Water Quality and Nearshore Sediment Nutrient Flux [14] Effect of temperature on nitrogen removal and biological mechanism in an up-flow microaerobic sludge reactor treating wastewater rich in ammonium and lack in carbon source
[15] 2023 USDA Plant Hardiness Zone Map

Creek was also sampled and listed as impaired for the same reasons. See **Figure A3** in the



Appendix for sampling locations. This impairment declared that any activity with a risk of ingesting the water or full-body contact is now unsafe.

Figure 1. Single-sample *E. coli* concentrations and geometric means (the average of five samples over a 60

day period) on Fish Creek and the Snake River by WDEQ in 2017.[17] The dotted black line indicates the regulatory limit of *E. coli* for "total body contact" (Swimming): *The geometric mean (GM) for a 60-day period should not exceed 126 E. coli per 100 mL, and no more than 10% ofsamplesshould exceed 410 E. coli/100 mL.*[18]

By 2019, the JHCWC had grown to over half a dozen partner organizations; all with differing opinions on how best to address Teton County's growing list of water quality problems. At this point, FOFC decided that a community-wide wastewater master plan was necessary to address our valley's nutrient pollution problem. In order to gain the support of TCD, Town of Jackson and Teton County, which became the steering committee for what would soon be called the Teton County Water Quality Management Plan (WQMP), the scope of the project was expanded to also include stormwater, drinking water, and other water-resource related topics.

It was also in 2019 that FOFC, having recognized that the problems in Fish Creek did not exist in a vacuum and were in fact connected to changing hydrology, land use, and other factors across the valley, decided to expand its mission to protect and restore Teton County's surface water and groundwater resources and rebrand itself as Protect Our Water Jackson Hole (POWJH). Wanting to utilize a more advocacy-heavy approach towards working with local, state, and federal government, POWJH left the JHCWC and focused on getting the WQMP off the ground. Thanks

[17] Memorandum, *Recreation Use Support Determination for Flat and Fish Creeks, Teton County, Ron Steg, Wyoming Department of Environmental Quality, 2019*
[18] EPA Fact Sheet on Water Quality Parameters

to an impressive outreach and fundraising campaign,[19] POWJH was able to provide $250,000 to catalyze the initiation of the WQMP, and together with funding support from the County and TCD, the WQMP was drafted over the next four years.

In 2021, a University of Wyoming graduate student used microbial source tracking (MST) to identify sources of bacteria into Fish Creek and Flat Creek.[20] See **Figure A4** in the Appendix for sampling site locations. This cutting-edge research, which was co-designed with TCD, provided a modern follow up to the first *E. coli* study on Fish Creek two decades prior. The research showed that human wastewater was the dominant source of identifiable fecal bacteria into each creek.[21] The study also found that *E. coli* values were not correlated with fecal bacterial contributions, suggesting *E. coli* may be a poor fecal indicator. **See Figure 2** below for results on Fish Creek. In addition, the authors determined that aquatic bacterial diversity decreased with increasing development. Lastly, sewage contributions increased during periods of runoff, suggesting that groundwater is a major mechanism of fecal loading in the surveyed streams.

