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Snake River Headwaters Comprehensive River Management Plan

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EXECUTIVE SUMMARY

Snake River Headwaters
Draft Comprehensive River Management Plan
Bridger-Teton National Forest

On March 30, 2009, passage of the Craig Thomas Snake Headwaters Legacy Act added all or segments of 13 rivers and streams in the Snake River Headwaters to the National Wild and Scenic Rivers System. The purpose of this designation is to protect the free-flowing condition, water quality, and 'outstandingly remarkable' ecologic, geologic, fisheries, scenic, recreation, and cultural values of the Headwaters for the benefit and enjoyment of present and future generations.

The Snake River Headwaters is unique in that it encompasses a connected watershed, rather than just one river or isolated rivers across a region. It includes 13 rivers and 25 separate river segments totaling 414 miles total (adjusted by more accurate mapping), with 315 miles of that within the Bridger-Teton National Forest. These rivers flow through an iconic landscape of stunning canyons, open meadows, broad vistas, striking mountains, glacial lakes, and sage flats. These landscapes provide spectacular undeveloped settings that create a distinctive sense of place and offer world-class recreational opportunities within the largest intact ecosystem in the contiguous United States.

These rivers flow across U.S. Forest Service, National Park Service and U.S. Fish and Wildlife Service lands, as well as a small portion of state and private lands. Due to the sheer size of this wild and scenic river designation, the Bridger-Teton National Forest and the National Parks have developed separate, but concurrent management plans for river segments within or along their respective administrative boundaries.

This draft Comprehensive River Management Plan (CRMP) establishes overall management direction for designated wild and scenic river segments within the Bridger-Teton National Forest. The plan establishes river corridor boundaries and incorporates river-specific goals, objectives, desired future conditions, standards and guidelines, user capacities, monitoring, and other management practices necessary to achieve desired resource conditions.

This plan will be finalized pending a decision notice being signed by the Forest Supervisor on the Wild and Scenic Snake River Headwaters Forest Plan Amendment Environmental Assessment that was released concurrently with this document. Direction from that decision will be incorporated into Chapter 4 – Management Direction.

A new Management Emphasis, closely coordinated with the National Park Service's CRMP goals, guides federal actions in these corridors, as follows: All designated river segments will

be managed to protect and enhance their outstandingly remarkable values, free-flowing condition, and water quality for future generations. More specifically, management will:

1. Promote the rivers' natural hydrological processes, channel form and function, and ability to shape the landscape, reduce impediments to free flow, ensure sufficient flows to protect and enhance outstandingly remarkable values, and ensure the maintenance of water quality.

2. Protect and enhance the natural biodiversity, complexity, and resiliency of riparian areas, wetlands, floodplains and adjacent uplands.

3. Protect and enhance cultural resources as important links to the human history of the river corridors, including historical and archeological sites, cultural landscapes, and ethnographic resources.

4. Provide a diversity of settings and opportunities for visitors of varying abilities to experience, learn about, and have a direct connection with the rivers and their special values. Such opportunities must be consistent with the values that caused the rivers to be designated.

5. Allow for legal and permitted multiple uses and associated developments, consistent with each river segment's classification while supporting the protection and enhancement of river values.

Key Components of this Document

Key components of this document as outlined below are based on guidance developed by the Interagency Wild and Scenic Rivers Coordinating Council (2012) in a paper called 'Newly Designated Wild and Scenic River: Interim Management and Steps to Develop a Comprehensive River Management Plan'. This paper and more information about wild and scenic river management can be found on the council's website at www.rivers.gov.

Outstandingly Remarkable Values – Foundation for Wild and Scenic River Planning

This comprehensive river management plan defines the Outstandingly Remarkable Values (ORVs) for the Snake River Headwaters system as well as within each designated river segment on the Bridger-Teton National Forest, so these values can be protected and enhanced according to the mandate of the Wild and Scenic Rivers Act. The free-flowing condition and water quality of the Snake River Headwaters support the integrity of these Outstandingly Remarkable Values, and are also key components of the planning effort. The Bridger-Teton National Forest, in collaboration with the National Park Service, National Elk Refuge and Wyoming Game and Fish Department, has developed a set of ORV statements for this plan,

which are presented in Chapter 2. These ORV statements reflect careful attention to input that was solicited during public scoping and review of draft ORV reports.

Chapter 2 contains detailed information regarding existing resources that provides a baseline to evaluate future actions.

Goals & Desired Conditions for Protecting River Values

The Forest Plan Amendment Environmental Assessment released concurrently with this document describes goals and objectives for designated rivers, a new Management Emphasis and overall Standards and Guidelines, plus subcategories of Desired Future Conditions with additional Standards that future actions in that category must meet. Once a decision is finalized on the Forest Plan amendment, the direction will be incorporated in the final CRMP. The proposed action is reflected in Chapter 4 – Management Direction.

Development of Lands and Facilities

The Forest Plan amendment created Desired Future Conditions and Standards and Guidelines that are reflected in the CRMP and against which any proposed development of lands and facilities will be measured. The CRMP is entirely programmatic, setting the roadmap for future projects and management. Chapter 4 presents the Desired Future Conditions and Standards and Guidelines. Chapter 5 discusses concerns, opportunities and future actions that may result in site-specific project proposals that will be analyzed through the National Environmental Policy Act.

Chapter 3 contains details of existing land uses and facilities that provide additional baseline information to evaluate future actions.

Visitor capacity

Agencies are required to address visitor capacities in the CRMP to protect river values; this Visitor Use Assessment can be found in the second half of Chapter 3. These capacity estimates are not proposals for restricting amounts of visitor use; rather, they provide a sense of the kinds and maximum amounts of use that are most likely sustainable without creating undesirable impacts.

Monitoring Strategy

The Wild and Scenic Rivers Act requires that the outstandingly remarkable values of the Snake River Headwaters be protected and enhanced. It is, therefore, important to periodically "check-in" on the status of river value conditions to be sure they are being protected and enhanced. A list of indicators and a survey schedule is included in Chapter 4 to show how the Forest will monitor for river corridor impacts from various sources, including recreation. The indicators include thresholds that will provide managers with an

early indication for when changes in management may be needed in order to protect river values as described in the Forest Plan as amended.

Evaluation of Water Resource Projects

Section 7 of the Wild and Scenic Rivers Act directs federal agencies to evaluate federally-assisted or -permitted water resource projects to assure that conditions of free-flow, water quality, and outstandingly remarkable values are not diminished. Please refer to Chapter 7 for a description of the Section 7 process.

Boundary Delineation

The Forest Plan amendment establishes river corridor boundaries to protect the free-flowing condition, water quality, and outstandingly remarkable values for which the river segments were designated. The corridor width cannot exceed a total average of 320 acres/mile, or an average of ¼ mile from the banks on both sides of the river. Boundaries can be wider or narrower in places as long as no more than 320 acres per mile are included in the overall designation. River corridors are measured from the ordinary high water mark. The corridor boundaries are shown in Chapter 4.

In-stream Flows

The Omnibus Public Lands Management Act (P.L. 111-11) which designated waterways of the Snake River Headwaters as wild and scenic rivers, sets the priority date (March 19, 2009) for the quantification of water rights. Valid existing water rights within the Snake River Headwaters; all interstate water compacts; water rights in Idaho and Wyoming; other rights held by the United States; and existing private water rights in existence as of March 19, 2009 are not affected by this Act. A federal reserved water right will be established to protect and enhance the free-flowing condition and outstandingly remarkable values that allowed these rivers to be designated. Chapter 2 describes the free-flowing condition, hydrology and river values that are dependent on in-stream flows. Chapter 3 includes a summary of existing valid water rights. Flow data continues to be collected at this time, to provide a basis for a future filing of water rights under Wyoming state law, as required in the Act.

