

WATER RESOURCES WHITE PAPER v.3

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Prepared by the Jackson Hole Clean Water Coalition for
Candidates for Town of Jackson Mayor and Town Council
and Teton County Board of County Commissioners

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JACKSON HOLE
clean water
coalition

Water Resources White Paper v.3

2020 Candidate Water Forum: Event Information

Date: Thursday, October 8, 2020

Time: Mayor & Town Council: 12:00-1:00 p.m. | County Commissioner Candidates: 1:00-2:00 p.m.

Participating Candidates: Town of Jackson Mayor and Town Council Candidates and Teton County, Wyoming Board of County Commissioners Candidates

Location: Stream the event live at www.tclib.org. Candidates will be sent a Zoom link prior to the event.

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Co-Hosted by the partners of the Jackson Hole Clean Water Coalition: Teton Conservation District, Trout Unlimited, Protect Our Water Jackson Hole, Snake River Fund, Jackson Hole Land Trust, Teton County Weed & Pest District, PAWS of Jackson Hole, Wyoming Nature Conservancy, Wyoming Ducks Unlimited, and Flat Creek Water Improvement District. With additional support from LegacyWorks Group and Friends of the Teton River.

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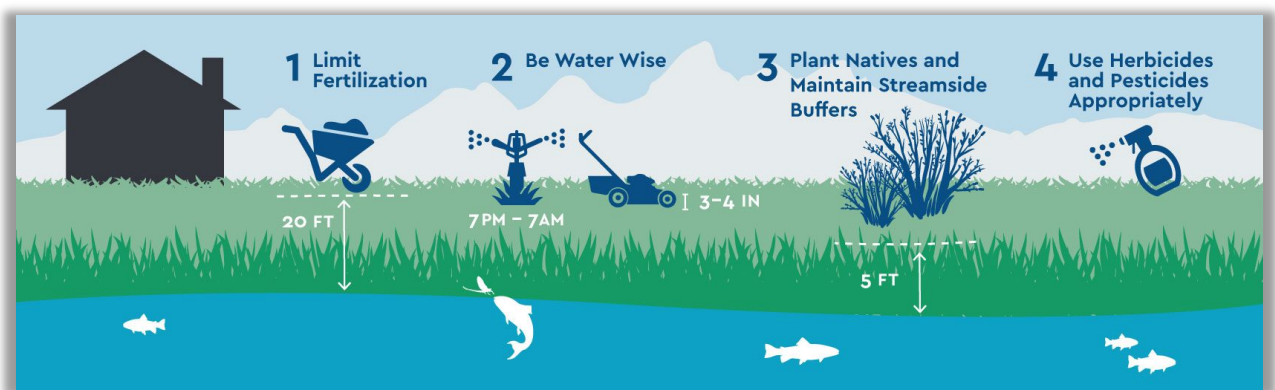
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Jackson Hole Clean Water Coalition

The Jackson Hole Clean Water Coalition is a collaborative group of ten local government agencies and nonprofits working together to measurably reduce nonpoint source pollution in Jackson Hole's surface and groundwater. The group was founded to address water quality issues by engaging individuals in science-based programs and initiating community-wide action. The coalition's major initiatives include:

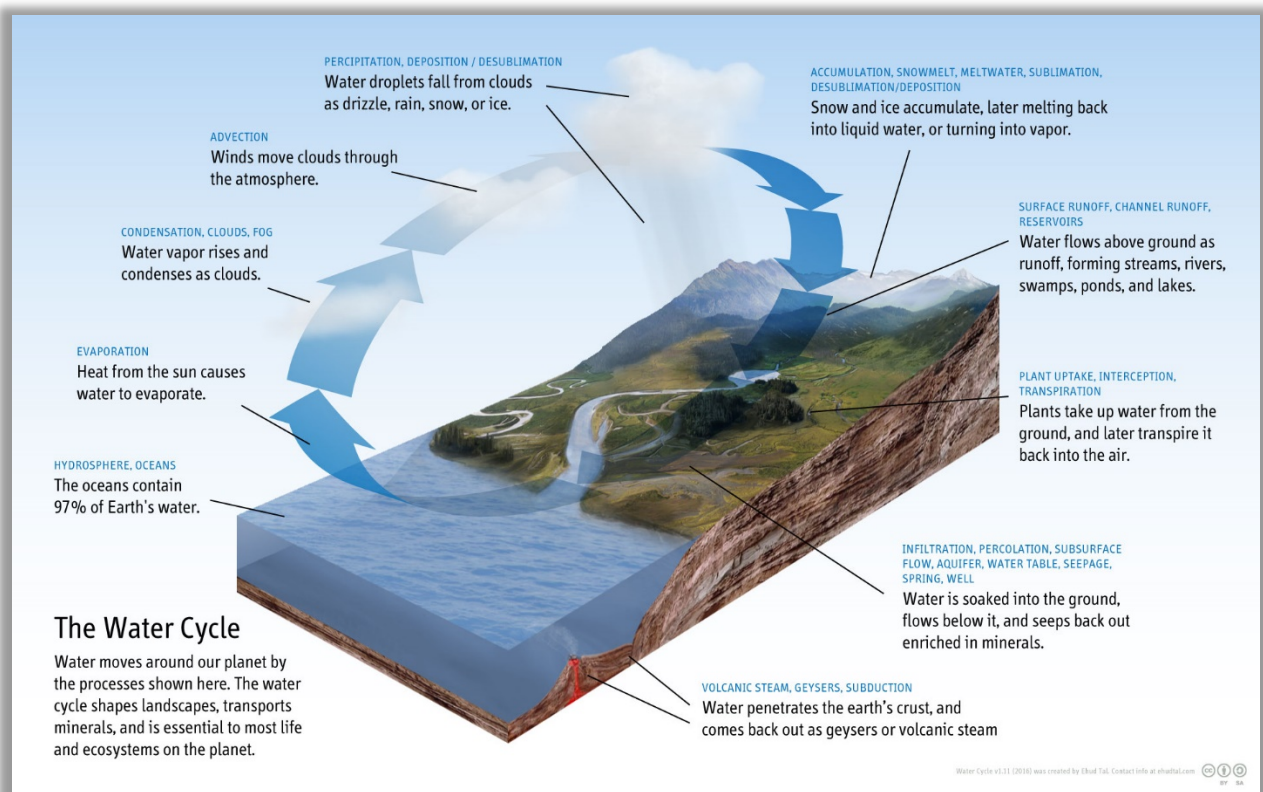
- **Trout Friendly Lawns Program:** Nutrient pollution from lawn care practices, such as over-fertilizing and over-watering, can lead to increased algae and aquatic plant growth, harming aquatic habitats and disrupting the ecosystem. 'Trout Friendly' landscaping practices are designed to improve water quality for the health of all the plants, insects, fish, wildlife, and humans that rely on clean water. Over 150 residents, businesses, and public parks have been certified Trout Friendly at www.jhcleanwater.org.
- **Trout Friendly Landscaper & Business Partners:** The Trout Friendly Landscaper & Business Partner program is designed to help lawn care and landscaping professionals meet the growing demand for Trout Friendly services, promote Trout Friendly businesses, and certify their lawns.
- **Septic System Maintenance (completed):** The JH Clean Water Coalition provided rebates to Teton County residents for pumping their septic systems. Unmaintained septic systems pose risks of surface and groundwater contamination from nutrients and pathogens.
- **Other Community Engagement Opportunities:** Partners of the coalition have hosted a number of community engagement and educational opportunities, including an interactive panel with Teton County/Jackson Parks & Recreation Department on landscaping practices and values in local public parks, site visits and funding opportunities for coral owners in partnership with an organization called Horses for Clean Water, previous Candidate Forums on water, and many more direct outreach events.



H2O: An Introduction

Although fresh water is by far the most precious natural resource worldwide, we in Jackson Hole take it for granted too often, especially when it comes to long-range planning. Long-term water resources planning is a political exercise. The headwaters of the Snake River provide us with an ample supply of clean water—but the choices we make to utilize that water and distribute it around the valley require our attention. In this synopsis, we hope to familiarize candidates with these issues, particularly with regard to human health, wildlife habitat, agriculture, recreation, and infrastructure.

Water is a complicated substance. Pure water (H₂O) is not found in the natural world, but is created in laboratories in the form of distilled or deionized water. Real water is H₂O, plus all the chemicals and substances that it interacts with. Water dissolves materials, holding those materials within its chemical bonds. It also has erosional capacity, carrying other materials suspended within it. Therefore, water should always be considered a sum of its parts, coalescing through its interactions with air, geology, and lifeforms as it falls as precipitation and travels across and within the earth.



Drinking Water: Where does it come from?

Potable water in the valley (except that imported in bottles) is typically derived from groundwater wells, including both individual residential wells and community water systems. In rare cases, surface water is used for drinking water following treatment. All ground and surface waters are property of the State of Wyoming and the State Engineer's Office issues permits for water use. While some parts of the valley, such as the West Bank, receive significant groundwater recharge from the Snake River, other areas east of the river do not. North of town, Ditch Creek and the Gros Ventre River provide minimal aquifer recharge. South of town, Flat Creek, Spring Creek, and the Hoback River similarly appear to be only partially connected with groundwater.

Though the water table is often found just 2 to 20 feet below the surface, it's common practice for drinking water wells to be drilled to a depth of 80 feet. This depth accommodates seasonal water table fluctuations, vertically separates water intake from septic system effluent, and avoids layers of glacial silt carrying sediment. The South Park area in particular possesses copious amounts of silt and wells there often require filtration.

Some of the most productive local aquifer material is glacial outwash consisting of gravel and cobbles. As opposed to fine-grained lake sediments, these coarse materials allow for more water storage capacity and permeability, enabling faster well recharge. On the West Bank, glacial outwash can reach depths of 1,000 feet. However, glacial outwash is poor at protecting drinking water resources from surface contaminants.

Another good aquifer material found in Jackson Hole is fractured or karstified limestone, where solutional cavities and cave systems provide water storage and transport. Vertical limestone strata may provide the main pathway for groundwater flowing into South Park from the mountains to the east. Subdivisions above the valley floor, such as Indian Paintbrush or those on the Gros Ventre Buttes, also tend to tap these limestone formations for their water supplies.

The Town of Jackson appears to be underlain primarily by fine-grained pre-glacial lake deposits. At greater depths, there are no limestone layers, only impermeable shales. Providing for future water needs may require drilling wells at substantial distances from the town.



Limestone foothills south of Jackson.