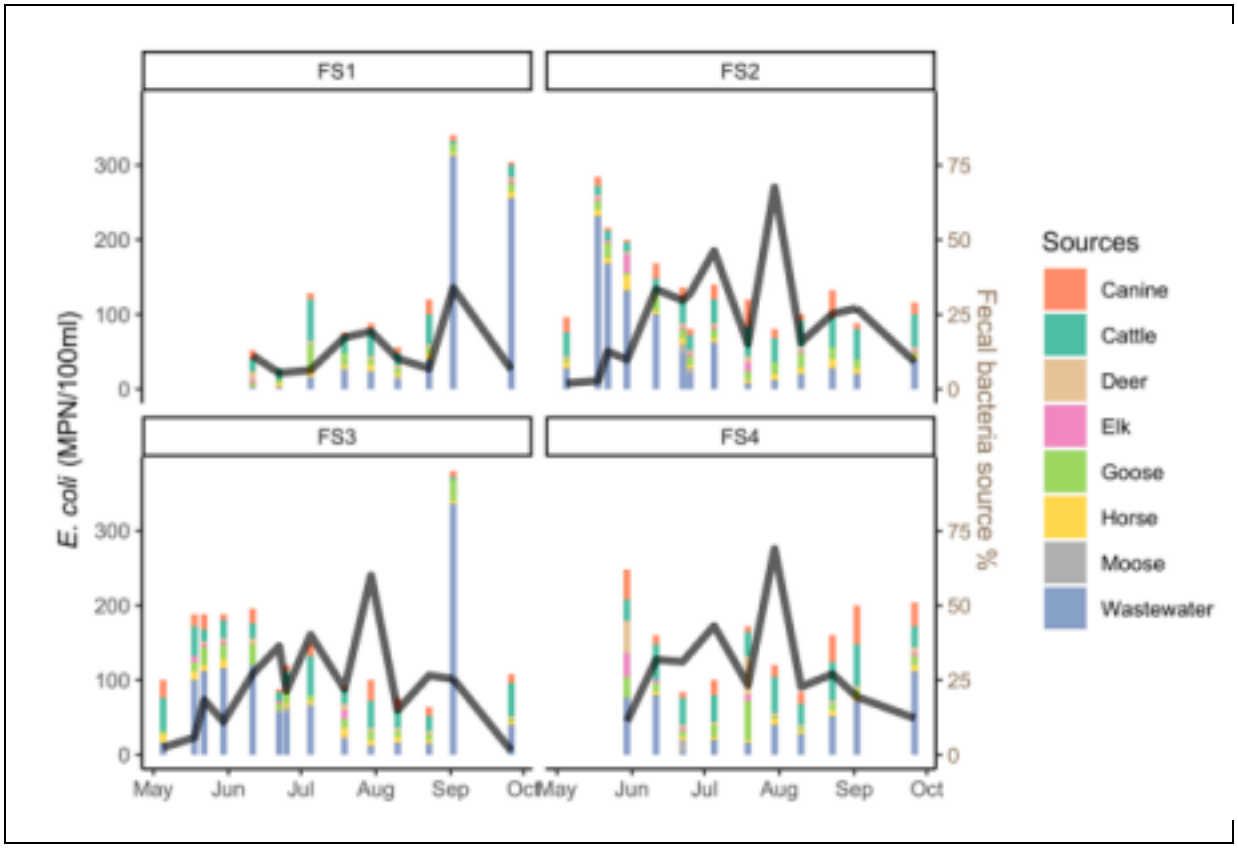


Figure 2. Seasonal Fish Creek *E. coli* concentration (left y-axis), indicated by the line, and fecal bacterial source contributions (right y-axis), indicated by the bars with colors representing different sources, at each sampling location[22]

[19]"A Proposal for Philanthropic Support for Comprehensive Wastewater Master Planning in Teton County, Wyoming."
[20] Teton Conservation District "Water Quality Monitoring" webpage
[21] Understanding the contribution of different microbial sources to surface water for informed management of waterborne pathogens in Wyoming
[22] Understanding the contribution of different microbial sources to surface water for informed management of waterborne pathogens in Wyoming

To follow up on this research, POWJH launched and funded an *E. coli* and MST water quality monitoring program 2023 to provide data critical to safe recreation and informed management of Fish Creek and Flat Creek. Staff from Alder Environmental, LLC collected *E. coli* and bacteroides samples for MST from 5 locations on each creek from May to September that year. While the UW project examined all the bacteria in these surface waters, the 2023 monitoring was examining specific fecal indicator bacteria. See **Figure A5** in the Appendix for sampling sites. See **Figure 3** below for *E. coli* results from Fish Creek. Funding for this project was provided by POWJH, Teton County, the Town of Jackson, TCD, Jackson Hole Trout Unlimited, the Community Foundation of Jackson Hole's Youth Philanthropy Grant program, and a private foundation.