Collaboration

Other governmental agencies hold various regulatory authorities that assist in protecting river values, and all stakeholders, whether public or private, will be needed, working in collaboration for the best river outcomes. These are brought forward in Chapter 6.

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Introduction 1

Chapter 1: INTRODUCTION

On March 30, 2009, passage of the Craig Thomas Snake Headwaters Legacy Act added all or segments of 13 rivers and streams in the Snake River Headwaters to the National Wild and Scenic Rivers System. The purpose of this designation is to protect the free-flowing condition, water quality, and 'outstandingly remarkable' values of the Headwaters for the benefit and enjoyment of present and future generations.

The Snake River Headwaters is unique in that it encompasses a connected watershed, rather than just one river or isolated rivers across a region. It includes 13 rivers and 25 separate river segments totaling 414 miles, with 315 miles within the Bridger-Teton National Forest. These rivers flow through an iconic landscape of stunning canyons, open meadows, broad vistas, striking mountains, glacial lakes, and sage flats. These landscapes provide spectacular undeveloped settings that create a distinctive sense of place and offer world-class recreational opportunities within the largest intact ecosystem in the contiguous United States.

These rivers flow across lands administered by the U.S. Forest Service (FS), National Park Service (NPS) and U.S. Fish and Wildlife Service (FWS), as well as a small portion of state and private lands. Due to the sheer size of this wild and scenic river designation, the Bridger-Teton National Forest and the National Parks/FWS have developed separate, but concurrent management plans for river segments within or along their respective administrative boundaries.

A Comprehensive River Management Plan (CRMP) is required by Section 3(b)(1) of the Wild and Scenic Rivers Act (WSRA). *The Forest Plan Amendment, analyzed through the Snake River Headwaters Wild and Scenic Environmental Assessment (EA) (see separate document released concurrently with this CRMP), forms the decision framework for Wild and Scenic Rivers management. This CRMP tiers to that amendment. DRAFT direction given in the proposed amendment is duplicated in Chapter 4 of the CRMP. When a decision has been finalized regarding the elements of the Wild and Scenic Rivers Forest Plan Amendment, they will be incorporated in the CRMP to provide the final direction for planning and management of the designated rivers. Any site-specific projects or potential visitor management changes discussed as 'Opportunities' or 'Strategies for Future Changed Management' in the CRMP will be subject to further analysis and public involvement requirements if and when they are proposed.*

Questions and concerns raised by stakeholders are answered throughout this document. Some of those include the following:

1) How are the jurisdictions of other agencies incorporated into river management and protection? (see Chapters 6 & 7)

2) How are private landowners included or impacted? (see Chapters 4, 6 & 7)

3) What management direction will ensure that the identified values will be protected and enhanced into the future? (see Chapters 4 & 7)

4) What are the baseline conditions and activities within the Snake River Headwaters? (see Chapters 2 & 3)

5) What is the process for the Wild and Scenic Rivers Act Section 7 analysis for projects within the bed and banks of designated river segments or adjacent to those segments? (see Chapter 7)

6) What is the Forest Service doing to incorporate the growing body of information about climate change and climate adaptation into river management? (see Chapter 5)

7) How do organizations and individuals find ways to be a part of implementing the CRMP? (see Chapters 5, 6 & 7)

Wild and Scenic Rivers Defined

In 1968, Congress passed the *National Wild and Scenic Rivers Act*, establishing a nationwide system of outstanding free-flowing rivers. The primary purpose of the Act is to complement national river development with river protection and conservation. The Act specifically protects rivers from future hydroelectric power development and requires administering agencies to protect and enhance those values for which the river was designated. The current Forest Plan lists rivers on the Bridger-Teton National Forest that are considered 'eligible' for designation and offers some protections to retain their eligibility until such time that Congress chooses to add specific segments to the National System.

As defined by the Act, a National Wild and Scenic River must be maintained in a free-flowing condition and must have its water quality protected. In addition, the river must have at least one 'outstandingly remarkable' scenic, recreational, geologic, fish, wildlife, historic, cultural, or other similar value. Outstandingly remarkable values are those values that are river related and owe their existence or location to the river, and that are rare, unique, or exemplary in character.

The *Wild and Scenic Rivers Act* requires that the agency charged with administration of each designated river establish a certified river corridor boundary that encompasses the identified river-related values, while not exceeding an average of 320 acres of land per river mile. Please refer to Chapter 4 for a complete description of proposed corridor boundaries.

Additionally, the Act requires designated rivers be classified as wild, scenic or recreational, depending on the level of development and access present along the river at the time of designation. Wild river segments are the most natural appearing and the least accessible. Little or no developments, such as roads or campgrounds, are present. Scenic river segments have shorelines that are largely undeveloped with few access points. More types of land uses and developments are compatible with management goals on a scenic river than on a wild river. On river segments with a recreational classification, the shoreline is more developed and roads may parallel the river. There may be some development along its banks, and some existing impoundments or diversions. With the designation of the Snake River Headwaters, Congress established the classification level for each segment. The 'protect and enhance' mandate of the Act applies equally to all designated rivers regardless of development level classification.

Craig Thomas Snake River Headwaters Legacy Act

The *Craig Thomas Snake Headwaters Legacy Act* was passed by Congress in 2009 as part of a larger 'omnibus' bill (Public Law 111-11). It established as Wild, Scenic, or Recreational 18 river segments across three National Park Service units, the National Elk Refuge, and the Bridger-Teton National Forest. A summary of designated river segments within the BTNF follows, with mileage refined from the legislation by more accurate Geographic Information System (GIS) review.

Bailey Creek. The 6.9-mile segment of Bailey Creek from the divide with the Little Greys River north to its confluence with the Snake River: **wild river**.

Blackrock Creek. The 21.7-mile segment from source to the confluence with Buffalo Fork River: **scenic river**.

Buffalo Fork of the Snake River (2 segments). The 70.3-mile segment consisting of the North Fork, the Soda Fork, and the South Fork, upstream from Turpin Meadows: **wild river**. The 14.1-mile segment from Turpin Meadows to the upstream boundary of Grand Teton National Park: **scenic river**.

Crystal Creek (2 segments). The 14.2-mile segment from the source to the Gros Ventre Wilderness boundary: **wild river**. The 5-mile segment from the Gros Ventre Wilderness boundary to the confluence with the Gros Ventre River: **scenic river**.

Granite Creek (2 segments). The 12.5-mile segment from its source to the Wilderness boundary: **wild river**. The 9.7-mile segment from Wilderness Boundary to the point one mile upstream of its confluence with the Hoback: **scenic river**.

Gros Ventre River (2 segments). The 16.5-mile segment from its source to Darwin Ranch: **wild river**. The 40.1-mile segment from Darwin Ranch to the upstream boundary of Grand Teton National Park, *excluding Lower Slide Lake*: **scenic river**.

Hoback River. The segment from its confluence with the Snake River to 10.7 miles upstream: **recreational river**.

Pacific Creek (2 segments). The 22.5-mile segment from its source to the Teton Wilderness boundary: **wild river**. The 6.8-mile segment from the Wilderness boundary to the National Park Service boundary: **scenic river**.

Shoal Creek. The 8.5-mile segment from its source to the point 8.5 miles downstream of the source: **wild river**.

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Snake River (3 segments). The 6.9-mile segment from its source to the Yellowstone National Park (YNP) boundary and a 2.7 mile segment below the YNP boundary along the east bank only: **wild river**. The 23.1-mile segment from the mouth of the Hoback River to the point one mile upstream from the Highway 89 Bridge at Alpine Junction: **recreational river**.

Willow Creek. The 16.2-mile segment from the point 16.2 miles upstream from its confluence with the Hoback River to its confluence with the Hoback River: **wild river**.

Wolf Creek. The 7-mile segment from its source to its confluence with the Snake River: **wild river**.

Table 1.1 below displays total miles by classification; Figure 1.1 on the following page is a general map of the river segments.