Irrigation

Perhaps the most important thing to remember concerning surface water flowing through Jackson Hole is that all of it has been “spoken for,” i.e., it is subject to water rights granted by the State of Wyoming or governed by interstate compacts. Much of this flow (e.g. the contents of Jackson Lake) is “owned” by irrigators in Idaho who built the original Jackson Lake Dam. Water rights specify the point of diversion, amount diverted, and the land parcel where the water is to be used, usually for purposes of irrigation or stock watering.



The means of surface water conveyance is not as carefully specified and can be by human-made ditches, canals, or pre-existing natural streams. For instance, a significant amount of the flow in Fish and Lake Creeks is derived from the Granite Creek Diversion off the Snake River. Diversions off the Gros Ventre River supply much of the flow in Flat and Spring Creeks. Over time, the distinction between natural streams and irrigation ditches has become less clearly defined.

Irrigation in Teton County has traditionally been in the form of flood irrigation, a practice in which water is diverted from streams or rivers and directed to flow onto pastures or hay meadows. Much of this water seeps into the ground and serves to locally recharge the groundwater aquifer. Recently, more ranchers have been converting to sprinkler irrigation, which draws from groundwater wells or surface reservoirs. This method uses water more efficiently, which can translate to more water left instream for fish and other aquatic organisms. However, in some instances, such as in Teton Valley, flows in springs have decreased as this conversion to sprinklers has occurred. Fish- and flow-related benefits from flood and sprinkler irrigation are dependent on numerous variables, including lag time on return flows and whether or not return flows are intercepted.

The use of natural stream courses for transporting diverted water increases the flow levels of these streams beyond the normal peak period. Similarly, irrigation runoff, especially from flood irrigation, can increase water in streams and associated wetlands. Theoretically, this effect is more pronounced in parts of the valley cut off from seasonal flooding by levees along the Snake River.

Permits can be obtained from the state to expand a ditch to create a reservoir. Many of the ornamental ponds in the valley followed this process. Other ponds can be supplied by a state-permitted well or built under a county permit for excavation of material. Ponds that have been improperly designed, built, or maintained can pose problems for downstream water right holders. In recent years, water rights have been granted for the production of wells to feed artificial stream features. This new type of water development has required regulators to create new rules to ensure degradation does not occur to receiving waters.

Teton Conservation District’s Surface Water Inventory (www.tetonconservation.org/surface-water-inventory) is a publicly-available tool that allows an in-depth review of natural and manmade surface water features, and their associated water rights.

Flooding

Snake River Flood Prevention

Before the construction of the Snake River levees in the 1950s and 1960s, the river routinely overflowed its banks during spring runoff, flooding adjacent lands. The town of Wilson lies approximately seven feet below the river's average water level and was especially vulnerable to flooding.



While the levees are successful in preventing floods, there are deleterious consequences for the local ecology. The river has been confined to a narrow corridor and no longer functions fully as a multi-channel braided stream. Cut off from annual floodwaters and accompanying sediment, seasonal wetlands and riparian habitats have disappeared. Islands and their associated vegetation have shorter lifespans due to more frequent channel shifting and no longer provide the same riparian habitat they once did.

Narrowing the river has also increased water velocity, increasing sediment transport. Recent studies suggest this may be responsible for the removal of many feet of material from the river bed in the leveed section and its deposition downstream. The depositional areas now have increased bank erosion.

In recent years, Teton County and Teton Conservation District have partnered with the Army Corps of Engineers to mitigate some of these effects, primarily attempting to protect islands between the levees. Additionally, local partners have been trying to incentivize bio-engineered bank stabilization solutions.



A bioengineered streambank. Photo by Leslie Steen.



A cottonwood grove – few young trees are present.

Flat Creek Flood Prevention

As Flat Creek passes through the town of Jackson, it has been subject to winter flooding in periods of extreme cold. Sub-zero conditions can super-cool water, resulting in a type of rapid ice formation called frazil ice. When frazil ice binds to the stream bed, it displaces water and can flood homes, streets, and pathways along Flat Creek. When this occurs, excavators are employed to remove ice from the channel. While effective, these activities are costly and can cause damage to the streambed and private property.

Thaw wells, owned and operated by the Town of Jackson, have been installed to discharge warmer groundwater into the creek. Research has been done recently to better understand the timing and proper operation of these wells, and potential locations for new wells.

Professionally-designed rock structures, funded jointly by the Town of Jackson and Teton Conservation District, have also been installed to mitigate ice formation. Modifications to these structures continue today. The thaw well and rock weir projects have cost hundreds of thousands of tax dollars and have had varying levels of effectiveness.

In 2014, the Town of Jackson stopped providing winter flood-fighting services. Teton Conservation District then agreed to oversee a new special district, the Flat Creek Watershed Improvement District (FCWID), to address this issue. The FCWID consists of a five-member elected board and receives tax revenues via a flat fee to its 183 landowners, in addition to funds from Teton Conservation District and the Town of Jackson. To date, the FCWID has developed communication tools with its constituents, implemented a research project to monitor stream conditions and ice formation, and developed an operational framework for mechanical flood fighting. Based upon recommendations from research and data collection, proactive flood mitigation projects have been identified and are being pursued.



Ecology

Fisheries

Teton County hosts some of the finest naturally-reproducing native fish populations in the United States. Most of the rivers, streams, and lakes in Teton County maintain the array of native fish species historically present—which is rarely seen throughout much of the country. Local fisheries are the result of good management practices and relatively low levels of human disturbance to our waterways due to a high percentage of public land ownership.