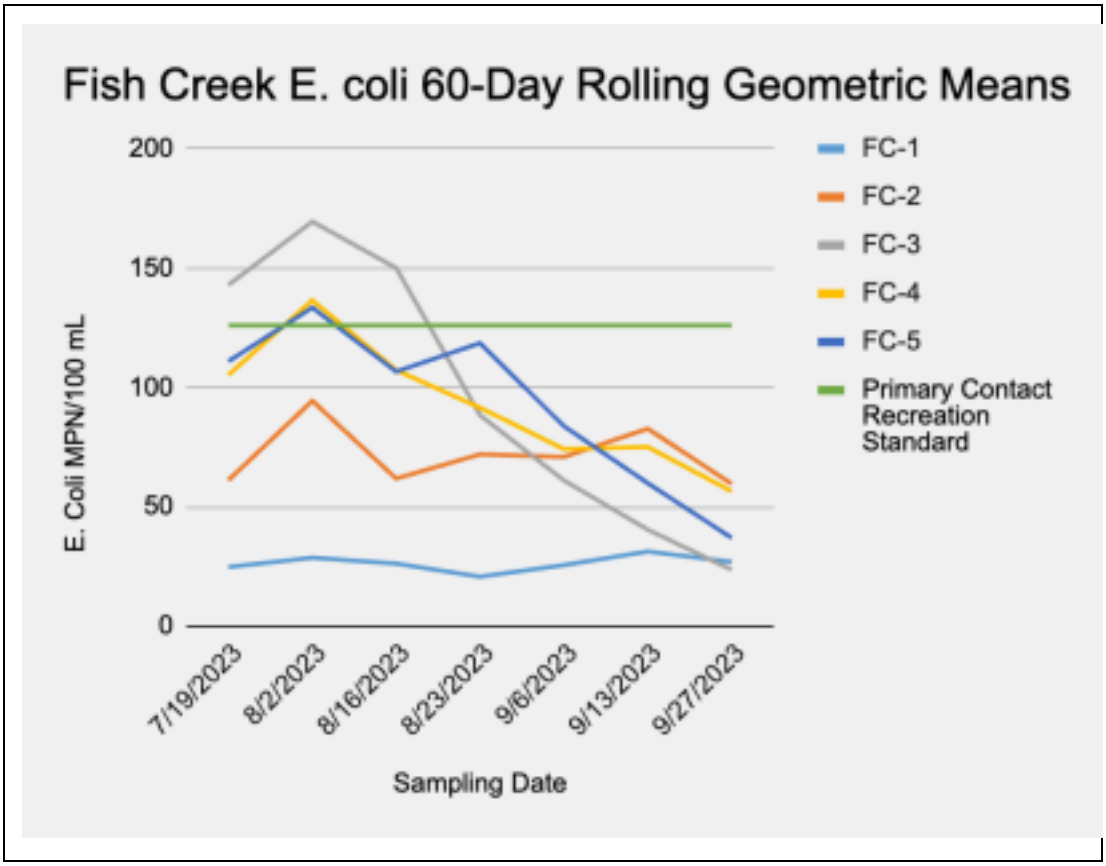


Figure 3. *E. coli* 60-day rolling geometric mean results from POWJH's 2023 *E. coli* and MST study[23]

The data collected by this study was, and still is, used to inform messaging from Teton County Public Health regarding safe recreation on each stream. Waterborne Pathogen Awareness signs were placed at common access points for each stream. Additionally, Caution signs are placed at publicly-accessible sampling sites when concentrations exceed the state's safety threshold (235 organisms/mL) and must remain in place until concentrations from two independent sampling events are less than the threshold or until the recreation season ends (May 1 - September 30).

The results from the 2023 MST project seem to agree with components of UW's research and the 2003 TCD *E. coli* tracking study, although they did highlight problems with MST methodologies overall. First, bacteroides markers did not correlate with *E. coli* data. Second, while bacteria from human, canine, wild ruminant animals, and cattle were all detected, the BacCow marker for cattle was most common across samples. However, this marker can indicate fecal pollution from cattle as

[23] *Credit: Alder Environmental 2023*

well as wild ruminant animals like elk, moose, and deer. Due to its high cost and issues with marker reliability, it was decided that MST sampling would be discontinued. Despite this, *E. coli* monitoring remains a priority for our community, and in 2024 TCD took over monitoring to continue tracking fecal bacteria loading into each waterbody.