Table 1.1: Summary of Designated River Miles by Classification, BTNF

Miles designated	Classification
33.8	Recreational
97.1	Scenic
184.0	Wild
314.9	Total within the BTNF

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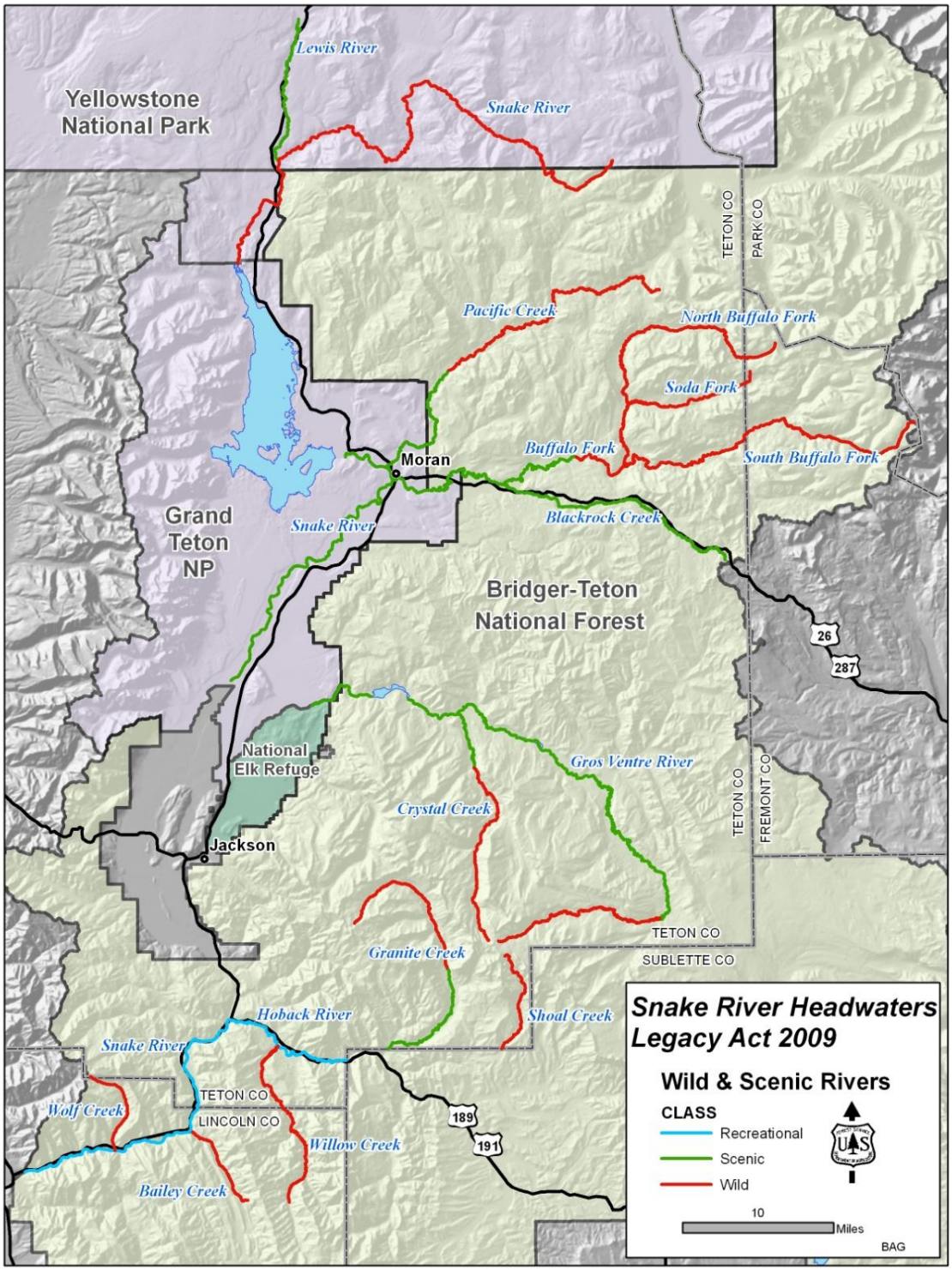
Figure 1.1: Map of Wild, Scenic and Recreation Segments of the Snake River Headwaters



Scope of the Snake River Headwaters Comprehensive River Management Plan

The CRMP sets direction for protecting three primary aspects of the river: (1) free flow, (2) water quality, and (3) Outstandingly Remarkable Values. The CRMP includes descriptions of each river segment and its Outstandingly Remarkable Values, goals and desired conditions for each river segment, and management actions, including standards for management, information regarding visitor use, indicators for monitoring visitor and resource capacity, and suggestions for projects that will help protect the rivers or enhance the identified river values.

The CRMP does not revisit broad-scale decisions such as travel planning or other decisions already made. It seeks to support existing direction where that provides for maintenance of river values, not to replace current efforts directed toward public land conservation and for which public involvement through the National Environmental Policy Act (NEPA) has been completed. For example, the current motor vehicle use maps (MVUM) will not be revisited through this document. If existing conditions can be improved through revision of the MVUM, specific issues would be addressed as that map is revised and updated.

This CRMP implies no jurisdiction over private land or private rights in river corridors, outside the bed and banks of designated rivers. Certainly the Bridger-Teton National Forest encourages compatible uses on private land and would welcome voluntary conservation easements. The CRMP does not include authority to manage or acquire private land except from willing sellers, and does not affect any existing water rights.

Wherever applicable, this CRMP incorporates existing policy and regulations, and operation plans for specific resources and special use authorizations. Any permit provisions not being met adequately are addressed through permit administration.

For rivers within Bridger-Teton National Forest classified wilderness, the wilderness action plans completed with public involvement will continue to be implemented. The 1997, 1998 and 2000 Snake River Recreation Plans, also completed with public and outfitter involvement, will continue to be implemented.

Conditions such as water quality, vegetation, bank stability, and development levels at the time of designation (2009) provide the baseline for the ‘protect and enhance’ directive in the Wild and Scenic Rivers Act (WSRA) and are described in this Comprehensive River Management Plan (CRMP).

This document contains the following elements involved in Wild and Scenic Rivers management as discussed below:

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Chapter 2: Regional River Setting & River Values

The foundation for Wild and Scenic Rivers planning lies in providing specific details regarding each Outstandingly Remarkable Values (ORV) category, clarifying exactly what managers need to focus their attention on when designing projects in order to avoid degrading any of the listed values, even if attempting to enhance others. The free-flowing condition and water quality of the Snake River Headwaters support the integrity of these Outstandingly Remarkable Values, and are key components of the planning effort, considered in tandem with the ORVs. Taken together, the free-flowing condition, water quality and ORVs comprise the river values described in this chapter.

The Comprehensive River Management Plan defines the Outstandingly Remarkable Values, first in overall statements for the Snake River Headwaters, and then within each designated river segment on the Bridger-Teton National Forest, so these values can be protected and enhanced according to the mandate of the Wild and Scenic Rivers Act. The Bridger-Teton National Forest, in collaboration with the National Park Service, U.S. Fish and Wildlife Service and state agencies including Wyoming Game and Fish Department, has developed a set of ORV statements for this CRMP, which are presented here. These ORV statements reflect careful attention to input that was solicited during public scoping and review of draft ORV reports.

In-stream Flows

The Omnibus Public Lands Management Act, which designated waterways of the Snake River Headwaters as a wild and scenic river, sets the priority date (March 19, 2009) for the quantification of water rights. Valid, existing water rights within the Snake River Headwaters; all interstate water compacts in existence as of March 19, 2009; water rights in Idaho and Wyoming; other rights held by the United States; and existing private water rights are not affected by this Act. A federal reserved water right will be established, following finalization of the CRMP, to protect and enhance the free-flowing condition and Outstandingly Remarkable Values (ORVs) that allowed these rivers to be designated. This section describes the hydrology, free-flowing condition, water quality and ORVs that are dependent on in-stream flows. Flow quantification data continues to be collected at this time that will provide a basis for a future filing of water rights under Wyoming state law, as required in the Act.