Our unique native cutthroat trout fishery is important to the local economy and culture. Yellowstone and Snake River cutthroat trout are icons of the Greater Yellowstone Region. The cutthroat trout found in this region has been classified by the federal government as Yellowstone cutthroat trout. However, Snake River cutthroat trout are recognized and managed by the Wyoming Game and Fish Department as a distinct subspecies of cutthroat trout, native to the portion of Teton County within the Snake River drainage (i.e. Jackson Hole). They are the only subspecies of cutthroat trout that still dominates in its native range and are considered a conservation priority for many agencies and nonprofits in the area.

Cutthroat trout are known for their affinity for feeding on the surface during the summer months. This propensity makes them particularly fun to fish using ‘dry fly’ patterns mimicking winged aquatic invertebrates (midges, mayflies, caddisflies, and stoneflies) or terrestrial invertebrates (grasshoppers, ants, etc.). Local fishing ethics that began in the guiding community have prevailed, and most people use catch and release when fishing for cutthroat.

Cutthroat trout in the Upper Snake River have been shown to use and migrate between a wide variety of habitat types throughout the year, making them susceptible to fish passage issues like dams and entrainment in irrigation systems. As spring spawners, these trout migrate from winter habitat (deep, slow-moving water) into spring-fed creeks, tributaries, and side channels, where male and female trout excavate nests in gravel substrate and deposit and fertilize eggs that hatch within weeks to months depending on water temperatures. The Upper Snake River has many protections afforded to it because of the high percentage of public land ownership in Teton County as well as Wild & Scenic River and Wilderness Area designations. However, habitat fragmentation and degradation nevertheless pose threats to the health of the fishery and watershed, especially in areas of the valley that have been developed. Culverts, dewatered stream reaches, and diversions in tributaries cut off connectivity and migration routes for fish. Impaired water quality, stream function, and stream habitat also threaten the long-term resilience of native fish populations that are adapted to cold, clean water. Federal, state, and local fish and land

management agencies; non-profit partners; and private landowners collaborate on habitat reconnection and restoration projects to benefit the fishery and watershed. The Teton County Wildlife Master Plan and associated Special Purpose Excise Tax include funding for aquatic crossings. Trout Unlimited, Friends of the Teton River, and Wyoming Game and Fish Department are currently doing fish passage inventories throughout the upper snake river watershed to help prioritize project implementation.

Through competition, predation, and genetic hybridization, non-native fish have decimated native fish populations throughout Wyoming and the United States. In the Upper Snake River drainage, east of the Tetons in Jackson Hole, native fish species have maintained robust populations despite the presence of non-native fish species. However, examples do exist in Teton County where non-native trout (lake, rainbow, brook, and brown trout) have significantly altered aquatic systems. In Yellowstone Lake, due to predation, non-native lake trout have crippled what was once an unparalleled keystone Yellowstone cutthroat trout fishery. In the Teton River drainage on the west side of Tetons, interbreeding between native cutthroat trout and non-native rainbow trout is seriously threatening the long-term persistence of cutthroat trout. In Game Creek, south of Jackson, non-native brook trout have outcompeted native cutthroat, and cutthroat are no longer present upstream of Hwy 89. These examples have resulted in management actions by fishery managers that seek to preserve our relatively intact native fishery.

Temperature tolerances for all life stages of cutthroat trout are relatively narrow compared with most other fish species. They require cool water and high levels of dissolved oxygen, which decreases as water temperatures rise. Rising stream water temperatures, which can be attributed to climate change, low instream flows, sunlight-warmed ponds that discharge to streams, and removal of shade vegetation from streambanks, are concerning for the long-term health of our fishery. Warmer water holds less oxygen and can be more amenable to fish parasites. For cutthroat trout, a water temperature of 73°F is considered lethal. Warm water conditions are stressful to fish and associated fish kills have recently been documented in regional streams, prompting fishing closures in Montana and special angling recommendations in Wyoming. This serves as a reminder that the health of our watershed has the potential to impact our recreation-based economy.

Riparian Habitat

In addition to fish, almost all other species of animals in the valley depend on waterways and their adjacent riparian lands to some extent. Besides being a source of water for consumption, these habitats provide food, shelter, and migration corridors. For example, waterfowl, beavers, amphibians, moose, songbirds and eagles all utilize these areas throughout much of the year. In fact, riparian habitats are probably more important to many species in the valley than all other habitat types combined, yet efforts to protect them have been piecemeal at best.



Recreation



Photo by Sam Beebe

Wild & Scenic Rivers: Holistic Management

Teton County boasts the largest single designation of Wild & Scenic Rivers in the United States. The Craig Thomas Snake River Headwaters Legacy Act passed by Congress on March 9, 2009 provided a certain level of protections on over 414 miles of rivers and streams in Teton and Lincoln County, Wyoming. These designated streams are managed by the Bridger-Teton National Forest, Grand Teton National Park, and the National Elk Refuge, in conjunction with local government where necessary.

Spawned by the large dam-building era of the 1950s and 1960s, the National Wild & Scenic Rivers system was created to protect free-flowing rivers with outstanding natural, cultural, and recreational values for the enjoyment of present and future generations. Today, less than one-quarter of one percent of all rivers in the United States are protected under the Wild & Scenic Rivers Act. The designation classifies streams as Wild, Scenic, or Recreational based on their proximity to existing development and infrastructure, and determines the Outstandingly Remarkable Values (ORV) for each designated segment. ORVs included fish, wildlife, recreation, geology, historical, and cultural values that are unique and special to the designated reach of water. The designation does not

prohibit development within the Wild & Scenic River corridor, but it does place restrictions on how the federal government supports water resource projects that may harm the free-flowing condition, water quality, or outstanding resource values.