In June 2024, the Teton County Board of County Commissioners officially adopted the WQMP as a countywide water quality protection plan to address the shared values and goals presented in

the Jackson/Teton County Comprehensive Plan.[24] It is a local land use plan developed under Wyoming statutory authority and incorporating elements of source water protection from the WDEQ as well as the federal Clean Water Act and Safe Drinking Water Act.[25] One component of this holistic planning effort was to evaluate nutrient loading into all sub-watersheds in Teton County. Wastewater was evaluated in Appendix C-2 and stormwater/nonpoint sources were evaluated in Appendix C-3. The authors of the WQMP, TriHydro Corporation, compiled the results of their nutrient loading analysis in Table C-1B.[26] Septic system nutrient loading was estimated based on data obtained from the Teton County Septic System Effluent Monitoring Report (prepared by Nelson Engineering) and the TCD Septic System Inspection and Maintenance Program. Fertilizer's contribution to nutrient loading was based on application rates assumed in the 2016 USGS study and multiplied by the area of lawns and golf courses in each subwatershed. Livestock waste was not included in the nutrient loading calculations due to a lack of relevant nutrient data. Again, atmospheric deposition was included and improperly contextualized, resulting in the conclusion that *"atmospheric deposition isthe primary contributor of nutrients, with fertilizersecond, and wastewater third."* Unfortunately, this section of the WQMP did not improve our understanding of nutrient loading into Fish Creek.

In fall 2024, WGFD published a report showing that autumn counts of fish in Fish Creek declined more than 50% between 2017 and 2022. In 2023, the decline continued, and fell again in a 2024 survey.[27] It's thought that excess algae lowers dissolved oxygen, which is critical for egg development in redds. Algae can also suffocate habitat for stoneflies and mayflies, which rely on the nooks and crannies between clean rocks. *"Booms and busts are pretty normal. We've seen big rises and falls on riverslike the Snake. But on smallerstreamslike this, they're at least relatively consistent. I haven'tseen anything this dramatic,"* said WGFD fisheries biologist Diana Miller to the JH News and Guide upon publication of the report.

In January 2025, POWJH partnered with the USGS to add continuous autonomous monitoring for dissolved oxygen, pH, conductivity and turbidity to the stream gage on North Fish Creek Rd. in Wilson.[28] This gage, which previously collected gage height, discharge, and temperature, gives us the ability to better understand baseline water quality and changing algae conditions in the creek. TCD and WDEQ both supported this program, with WDEQ's Ron Steg writing *"(these variables) are response variablesfor the nutrients causing the impairment. Data collected through this program will assist usin better understanding the nutrient impairment and allow usto track trendsin these variables over time as BMPs are implemented to restore Fish Creek."* Thanks to support from these technical

[24] 2012 Jackson Teton County Comprehensive Plan
[25] Teton County Water Quality
[26] Teton County Water Quality Management Plan
[27] "Fish Creek's cutthroat trout are disappearing. Is nutrient pollution to blame?" *Jackson Hole News and Guide*, 12 Sept., 2024, Pg. 1.
[28] Fish Creek at Wilson, WY - 13016450

experts, the project was awarded funding support from the Jackson Hole One Fly Foundation, the Community Foundation of Jackson Hole, and matching donations from private donors.

On June 27, 2025 WDEQ added elevated nutrients (nitrogen and phosphorus) as a new impairment in Fish Creek. The 2022/2024 305(b) and 303(d) Integrated Report states that the *Aquatic Life Other than Fish*, *Cold Water Fish* , and *Nongame Fish* designated uses are impaired due to nutrients on the upper stretch of the creek between Teton Village and Wilson.[29] This official designation is based on a "multiple lines of evidence approach" taken in the Fish Creek Nutrient

Assessment.[30] The Assessment compared nutrient concentrations, benthic algal biomass, periphyton composition, dissolved oxygen and pH, and macroinvertebrates between Fish Creek and regional reference sites to establish a threshold for nutrient impairment. WDEQ and TCD are also compiling all relevant existing data and drafting an Advanced Restoration Plan for the watershed, which we expect in 2026.

Conclusion

It's clear that human activity continues to degrade Fish Creek; nuisance algal growth persists and the fishery continues to struggle. Since intensive research and planning efforts really took off in the early 2000's, residential land use has expanded (more lawns, septic systems and ornamental water features) and existing septic systems have aged without required maintenance or inspections. Steps must be taken to reduce the factors leading to nutrient loading and excess *E. coli* contamination, including upgrading wastewater infrastructure, enhancing riparian buffers, and fortifying wetlands. There are public health implications to this work- the longer *E. coli* concentrations are too high, the greater the likelihood that recreators will be sickened by accidentally ingesting waterborne pathogens from feces. In addition, the longer nuisance algal blooms dominate Fish Creek, the more the fishery will continue to struggle with degraded habitat conditions. By curtailing pollutants and rehabilitating a natural water cycle, we can restore this watershed to protect human health and ecosystem function.