Chapter 3: Land Uses and Facilities

This section provides baseline information from the time of designation regarding activities, structures, facilities, and conditions in all of the designated segments. These segments qualified for designation with all of these developments and activities in place, and river values protection will now be considered before approval of any further development or activity.

Visitor Use Assessment

Forest visitation and recreation are a key kind of land use, and often include specific facilities or structures. Agencies are required to address visitor capacities in the CRMP to protect river values; this Visitor Use Assessment can be found in the second half of Chapter 3. The visitor capacities presented in this document are not proposals for restricting amounts of use. These capacity discussions offer some guidance to future managers in evaluating any potential need for changed management strategies to address public or internal concerns.

Visitor use must be managed within capacities that protect all of the Outstandingly Remarkable Values (ORVs). A monitoring plan is described in Chapter 4 that would more directly measure river corridor impacts from various kinds of land uses, including recreation, and would provide managers with key thresholds for when changed management must be considered in order to protect the Outstandingly Remarkable Values (ORVs) and manage use within capacity.

Chapter 4: Management Direction

The CRMP incorporates the Forest Plan Amendment in this chapter. This includes a new Forest Plan Goal and Objective for designated rivers, a new Management Emphasis and overall Standards and Guidelines, plus subcategories of Desired Future Conditions with additional Standards which future actions in that category must meet.

The Wild and Scenic Rivers Act requires that the river values of the Snake River Headwaters be protected and enhanced. It is, therefore, important to periodically "check-in" on the status of conditions to be sure that established management direction is effectively protecting and enhancing the river values identified. Accordingly, the CRMP also includes a monitoring program, established by Forest Plan amendment, using selected Indicators to determine trends regarding impacts. These are coupled with a defined set of 'early warning' thresholds for those Indicators. The proposed Indicators and thresholds are included here.

A section of this chapter provides strategies for changed management direction in the case where monitoring shows any downward trend in conditions or functions across specific areas of the designation. Specific guidance for managers regarding common issues, from evaluating Large Woody Debris (LWD) in river channels, to highway staging and storage areas and climate change strategies are also included here. These discussions provide examples of how the CRMP will remain a living document, adding useful information for future managers that will not require Forest Plan amendment.

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Chapter 5: Opportunities, Concerns and Actions

A summary of potential designation-wide or site-specific projects that would likely move existing conditions towards desired conditions in places where concerns have been noted, or that offer 'enhancements" of the various river values, are described in this chapter. Many of these projects would require NEPA at the point in time when moving forward on them becomes feasible.

Chapter 6: Partnerships and Stewardship

Only by working together can the full intent of the Wild and Scenic Rivers Act be accomplished. The responsibilities of relevant stakeholders, and the WSRA's direction regarding Easement Acquisition on private property, are described in Chapter 6.
The CRMP has been developed in consideration of the goals of Federal, state and local agencies with jurisdiction over the resources of the designated rivers; these authorities are outlined in this section. Tribes also continue to have traditional cultural-use ties and off-reservation interests in lands and waters of the area. Additionally, private landowners have an ongoing role to play.

Chapter 7: Evaluation of Water Resource Projects

Section 7 of the Wild and Scenic Rivers Act directs federal agencies to evaluate federally-assisted or -permitted water resource projects to ensure that existing conditions of designated river values (i.e., free-flowing condition, water quality, and Outstandingly Remarkable Values (ORVs)) are not diminished. The final portion of the plan clearly describes how to conduct the required Section 7 reviews of projects in the bed or banks of designated segments, or if affecting those segments from upstream, downstream or on a tributary.

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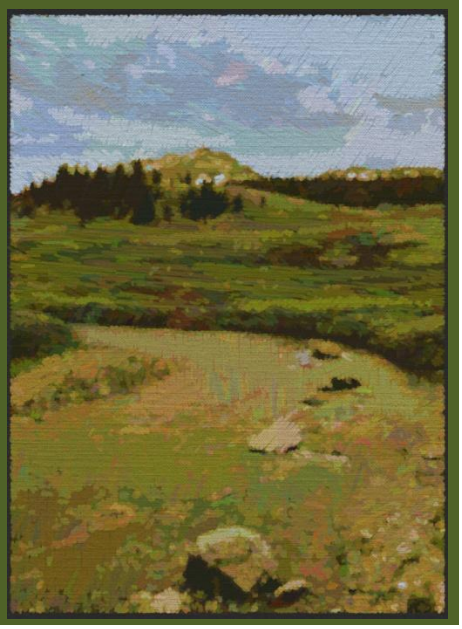
Regional Setting & River Values 2



Chapter 2: Regional Setting and River Values

In Wild and Scenic Rivers planning, 'river values' collectively refers to three elements that are required for designation. To qualify for the National System, rivers must be primarily in a free-flowing condition, with high water quality, and have at least one outstandingly remarkable value (1968 Wild and Scenic Rivers Act).This section describes the current condition of free flow, water quality and Outstandingly Remarkable Values (ORVs) for each segment of the Snake River Headwaters within the Bridger-Teton National Forest.

Regional River Setting

The Snake River Headwaters flow through an iconic landscape dominated by dramatic mountains. The river and its tributaries create unparalleled scenery, an abundance of native wildlife, and a range of outdoor recreation on a scale that draws visitors from all over the world. The river system lies at the heart of the Greater Yellowstone Area, often referred to as one of the last intact functioning temperate ecosystems on earth (U.S. House of Representatives 1985; Keiter and Boyce 1991; Schullery 1997).

The Bridger-Teton National Forest contributes much to the Greater Yellowstone region and it contains some of the most pristine areas within it. A third of the forest is classified Wilderness or Wilderness Study Area; another forty percent is included in undesignated backcountry that is every bit as wild. The remaining part of the forest includes major recreation corridors, roads that give access to backcountry trailheads, scenic byways, and rivers that attract great numbers of visitors. People are attracted by the wildlife, scenery, and recreation, particularly backcountry experiences, so a major theme for this forest is *world-class headwaters, wildlife and wildlands* (taken from the Bridger-Teton National Forest 'vision statement'). The Bridger-Teton National Forest is made up of high quality riparian areas, large tracts of undisturbed land, and more diversity of geology and vegetation than is found in many places of similar size. The forest includes headwaters of three nationally significant rivers (the Yellowstone, Snake, and Green) and numerous mountain ranges from the lofty Wind River Range to the Snake River Range, the lowest-elevation range of mountains within the forest, whose highest points top out at just over 10,000 feet.

The section of the forest within the Snake River watershed is surrounded by mountains which hold the headwaters of the Snake and its tributaries. Grand Teton and Yellowstone National Parks hold additional tributaries, some of which are shared with the national forest (Pacific Creek, Buffalo Fork, and Gros Ventre). Downstream of the Snake River Headwaters and Palisades Reservoir is the South Fork of the Snake, an important section of fishing, floating, wildlife, scenery, and the gallery forest of cottonwood that harbors nesting raptors. The

Henry's Fork lies west of Yellowstone and Grand Teton National Parks, flowing through the Targhee National Forest to join the Snake a few miles north of Idaho Falls. The major branches of the upper Snake River and many of their tributaries combine to create a region known for blue-ribbon trout fisheries, whitewater floating, and camping or picnicking beside a river, all within a region of great natural beauty. Many of the rivers beyond the Snake River Headwaters have been found eligible for wild and scenic status.

Free-Flowing Condition

According to the Wild and Scenic Rivers Act, "free-flowing" means flowing in a natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. However, the existence of low dams, diversion works, and other minor structures at the time any river is proposed for inclusion in the national wild and scenic rivers system shall not automatically bar its consideration for such inclusion provided that this shall not be construed to authorize, intend, or encourage future construction of such structures within components of the national wild and scenic rivers system.