Teton County and Town of Jackson planning and development rules, regulations, and procedures currently don't have a mechanism to promote and protect the intent of Wild & Scenic Rivers designations. This creates a gray area for landowners, local government, and federal government. In recent years, bank stabilization projects at the Snake River Sporting Club, Highway 89 Gros Ventre River bridge, and other areas are examples where well-defined guidance in the Comprehensive Plan would reduce bureaucracy and increase project review and efficiency.

Recreation Statistics

The rivers and streams of Teton County are recreational assets and economic engines for our community, generating tens of millions of dollars for businesses and our local economy. Not only do these rivers provide economic stimulus, they provide a high quality of life for visitors and locals alike. Here are some recent river-use statistics:

- Outside of the boundaries of Grand Teton National Park, the Snake River is visited by nearly 100,000 commercially-guided (float fishing, whitewater rafting, and scenic rafting) visitors annually.

- In 2019, over 9,100 commercial whitewater rafts ran Snake River Canyon (which is located in Lincoln County, but business operations originate in Teton County).
- On the Bridger-Teton National Forest, there were over 2,100 commercially guided fishing trips in 2019 (Teton & Lincoln Counties).
- On the Teton County-managed reach of water from the south boundary of Grand Teton National Park to South Park Landing, there were over 2,800 commercially guided fishing boats and 3,800 scenic raft trips in 2019.

There are no hard statistics on private recreation on these bodies of water. However, we do know that our community relishes the opportunity to recreate on the Wild & Scenic Snake River from the southern boundary of Yellowstone National Park all the way to Lincoln County. Uses include rafting, angling, paddle boarding, canoeing, kayaking, tubing, and more. Add in the bank fishing opportunities and other passive river use, and the numbers continue to climb.

Bureau of Land Management: Snake River Corridor Parcels

While much of Teton County is comprised of public lands managed by the U.S. Department of Interior and U.S. Department of Agriculture, there are approximately 1,000 acres of Bureau of Land Management (BLM) lands on approximately 20 individual parcels in the Snake River corridor. The BLM Pinedale Field Office is the managing office of these lands. In 1999, the BLM began developing a Snake River Resource Management Plan (RMP) to outline future objectives for these parcels. The 2004 Record of Decision (ROD) supports the RMP and outlines the BLM's intent for disposal of the parcels from BLM administration, while ensuring that the lands remain in public ownership and available for recreation, public access, open space, and wildlife habitat.

In 2004, the Snake River Fund convened a stakeholder group consisting of representation from the Bureau of Land Management Pinedale Field Office, Teton County, Wyoming Game & Fish Department/Commission, Bridger-Teton National Forest Jackson Ranger District, Jackson Hole Land Trust, and Snake River Fund. Guided by professional facilitation, the stakeholder group developed and adopted the Snake River Corridor Management/Ownership Transfer Plan in 2008. The Plan provides general information for all of the parcels, documented uses, recommended management objectives, recommended future conditions, and recommended ownership should the parcels transfer ownership. Nothing guarantees transfer of these BLM lands to another public ownership agency. While developing ownership transfer, a Memorandum of Understanding for Cooperative Management of the Snake River Corridor was established, agreed to, and signed by all stakeholders. In 2019, that MOU (with updated language) was renewed.

In 2020, the Teton County Board of County Commissioners contracted with Western Land Group, Inc., of Denver, Colorado to pursue ownership transfer of the BLM Parcels. Currently, Teton County is pursuing ownership of BLM Parcel 13 (Wilson Boat Ramp), Parcel 14 (east landing of Path 22 Pedestrian Bridge), and Parcel 26 (South Park Landing) through the Recreation and Public Purposes Act. As of autumn 2020, the only public agency that has expressed interest in owning these parcels is Teton County; all others have declined ownership. Senator Barrasso submitted a letter on July 21, 2020 to the Teton County Board of County Commissioners pledging his support for the ROD and legislative ownership transfer to Teton County. Western Land Group is currently working on Phase II contract for legislative transfer.

Acquiring Federal Lands in this day and age requires meticulous conversations, negotiations, and diligence on behalf of the public interest. Ultimately, Teton County Board of County Commissioners must endorse a proposed Term Sheet for the transfers. Those terms must uphold the values stated in the ROD and balance the needs of the public at large and adjacent landowner interests. Anything short will result in a failed effort.

Management: Who Regulates What?

Surface water quality (streams, lakes, and rivers) is regulated under the Clean Water Act, administered by the Environmental Protection Agency (EPA). However, Congress allows oversight of water quality protection by states. In Wyoming, the Water Quality Division of the Wyoming Department of Environmental Quality (WDEQ) administers surface water quality regulations based on federal guidance. Surface waters are regulated according to their specific management goals and expectations, described as Designated Uses. Designated Uses in Wyoming include: drinking water, fisheries, aquatic life other than fish, fish consumption, recreation, wildlife, agriculture, industry, and scenic value. Water bodies are categorized according to the Designated Uses they are expected to support. WDEQ also regulates discharge into surface waters, which requires permitting and monitoring and is subject to meeting the requirements of the receiving water's Designated Uses.