[29] Wyoming's 2022/2024 Integrated 305(b) and 303(d) Report
[30] Fish Creek Nutrient Assessment

Appendix

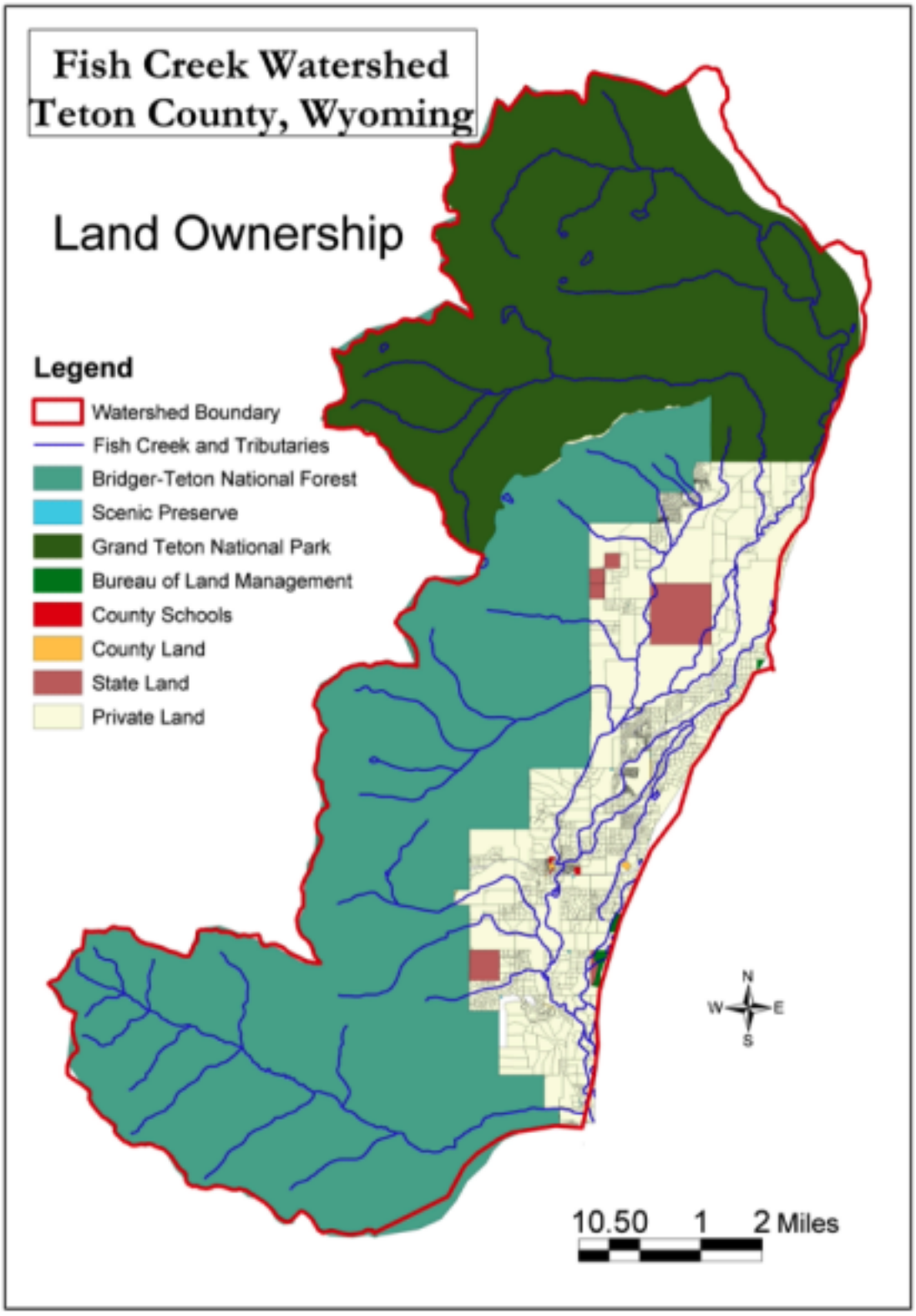


Figure A1. Land ownership in Fish Creek basin, Teton County, Wyoming, 2003[31]