The Snake River Headwaters are high quality snowmelt-dominated streams. The headwaters contain several U.S. Geological Survey stream gauges which provide flow data for monitoring their free-flow conditions. Peak flows generally occur in late May and early June. Low flows generally occur in October below Jackson Lake and in September above the dam and on tributary streams. The majority of the river segments contain an unaltered hydrograph (except as noted below). These natural flow regimes are a feature no longer commonly found on the majority of stream miles in much of the Intermountain West, and contribute substantially to the river values found in the Snake River Headwaters. Observed national and regional trends toward increased demands for consumptive water uses and hydropower production highlight the positive effect of current action to maintain existing low-use conditions into the future.

The Snake River below Jackson Lake is influenced by Jackson Lake Dam, originally constructed in 1907 and raised in 1917. The dam is operated by the Bureau of Reclamation to provide water to contract holders in Idaho. While the primary driver of releases from the lake is to meet Idaho water rights, the Bureau of Reclamation cooperatively works with the National Park Service to provide spring-release flushing flows in May/June. Constant flows between 1,500-2,100 cubic feet per second (cfs) are released from July to September. USGS records for the Kelly gage on the Gros Ventre state that flows are altered to an unknown degree upstream from the gage by irrigation diversions.

The middle reach of the Snake River (south of the boundary with Grand Teton National Park), which is not within the Wild and Scenic River designation, has been modified by a levee system, which does have some influence on the lower 19-mile recreational section. Because the term "free-flowing" means "flowing in a natural condition

without…straightening, rip-rapping, or other modification of the waterway", these levees are a noteworthy influence on this reach of the river. They confine the channel and partially keep it from accessing its natural floodplain, thus reducing its ability to perform the natural functions it would have if it were in a natural, free-flowing condition through this reach (e.g., water table recharge, overbank sediment deposition, flood flow attenuation). The alteration of channel and floodplain function has had impact on riparian vegetation—e.g., cottonwoods not regenerating due to lack of floodwater access.

The Snake River and its tributaries contain a number of other minor channel modifications (such as boat ramps, stream bank stabilizations, bridges, and culverts). The Buffalo, Gros Ventre and Hoback Rivers all have diversions. These man-made features generally do not impede the free-flowing character of the river system. The highways in both the Hoback and the lower Snake River have cut off the rivers' access to their floodplains, and highway fills affect the river, as well.

For most of the tributaries, the nearly unaltered flow regimes of the designated waterways are rare among large rivers in the nation.

The geomorphic classification system in use on the Bridger-Teton National Forest is the one developed by Dave Rosgen, which also bears his name. The Rosgen system includes classifications for both valley types and stream types; in this case, only the stream type classification will be discussed. The classification is alphanumeric, with the upper case letter (A through G, and DA) providing the broad level of classification based on the following parameters:

- Single-thread channel vs. multiple channels
- Entrenchment ratio (flood-prone width / bank-full width)
- Width/depth ratio
- Sinuosity

The broad level of classification is further refined by the use of numerals and lower case letters, based on two more parameters:

- Channel slope
- Channel materials

The chart in Figure 2.1 below summarizes the classification system.

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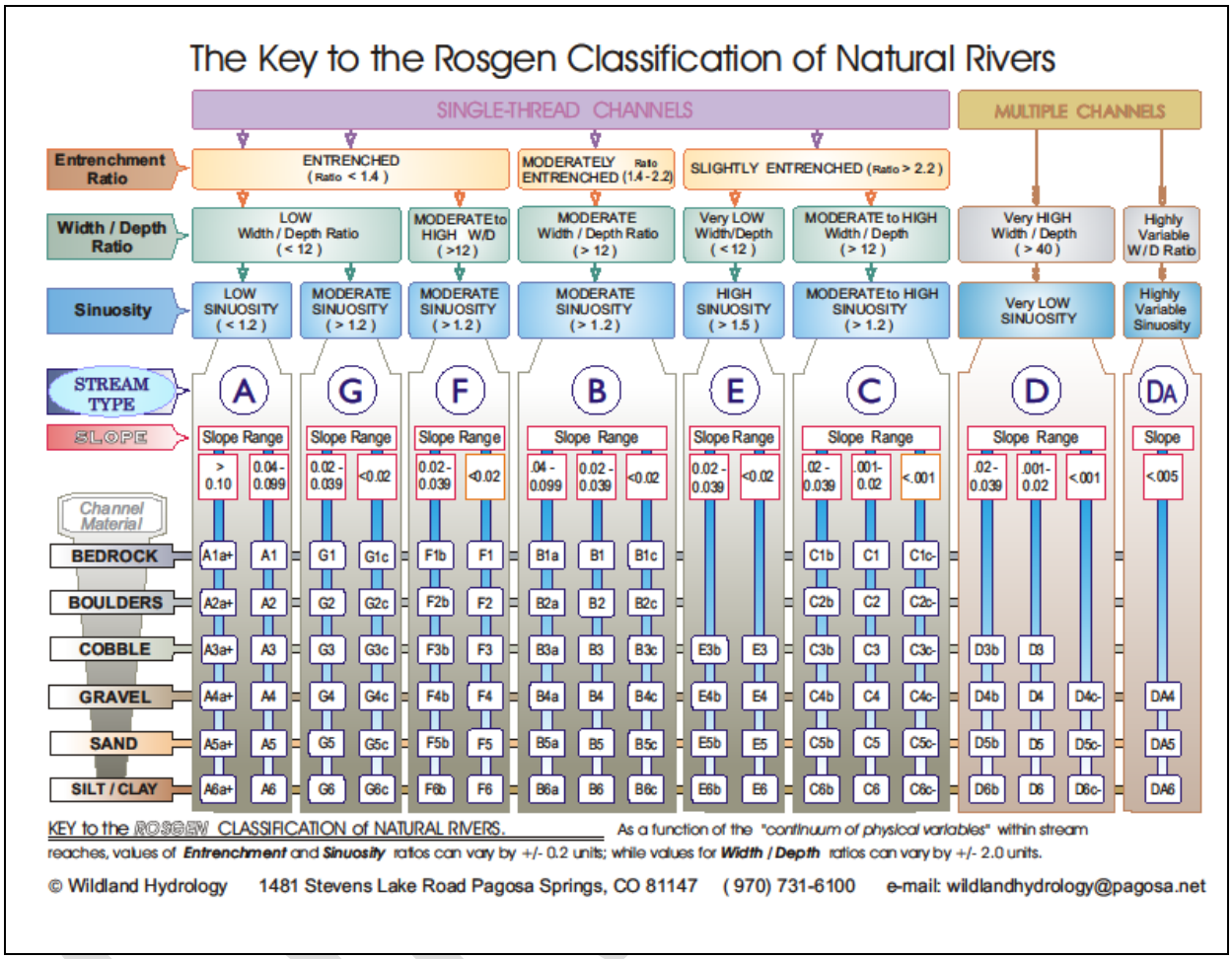
Figure 2.1 Diagram of the Rosgen Stream Classification System



Water Quality

Water temperature fluctuation, sediment, dissolved oxygen, and other physical, chemical and biological characteristics help define water quality. The descriptions of water quality in this CRMP are derived from available data sources, which differ by stream. Some segments of the Snake River Headwaters have had little monitoring in the past, and therefore there are fewer parameters to be described here.

Outstandingly Remarkable Values (ORVs) Overview

The foundation for planning for wild and scenic rivers is to clearly articulate Outstandingly Remarkable Values (ORVs), water quality, and free-flowing condition of designated rivers, so that these combined river values can be protected and enhanced in accordance with the mandate of the Wild and Scenic Rivers Act.