Drinking water in Wyoming is regulated by the EPA. Wyoming is a true exception in this regard. In almost all other states, the state has gained primacy over drinking water regulations; Wyoming has not. The EPA Denver, Region 8 office is our point of contact.

Wastewater systems with discharges under 2,000 gallons per day are overseen by Teton County. Jurisdiction and permitting for larger systems are overseen by the State of Wyoming.

Wetland dredging and filling is regulated at a national level by the Army Corps of Engineers (ACE), per Section 404 of the Clean Water Act. Permitting through ACE is required for the alteration of wetlands. Teton County also regulates wetland alteration according to its Land Development Regulations. Teton County requires that wetland loss or alteration is mitigated on a 2 to 1 basis (i.e. two acres of wetlands must be created for every one lost).

Surface and ground water rights are regulated by the Wyoming State Engineers Office (SEO). Water right permits can be applied for at the SEO, but are subject to pre-existing water rights on that water body by priority date and in a downstream direction. Interstate compacts provide a framework by which water rights are maintained across state boundaries.

Regulatory floodways are overseen by the Federal Emergency Management Agency (FEMA). Regulatory floodways are those waterbodies that must be reserved in order to discharge the base flood (100-year flood) without cumulatively increasing surface water elevations above a certain height (its base flood elevation). Base flood elevation (BFE) for a watercourse is often determined according to measurement and calculation of the FEMA 100-year flood, which is the largest modeled discharge of a watercourse expected to occur on a 100-year recurrence interval. BFE's are used to delineate the area where flood insurance is required to be purchased, and how new development proceeds.

Fisheries are managed and regulated by the Wyoming Game and Fish Department (WGFD). Locally, WGFD maintains a strong native fish initiative with little human augmentation of fish populations. Their mandate is to provide recreational opportunities and preserve fisheries resources. WGFD receives most of its funding for fisheries work from license fees, and remain accountable to this user group. Yellowstone National Park has stronger management of fisheries within its boundaries compared to Grand Teton National Park, where state control was given as a part of negotiations to establish the national park.

Snake River flows are regulated at Jackson Lake Dam. This dam is managed and operated by the Bureau of Reclamation in accordance with water right holders, natural resource interests, and flood risk. Although Jackson Lake is a natural water body that is over 400 feet deep, the top 30 feet is controlled by the dam, with the primary purpose of managing flows for irrigation in tandem with the other large dams along the Snake River.

Water Quality

Drinking Water

Drinking water quality and quantity issues are often isolated to specific areas in Teton County. Some residential developments situated above limestone (Game Creek) or impermeable bedrock (Hoback Junction) face challenges accessing viable quantities of good water. In addition to quantity issues, bacteria and nitrate are among the most common human health concerns in drinking water, and at times are due to wastewater contamination. Taste and odor problems from sulfur are common for well owners in southern Teton County and Buffalo Valley. Arsenic and fluoride can be found sporadically throughout the valley at levels not suitable for human consumption. Teton Conservation District has undertaken a mapping project to depict chemical concentration gradients in drinking water throughout the county, which is planned to be completed in 2021.

Unlike many other drinking water aquifers, the aquifer in Jackson Hole is not confined by impermeable strata. Laterally extensive glacial silt layers can vertically separate some portions of the aquifer, but for the most part, the aquifer is in communication with shallow groundwater and is vulnerable to contamination from human activities. To a great extent, the rapid movement of water through shallow portions of the aquifer serves to dilute pollutants, preventing contamination of lower portions. However, high flow rates are not universal, and almost nothing is known about flow rates at greater depths.

Where used for potable water, groundwater in Teton County must adhere to federal drinking water standards (<https://www.epa.gov/sites/production/files/2014-12/documents/wy-chapter1.pdf>). Groundwater may be degraded below those standards within a property (i.e. proximal to the discharge of a residential or municipal sewer facility), as long as the standards are met at adjacent points of use (i.e. drinking water wells). When a violation does occur, however, it is often difficult to conclusively determine the source of pollutants.

Surface Water

Surface water quality in Wyoming is administered separately from groundwater, primarily by means of stream classification (<http://deq.wyoming.gov/wqd/surface-water-quality-standards-2/>). Many streams in the valley are Class 1, meaning they cannot receive direct discharges. However, degrading discharges can be made into the groundwater directly adjacent to such streams. Several studies of Fish Creek (a Class 1 stream) have demonstrated that a significant amount, and at times the majority, of its flow is derived from the groundwater. The Clean Water Act, Section 305(b) requires that states prepare and submit a biennial report to the EPA. This report outlines the status of water bodies and their Designated Uses and includes explanations of water quality issues and the process in place to mitigate these issues. Section 303(d) of the Clean Water Act further requires states to list water bodies that do not meet their Designated Uses. This list is often referred to as the “impaired stream list.” Wyoming Department of Environmental Quality (WDEQ) combines these two reporting requirements and publishes a biennial Wyoming Integrated 305 (b) and 303 (d) Report (<http://deq.wyoming.gov/wqd/water-quality-assessment/resources/reports/>). Streams are also classified according to recreational use, depending on whether recreational use is expected to result in immersion or ingestion (primary contact) or not (secondary contact).