[31] Microbial Source Tracking for *Escherichia coli* in Two Upper Snake River Basins

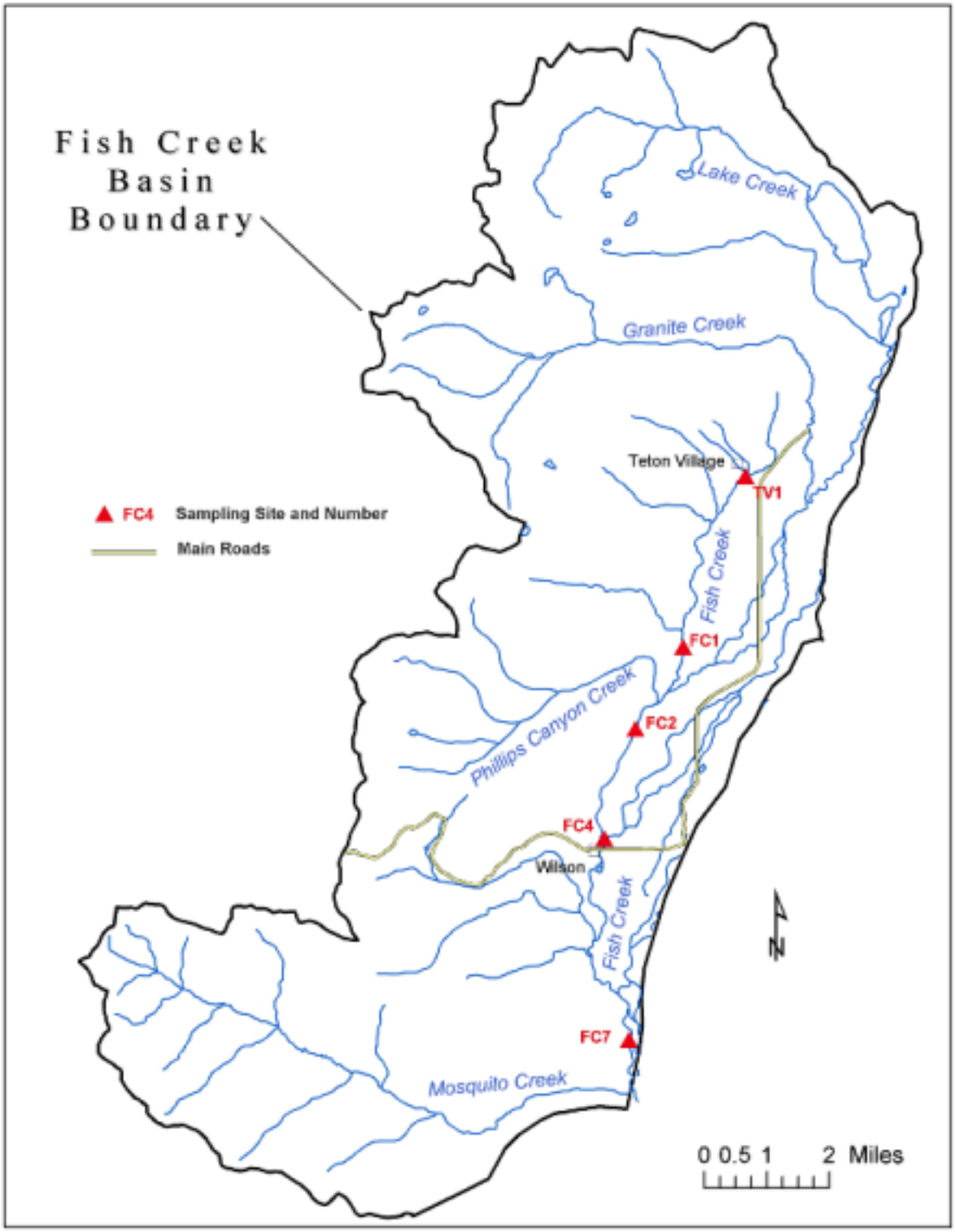


Figure A2. TCD *E. coli* sampling sites, 2003[32]