The Interagency Wild and Scenic Rivers Coordinating Council has issued criteria for identifying and defining these Outstandingly Remarkable Values (ORVs). The values must be river-related and they must be rare, unique, or exemplary in a regional or national context. Staff from the Bridger-Teton National Forest, in collaboration with the National Park Service, and Wyoming Game and Fish Department, used these criteria to develop a set of broad Outstandingly Remarkable Values statements for the entire Snake River Headwaters, and specific descriptions for individually designated river segments located within the Bridger-Teton National Forest. Public comment was invited and incorporated where appropriate.

The Bridger-Teton National Forest completed its Outstandingly Remarkable Values Report in August 2011 and made it available for public review. The assessment describes the following set of Outstandingly Remarkable Values (ORVs): scenic, recreational, cultural, ecological/wildlife, fish, and geologic. In cases where Outstandingly Remarkable Values were not identified for particular river segments, their associated river-related values are considered similar to the many other rivers in the Greater Yellowstone Ecosystem, and therefore they are not considered rare, unique, or exemplary in a regional context.

Table 2.1, on the following page, provides a summary of which Outstandingly Remarkable Values (ORVs) are identified in each of the designated river segments within the BTNF.

Table 2.1. Outstandingly Remarkable Values (ORVs) Summary by Segment

River Segment	Outstandingly Remarkable Value Category					
	Scenic	Recreational	Cultural	Ecological Wildlife	Fish	Geologic
Bailey Creek (wild)	•	•		•	•	•
Blackrock Creek (scenic)	•	•	•	•	•	
Buffalo Fork (wild)	•	•		•	•	•
Buffalo Fork (scenic)	•	•	•	•	•	•
Crystal Creek (wild)	•	•		•	•	•
Crystal Creek (scenic)	•	•		•	•	•
Granite Creek (wild)	•	•		•		•
Granite Creek (scenic)	•	•	•	•	•	•
Gros Ventre (wild)	•	•	•	•	• *	•
Gros Ventre (scenic)	•	•	•	•	•	•

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River Segment	**Outstandingly Remarkable Value Category**					
	Scenic	Recreational	Cultural	Ecological Wildlife	Fish	Geologic
Hoback River (recreational)	•	•	•	•	•	•
Pacific Creek (wild)		•		•	•	•
Pacific Creek (scenic)		•		•	•	
Shoal Creek (wild)	•	•		•	•	•
Snake River (wild)		•		•	•	
Snake River (recreational)	•	•		•	•	•
Willow Creek (wild)		•		•	•	
Wolf Creek (wild)	•	•		• **	• **	

*Ouzel Falls to Darwin Ranch only **Lower three miles only

The overall Snake River Headwaters Outstandingly Remarkable Values statements are based on a set of qualifying criteria that was developed by specialists for each resource area. These overall descriptions are similar across all agency jurisdictions, demonstrating the unified approach to managing the single designation. Following these descriptions and evaluation criteria, river-specific values are presented on a stream-by-stream basis.

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Scenic Value

The Snake River Headwaters, from its origins in Fox Park, flow downstream through an iconic landscape dominated by the Yellowstone Plateau and the Teton Range. The geologic history defines the scenery, moving south from the volcanic Yellowstone Plateau to the fault block uplift/glacial forms of the dramatic Teton Range. These landscapes provide spectacular settings undeveloped by humans that create a distinctive sense of place. The river and its tributaries create unparalleled scenery with diverse opportunities for viewing the rivers, and for viewing the magnificent surrounding landscape from the rivers, with scenic views that can be both dramatic and subtle. Seasonal and climatic variations of vegetation, combined with water features, clean air and landforms, create varied scenescapes such as fall colors and winter wonderlands. These elements combine to offer a landscape character throughout the Snake River Headwaters that is unique and unforgettable on a scale that draws visitors from all over the world.

Evaluation Criteria

River Related or River Dependent: River-related scenery is considered views of the river and its immediate environs and/or scenes *from* the river of distant landscapes where the river factors into the foreground view.

Rare, Unique, or Exemplary in a Regional or National Context:

- *Regional or National Context* - The greater Yellowstone ecosystem is uniquely identifiable from scenery across the nation or internationally.
- *Rare* - The scenery represents an example of views that are uncommon within the national context.
- *Unique* – The scenery represents a singular example of views within the regional or national context.
- *Exemplary* – The scenery represents a conspicuous example among other similar views within the regional or national context.

Recreation Value

The primary recreational value of the Snake River Headwaters lies in the fact that an interconnected watershed system across multiple agency jurisdictions has been protected, encouraging visitors to establish memorable relationships and a 'Sense of Place' with associated emotional bonds, strongly felt values, meanings and symbols. The Headwaters offer world-class recreational opportunities within a largely pristine ecosystem of clean air, clear water, natural soundscapes, spectacular landscapes, and high quality wildlife and fish habitat. Due to the number of river miles and their distribution across a natural landscape largely comprised of public lands, the system offers a unique opportunity for recreationists to participate in a *diverse spectrum of year-round, river-related activities within a variety of*

settings, ranging from easily accessible social opportunities to rustic peaceful settings along low volume gravel roads to wild quiet settings accessible by horse or foot trails, where solitude is a primary value. The diversity of landscapes and waters ranging from small fast moving streams to meandering rivers and challenging whitewater also provides recreationists opportunities for skill development progression whether the activity is bank fishing, float fishing, kayaking, rafting, or hiking, horseback riding and backcountry camping along the waterways. Because of this wide range, some settings and some activities are particularly well-suited to younger people, those with little experience, or people with physical limitations, and can serve to create immersive experiences for these people on public lands that may otherwise seem intimidating.

The discussion below assumes the Headwaters System as a whole meets the criteria of uniqueness by its inclusion of such a distinctive range of activities and settings as described by the Recreation Opportunity Spectrum. Because travel corridors through otherwise inaccessible terrain follow the path of waterways, and because people, especially in the arid West, are attracted to waterways for their recreation, the recreational values of the whole system are also considered river-related/dependent. All segments thus meet the requirements for having Outstandingly Remarkable Recreation Value. Within that system, we have analyzed each stretch for its specific contributions to the overall recreation opportunity spectrum, and noted any features that stand out as rare across the region.

Evaluation Criteria

Contribution to the Spectrum of Recreation Activities Diversity: What recreation *activities* are present on each segment? What kinds of experiences are available for what level of participant?

Contribution to Settings (remoteness, encounters, etc…): What attributes of the physical, managerial and social *setting* are specific to each segment, and how do they fit within the range of settings offered?

Special Features that Contribute to the Recreational Value: Are there rare or unique features that contribute to the segment's recreational value?

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Cultural Values

The continuum of human use along the Snake River Headwaters encompasses thousands of years of diverse people, cultures, and uses. American Indian through early-twentieth century American cultures flourished along these rivers because they provided a corridor for travel through inaccessible terrain and sustenance for travelers. Evidence of Native American travel and settlement, fur trapping, exploration, early European-American settlement, tourism, dude ranching, public lands management, and conservation activities is reflected in archeological sites, historic buildings, and cultural landscapes along the river corridors. Natural and cultural resources continue to carry cultural significance to American Indian Tribes and others to the present day.

Evaluation Criteria

Prehistoric –The river or area within the river corridor contains a site where there is evidence of occupation or use by Native Americans. Sites must have unusual characteristics or exceptional human interest value. Sites may have national or regional importance for interpreting prehistory: may be rare and represent where a culture or cultural period was first identified and described; or may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes. Of particular significance are sites or features listed in, or eligible for inclusion in, the National Register of Historic Places as regionally or nationally significant.

Examples: Travel routes; camping sites; fishing sites; settlements; ceremonial sites

Historic – The river or area within the river corridor contains a site or feature associated with a significant event, an important person, or a cultural activity of the past that was rare, unusual or one-of-a-kind in the region. A historic site and/or feature in most cases is 50 years old or older. Some cultural values may be displayed as place names. Of particular importance are sites or features listed in, or are eligible for inclusion in the National Register of Historic Places as regionally or nationally significant.