The assessment process by which rivers, streams, and lakes are determined to not meet their Designated Uses is not trivial. There are numeric criteria for pollutants that must be met (e.g., nitrate must be below 10 mg/L). Stream health impairment and Designated Use determinations can also be made using aquatic macroinvertebrate or fish population health, as well as physical conditions such as riparian vegetation and stream bank stability. From the north boundary of the Town of Jackson to its confluence with the Snake River, Flat Creek is identified on the impaired stream list as ‘threatened’ due to municipal discharges into

the creek. Large-scale mitigation by the Town of Jackson with support from Teton Conservation District and WDEQ has included adding sediment collection bays within the stormwater system, street sweeping, and the Karns Meadow Stormwater Treatment Wetland. The portion of Flat Creek within and downstream of the South Park Wildlife and Habitat Management Area and all of Fish Creek have been added to the state's impaired stream list in 2020 for exceeding *E. coli* criteria.



Karns Meadow Stormwater Treatment Wetland.

E. coli bacteria levels in primary streams may not exceed a 60-day average of 126 colony forming units (cfu) per 100 milliliters. Fish Creek and a portion of Flat Creek exceed these criteria. The limit for secondary streams is 630 cfu. *E. coli* is not necessarily harmful in and of itself but is used as an indicator that other harmful pathogens might be present, such as Giardia, Shigella, Hystolytica, Campylobacter, and *E. coli* strain 0157:H7. *E. coli* in streams can originate from the digestive tract of humans or other warm-blooded animals. Some of these, including cattle, can be hosts for some human pathogens. Many others do not appear to be significant sources, especially those that spend considerable time in the water and thus contribute the majority of *E. coli* in streams, such as beavers, muskrats, and waterfowl.

Wastewater

Wastewater represents one, if not the largest, pollution source in Teton County. Residents and tourists produce wastewater directly proportional to the total population, and growing residential and tourist populations corresponds to an increase in wastewater generation.

The Town of Jackson owns and operates the largest municipal wastewater treatment plant in Teton County. This plant uses a series of lagoons to break down waste with chemical and biological agents, prior to UV disinfection and surface discharge to the Snake River. The Jackson Wastewater Treatment Plant is permitted to treat and discharge up to 5 million gallons per day, and currently reaches 3.5 million gallons per day during peak season in mid-summer. The Town of Jackson Wastewater Treatment Plant also services numerous "at-large" areas outside of the town's municipal boundary. Special districts, such as the Wilson Sewer District, own and operate sewer infrastructure which discharges to the Jackson Sewer lines, prior to treatment at the Jackson Plant. These special districts operate throughout the county and oversee themselves, but pay for treatment services occurring at the Jackson Plant. In addition, the plant receives all the highly concentrated sewage pumped from domestic septic tanks in the valley.

For proper functioning, all septic tanks should be periodically pumped and inspected. In many instances, however, this is not done, causing the system to fail. Failure is usually obvious and is then remedied. Where failure is not obvious or where high ground water prevents proper function of the leach field, degradation of groundwater quality can continue unnoticed for years.

Two other sizable tertiary treatment and injection treatment facilities are operated in Jackson Hole: the Teton Village Water and Sewer District (permitted for 800,000 gal./day) and Aspens/Pines Water and

Sewer District (permitted for 400,000 gal./day) These facilities have excellent treatment capacity, and are designed to bring effluent to drinking water standards prior to groundwater injection. Teton Village injects effluent to depths between 6 and 50 feet, while Aspen/Pines injects to depths between 20 and 100 feet. Current wastewater treatment and discharge practices occurring at these locations are the result of political and public pressure.

In 2018, a study was completed that consolidated all available sewer line infrastructure data found in Teton County (www.tetonconservation.org/septic-sewer-map). The final product is intended to assist in planning and development that incorporates the best wastewater treatment options possible.

Nutrients: Nitrates and Phosphates

Other non-biological parameters such as nitrates and phosphates can affect water quality and aquatic ecosystems. At high levels, nitrate is a concern for pregnant woman and young children because it can disrupt the body’s ability to transport oxygen within blood; new evidence also suggests that nitrate can be carcinogenic. But even at levels below drinking water standards they can promote excessive aquatic plant growth which in turn can have serious impacts on aquatic insects and fish. Such excessive algae growth has been observed in Fish Creek over many years, and nutrient input from numerous sources is thought to be the cause. Toxic algae blooms and fish kills are perhaps the worst examples of the degrading effects of nutrients, and so far, these have not been a significant issue in Teton County. The U.S. Geological Survey completed a study which attempts to quantify the relative magnitude of sources such as domestic septic systems, waste treatment plants, fertilizer run-off from lawns and golf courses, agricultural run-off, etc. (<https://pubs.usgs.gov/sir/2016/5160/sir20165160.pdf>). There is widespread acknowledgement that further assessment of algae and nutrients in the Snake River should be pursued.