[32] Microbial Source Tracking for *Escherichia coli* in Two Upper Snake River Basins

Figure A3. WDEQ sampling sites on Fish Creek, 2017[33]

[33] Memorandum, *Recreation Use Support Determination for Flat and Fish Creeks, Teton County, Ron Steg, Wyoming Department of Environmental Quality, 2019*

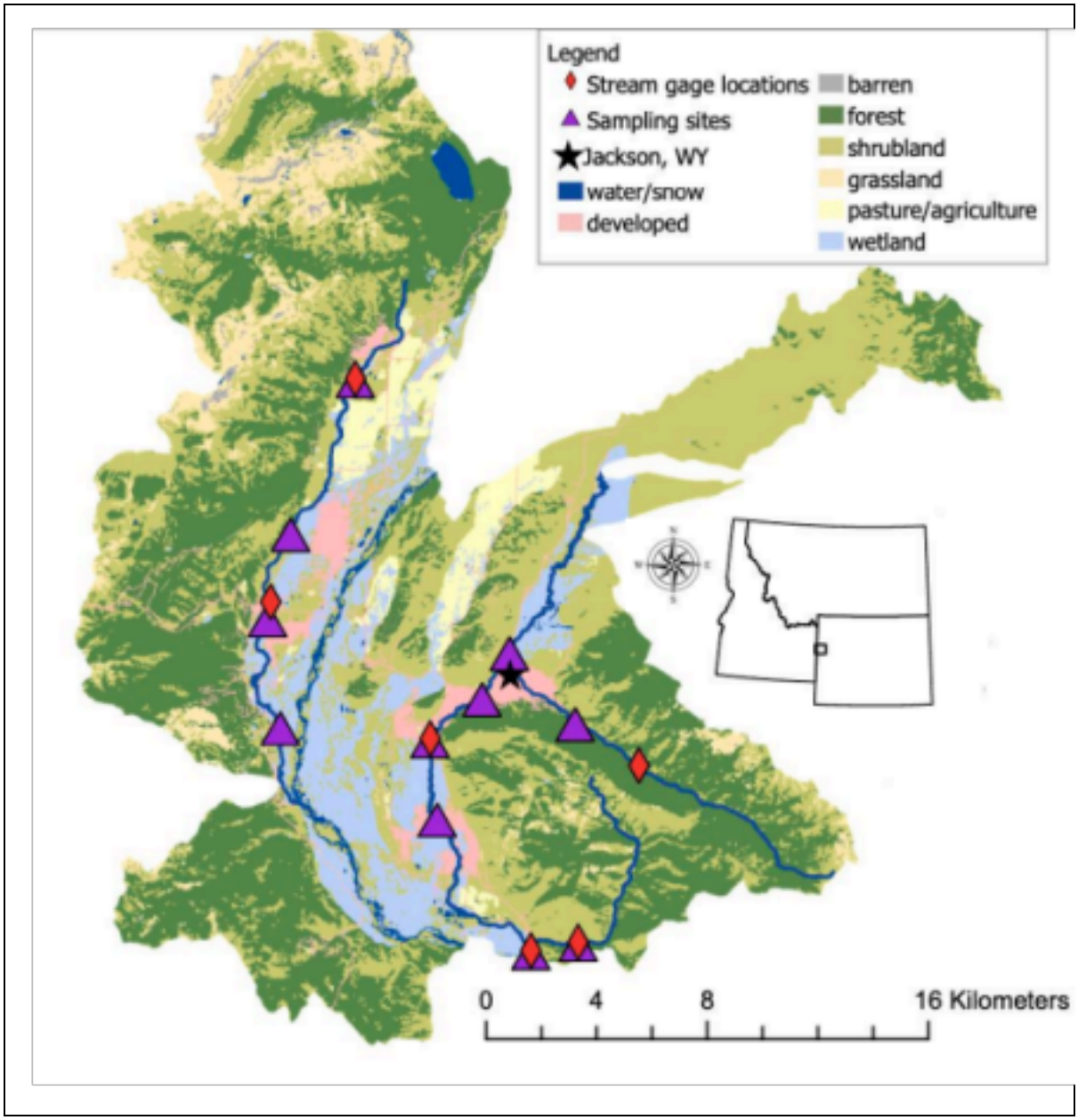


Figure A4. University of Wyoming sampling sites in Teton County, 2021[34]