Examples: Dude ranches; travel routes; camping sites; river crossings.

Traditional Use – The river or areas within the river corridor contains regionally unique location(s) of importance to Indian tribes (religious activities, fishing, hunting, and gathering). Locations may have unusual characteristics or exceptional cultural value being integral to continued pursuit of such activities. Locations may have been associated with treaty rights on ceded lands or activities unprotected by treaty on ceded lands or in traditional territories outside ceded lands.

Examples: fish, river-related flora and fauna

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Eligible or listed on the National Register of Historic Places –

The quality of significance in American history is present in districts, sites, buildings, structures and objects. A particular property could be significant at the national, regional or local level, but they should be:

- Associated with events that have made a significant contribution to the broad patterns of our history; or
- Associated with the lives of persons significant in our past; or
- Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- Have yielded, or may be likely to yield, information important in prehistory or history.

The National Register is the Federal government's official list of historic properties worthy of preservation. The register is administered by the National Park Service. Nominations for listing historic properties come from State Historic Preservation Officers. A property that is listed on the National Register has gone through the formal nomination process and has been accepted by the Keeper of the National Register.

A property is considered Eligible for the National Register if it meets one of the above evaluation criteria. The Federal Agency who manages the land on which a property is located makes a recommendation concerning the eligibility of property, and the State Historic Preservation Office concurs with that recommendation. A property that is eligible for the National Register has the same protective status as a property that is listed on the National Register.

Ecological / Wildlife Values

Due to the integrity of its wildlife and plant communities, and their natural interactions with physical processes, these ecological and wildlife values are Outstandingly Remarkable for the Snake River Headwaters. This value is relative to the multi-state region that includes Western Wyoming, Northern Utah, Eastern Idaho and Western and South-central Montana, and even more significant when viewed from a national or international perspective. The Snake River Headwaters is a particularly pristine and unique component of the Greater Yellowstone Ecosystem, the largest intact ecological unit in the lower 48 states. Natural processes such as fire, flooding, landslides, plant succession, wildlife migration, and predator-prey dynamics profoundly affect the Snake River Headwaters landscape and its biota. Beaver in all of these stretches build and sustain wetlands, and are successfully contributing to management efforts where they raise streamside water tables, increase late season flows, and provide holding areas for trout, waterfowl and other wildlife.

A full complement of native plant and wildlife species is present. Exotic flora, although often present on sites with a history of anthropogenic influence (e.g., along roads, trails, and in developed areas) have minimal influence on the ecological function of the extensive backcountry and wilderness areas. Plant species diversity is high. Species assemblages include numerous distinct riparian plant communities that are unique to the region. All native wildlife species are self-sustaining, and the river courses and associated habitats are critical to their viability. Nationally important wildlife populations include the Jackson elk herd (the largest in the world), the Yellowstone grizzly bear and gray wolf populations (the southern-most in North America), Tri-State trumpeter swans (the largest native resident population in the lower 48 states), the only nesting common loons in Wyoming and substantial recovered nesting populations of bald eagles and peregrine falcons. With only one exception (the northern leopard frog), all native wildlife are present, and no exotic birds, mammals, reptiles, or amphibians are known to use the rivers and creek corridors designated under the Wild and Scenic Rivers Act (although mountain goats present in the lower Snake were introduced). Beavers are common on most of the river segments. They act as a keystone species by building dams that create and sustain wetlands, providing habitat for nesting and migrating waterfowl, including sensitive species such as trumpeter swans. Four of North America's largest carnivores—grizzly and black bears, wolves, and cougars—occur along with 7 native ungulates, including moose, mule and white-tailed deer, bison, elk, pronghorn, and bighorn sheep, in an ecologically dynamic system rivaled in few places on earth. The diversity and abundance of wildlife in this assemblage is recognized world-wide and is the primary reason people visit Grand Teton National Park, the Bridger-Teton National Forest, and the National Elk Refuge, in the Snake River Headwaters.

Evaluation Criteria
River-related ecological and wildlife resources were evaluated on three criteria:

- Special wildlife/habitat/ecological attributes
- Ecological function
- Species diversity/abundance

Information regarding each of these criteria was collected for all 12 segments and analyzed to determine the aggregate value of the resource in each segment. The regional significance of the designated segments was determined by comparing them to other rivers within the Greater Yellowstone Ecosystem; in many cases, the national significance is more important than the regional significance.

Fisheries Values

The Snake River Headwaters provides a unique fishery in its historic native range for the Snake River finespotted and Yellowstone cutthroat trout, which are both nationally significant. While these two fish are not at present different genetically, and Wyoming Game

and Fish Department manages them as one species, they tend to be spatially separated, and are generally different visually. The Headwaters contain a diverse community of other native species including regionally significant populations of northern leatherside chub and bluehead sucker. The community of native fish also includes whitefish, suckers, dace, and sculpins. Spawning, rearing, and adult habitats are characterized by excellent water quality, few natural or man-made barriers, and a diverse and abundant macro-invertebrate community supporting naturally reproducing and genetically pure populations of native fish. Two Forest Service Region 4 Sensitive Species, the Columbia Spotted Frog and the Boreal Toad are found within the Snake River Headwaters, as are Boreal Chorus Frogs, a Management Indicator Species on the Bridger-Teton. Rainbow trout are listed and considered a negative indicator where present.

Evaluation Criteria
Aquatics were evaluated on four criteria:

- Species of concern present
- Diversity of native species
- Natural reproduction
- Habitat quality

Information regarding each of these criteria was collected for all 12 segments and analyzed to determine the aggregate value of the resource in each segment. The regional significance of the designated segments was determined by comparing them to other rivers within the Greater Yellowstone Ecosystem. A matrix was used to record and display findings, using a scale of 0-4, with a '3' indicating one of only a few this segment in the region (defined as the Greater Yellowstone Ecosystem), and a '4' indicating the most significant value in the region. Segments were found to have a fisheries ORV if they rated '4' for one or more criteria.

Geologic Values

The Snake River Headwaters lie within a seismically and geomorphically active zone where dynamic geologic processes continue to shape the landscape. Unique features include geothermal springs and landslides. In addition, the Snake River is a textbook example of a naturally braided river system, despite the presence of Jackson Lake Dam on the mainstem. This is a dynamic system that transports high sediment loads, creating a diverse landscape and supporting vegetative communities critical to the ecological health of the river. The BTNF segments that fall within the Teton and Gros Ventre Wilderness areas contain

stretches that can serve as reference reaches for future monitoring. Reference measurements for pattern, profile, and dimension also provide valuable templates for restoration projects.

Evaluation Criteria

River-related geologic processes and features were evaluated on three criteria:

- Fluvial Geomorphology
- Geologic Scenic Features
- Geothermal Areas (Springs)
- Landslides/Debris Flows

Information regarding each of these criteria was collected for all 12 segments and analyzed to determine the aggregate value of the resource in each segment. The regional significance of the designated segments was determined by comparing them to other rivers within the Greater Yellowstone Ecosystem. A matrix was used to record and display findings, using a scale of 0-4, with a '3' indicating one of only a few of this feature in the region (defined as the Greater Yellowstone Ecosystem), and a '4' indicating the most significant value in the region. Segments were found to have a geologic ORV if they rated '3' or above for one or more criteria.

River Values by Segment

This section describes in detail the river values identified above, including information related to hydrological characteristics, free-flow and water quality, as well as any of the six ORVs identified along that particular river. At the end of each stream section, a brief statement of landscape character is also provided. Because much of the information presented here is specific to an entire designated stream, each one is discussed as a whole (rather than by classification). The descriptions for each stream are organized as shown below.