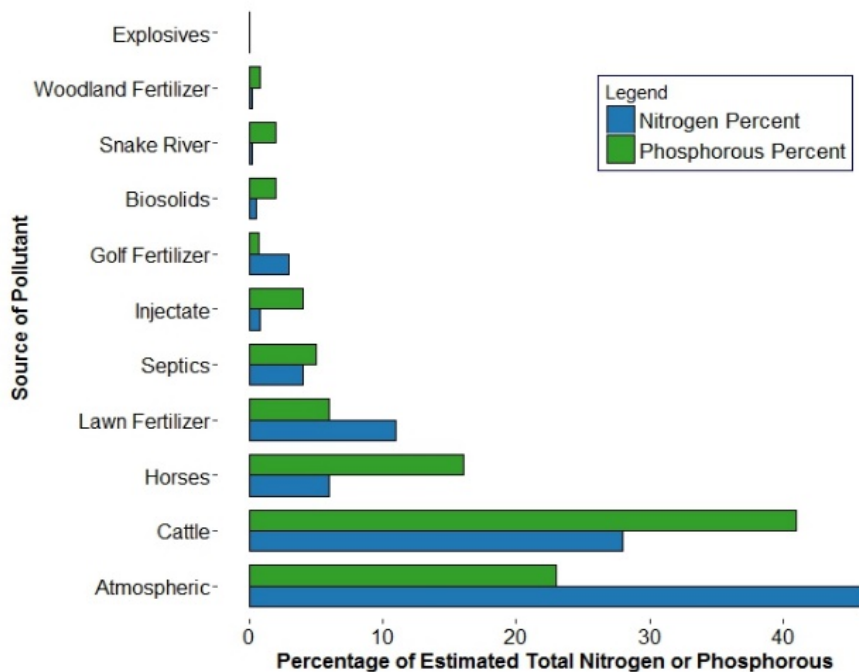


Figure 1. Estimated nutrient loading in the Fish Creek Watershed, per the 2016 USGS report. Estimates do not include potential uptake, fate or transport.

Current Issues and Topics

Water quality issues are not new to Teton County. Refer to Appendix A to see a timeline of historical and current water quality activities. Some of the historical impacts include:

1. Agricultural and irrigation related disturbances
2. Hydrocarbon discharges from gas station leaks
3. Residential and municipal wastewater discharges to surface and ground waters
4. Stormwater runoff from urbanized areas

Although water quality is generally good in Jackson Hole and surrounding areas, there are specific areas with serious drinking water supply and stream health issues. Below is a brief summary of these current issues and topics.

Stormwater management in the Town of Jackson was prompted by the Wyoming Department of Environmental Quality's 'impaired' listing of Flat Creek in 1996. Since then, improvements have been made, including:

- Street sweeping and inline stormwater treatment (2000 Stormwater Master Plan)
- Karns Meadow Stormwater Wetland was created in 2011
- Flat Creek Watershed Planning (www.tetonconservation.org/flat-creek-watershed-management-plan) was completed in 2006, and updated in 2019
- The Town of Jackson is formulating a stormwater program
- Biological and sediment monitoring is being conducted

Fecal contamination in surface waters has recently been elevated as a priority because Wyoming Department of Environmental Quality monitoring in 2017 showed exceedances of primary contact recreation standards for *E. coli*, a fecal indicator bacterium. University of Wyoming plans to study the sources of this contamination.

Nutrient reduction projects have been implemented through landscaping, wastewater, and livestock programs after data collected on Fish Creek documented prolific algae and plant growth. More recently, exceedances of nitrate limits in public and private drinking water sources has become a strong warning that some wastewater management practices lack effectiveness and endanger human health. In the Hoback area, local stakeholders are again attempting special district formation to address drinking water contamination and the loss of drinking water sources. Finding resolutions for these issues has been challenging, but the community is beginning to acknowledge that new actions need to be taken.

Residential septic systems have steadily improved since the 1970s due to permitting requirements, but questions still remain about the level of treatment they provide, given the geological (coarse soils) and climactic setting (cold soil, poor microbial activity). Teton Conservation District is now establishing a funding partnership with Teton County and Protect Our Water JH to monitor the effectiveness of septic system leach fields.



The Trout Friendly Lawns program offers easy guidelines to the community to reduce nutrient and chemical inputs from landscaping.

Regional Wastewater Master Planning is being embarked upon, funded by Teton County, Protect Our Water JH, and Teton Conservation District. The Town of Jackson will also be engaged. This is a countywide study that will evaluate waste water treatment alternatives. This plan will integrate leach field monitoring data, the Town of Jackson’s wastewater rate and capacity study, the septic and sewer mapping project, and an ongoing Teton Conservation District drinking water mapping project.

South Park Wetland Enhancement is being planned by Ducks Unlimited, and will further treat Town of Jackson wastewater effluent and provide wildlife and wetland habitat.

Jackson Hole Airport is currently completing drinking water testing and mitigation for poly- and per-fluoroalkyls substances (PFAS). This group of emerging contaminants are unregulated, but recommended lifetime ingestion concentrations are extremely low (70 parts per trillion). In addition to their origination in waterproofing and non-stick product development, they are also found in fire-fighting foam designed for petroleum fires. This foam has been used in trainings at the airport over time, prompting the Jackson Hole Airport to voluntary test for the substances both on-site and in the subdivision west of the runway. Well testing at roughly 50 wells demonstrated the presence of these chemicals, with only a few above 70 parts per trillion, but only a handful showing non-detections.

Conclusion

The Town and County Growth Management Plan amendment process has recognized that we are failing to meet our community vision for water quality stewardship. This joint Town and County exercise warns that future actions—such as stormwater and wastewater planning and the establishment of best practices—need to take place to avoid increasing water quality degradation.



Teton Conservation District and Teton County Weed and Pest District staff conducting annual Flat Creek sampling in September 2020.



Teton Conservation District
Est. 1946

Appendix A | Water Quality in Teton County: Using the past to guide the future