[34] Understanding the contribution of different microbial sources to surface water for informed management of waterborne pathogens in Wyoming

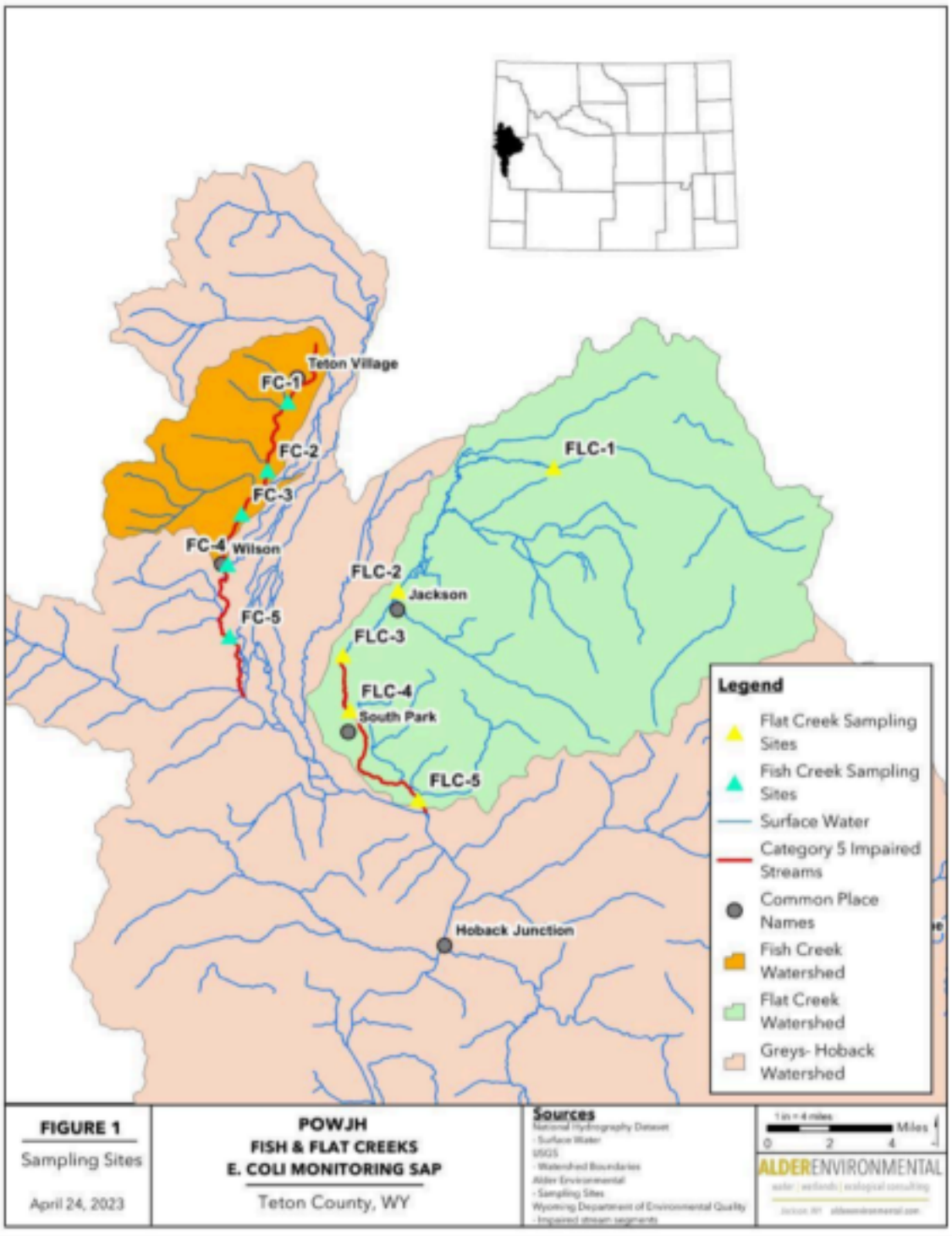


Figure A5. POWJH/Alder Environmental sampling sites from *E. coli* and MST study, 2023[35]

[35] *Credit: Alder Environmental 2023*