1. Free-flowing condition, including hydrology and basin characteristics

2. Water Quality: baseline conditions and related issues

3. Outstandingly Remarkable Values, including specific descriptions and general landscape character

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Bailey Creek

Basic hydrology and basin characteristics: The watershed encompasses 10,325 acres. The main stem flows in a generally northwesterly direction, and has a strikingly straight valley, with the stream confined upstream from Bailey Lake due to the area's sedimentary geology. Downstream from Bailey Lake the valley opens up and the stream is less confined to the mouth at the Snake River, as the valley is filled with sediments from tributary drainages along the lower valley. Tributary streams drain into Bailey Creek from the Wyoming Range to the east. The only tributary draining to Bailey Creek from the west is West Bailey Creek; the confluence is approximately 0.7 miles upstream from the mouth of Bailey Creek at the Snake River. Bailey Lake is approximately halfway down the length of the stream, and was formed when Bailey Creek was dammed by a rock slide.

Upstream from Bailey Lake the stream has a gravel bed for most of its length (Rosgen Class B4a or B4). It is moderately to well confined with low to moderate sinuosity. Bank full widths are 10 to 15 feet. Downstream from Bailey Lake, air photos show a small, highly sinuous stream that is intermittently visible for the first mile or two below Bailey Lake (through the main slide that dams Bailey Lake). There is a large wetland area at the West Bailey Creek confluence (despite the lack of mapping by the National Wetland Inventory there), and a well-developed sinuous channel from there down to the Snake River.

Peak stream flows result from snowmelt in the spring. Estimated peak discharges of various recurrence intervals were calculated using Miller (2003), and are summarized in Table 2.2 (discharges were calculated for the mouth of Bailey Creek):

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Table 2.2. Estimated Peak Discharges for Various Recurrence Intervals

Peak Flow Recurrence Interval (years)	Discharge (cfs)
1.5	63.6
2	81.7
5	128
10	160
25	200
50	228
100	258

These discharges may overestimate actual values at the mouth of Bailey Creek; Bailey Lake may temporarily store snowmelt runoff and attenuate flows in the lower reaches of the stream.

Free-flowing Character: There are no human-made obstructions to the free-flowing character of Bailey Creek.

Water Quality: Overall, riparian and channel conditions are very good. Many springs flow into the creek's headwaters. Springs flowing into the creek increase volume quickly. The water is cold and clear, the stream banks stable with well-developed gravel/rock bottom.

Management activities that have the potential to impact water quality include recreation and grazing, as described in the recreation section of this document. The East Table fire in 2003 burned the lower stream (from the lower end of Bailey Lake, downstream). There are no roads near the stream. The only obvious potential sources of impact to water quality seen in summer 2009 were several sections of trail that were close to the stream, delivering sediment to the channel.

Scenic River Value: A remote setting in a canyon with very diverse scenic values, including a fire burned landscape, a landslide, thickets of riparian willows, and a turquoise lake rimmed by forest. Moose and bald eagles are common. Bailey Lake, originally a small glacial pond, was greatly enlarged by a massive landslide that continues to build a natural dam at the lake's outlet.

Recreation River Value: The wild backcountry setting is outstanding, with a relatively undisturbed natural landscape and little evidence of human intrusion. Although geographically close to the Snake River Canyon and U.S. 26/89, the upper narrow canyon of Bailey Creek, running between steep parallel ridges, has a remote backcountry feel. This segment is unique within the Snake River Headwaters with its trail-only accessible, low-elevation, landslide-created destination lake midway between its source and confluence. The visible and still active landslide and the effects of the East Table Fire offer glimpses into landscape-scale processes. This is also the only reach in the system that can be accessed either by a short float across the mainstem Snake or from a remote roadway, and its relatively easy terrain allows families with young members or people with little backcountry experience to connect with this intimate stream as they travel, fish, or camp. This segment is sometimes also accessed in winter by a snowmobile trip to a remote guard station, and then a ski or snowshoe excursion into this peaceful little drainage.

Ecological/Wildlife River Value: This segment makes an important contribution to the ecological integrity of the lower Snake River system, owing to the presence of Bailey Lake and numerous riparian zones along its upper and lower sections. Also contributing to the wildlife values is a variety of vegetation types and habitats, including many springs flowing into the creek's headwaters, tall forb communities that support diverse plants and excellent ground cover, and a robust community of mountain shrubs.

Overall, vegetative and wildlife diversity is high—the creek corridor provides quality habitat for nesting and for seasonal migrations of many neotropical migrant birds, shorebirds, and waterfowl, including 10-20 trumpeter swans that winter on Bailey Lake. The entire corridor is also used by resident moose and migrating elk. Riparian communities above the lake include at least three willow species that provide shade and overhanging banks for trout. The wet meadows in this section and at Bailey Lake support a rich variety of plant species. The north shore of the lake provides excellent habitat for amphibians. Beaver activity along the lower 2-3 miles of the creek greatly enhances habitat diversity and ecological function. Bald eagles are commonly seen here as they have nested for decades near the confluence of the creek and Snake River.

Some other commonly observed species include Barrow's Goldeneye, Osprey, Mallard, Broad-tailed and other hummingbirds, Spotted Sandpiper, Bald Eagle, Dark-eyed junco, Ruby-crowned kinglet, various species of warbler, Gray Jay, and both Hermit and Swainson's Thrush.

Contributing to the wildlife values is the variety of vegetation types and habitats found in the corridor and surrounding watershed. These include:

- Tall forb patches exist where there is deep fine soil, with a high percentage of vegetative ground cover and diversity of plant species.

- A robust mountain shrub community grows within the corridor, on the lower slopes of Grayback Ridge. The mix of Rocky Mountain and bigtooth maple, serviceberry, ninebark, chokecherry, wild rose, mountain-ash, snowberry, ceanothus, dogbane, and aspen patches results in an extensive and continuous shrub community. Combined with open west-facing slopes at a relatively low elevation, the area provides cover, forage and winter range for ungulates, mule deer in particular.

- The willow community along the creek and at the upper end of Bailey Lake includes Geyer's and Booth's willow; Scouler's willow is also found here and on more upland slopes. Willows provide shade and overhanging banks for trout.

- Wet meadows surrounding the creek and its tributaries near and at Bailey Lake have a rich variety of plant species including Richardson's geranium, shortstyle onion, white-flowered bog orchid, red heath, selfheal, angelica, rhex-leaved paintbrush, blue-flowered jacob's ladder, cow parsnip, monkshood, and pink wintergreen. Aquatic buttercup grows in mats along the lakeshore.

- Thimbleberry, cow parsnip, monkshood, bluebell, angelica, currant, gooseberry, Engelmann aster, huckleberry, baneberry, spirea, Richardson's geranium, and other plants are found in the understory of mature spruce forest. This contrasts with the mountain shrub community above and the open areas remaining from the East Table Burn in the lower end of Bailey Creek. Shrubs, grass and aspen stands are regenerating in the burn.

- The creek slows and meanders above the lake. The riparian complex here and where side streams enter the lake is dominated by willows, sedge and grass wet meadows. Cutoff meanders and standing pools provide habitat for willow-nesting songbirds, ducks, aquatic organisms and amphibians.

- Weeds noted along the corridor include *Poa bulbosa*, Canada thistle, and a small amount of musk thistle near the mouth of the creek.

Fisheries River Value: This segment has three distinctive reaches – the free-flowing 4.3 mile reach between the confluence and Bailey Lake, 35 acre Bailey Lake, and the reach upstream of the lake to the headwaters. The entire segment contains native species including Snake River cutthroat trout and Paiute sculpin, with the addition of Yellowstone cutthroat trout and the non-native brook trout in and above the lake. The Management Indicator Species boreal chorus frog is present in this segment. Non-native brook trout may be suppressing native species where present; however, the exceptional quality of spawning habitat in the lowest reach and the presence of native species found in Bailey Creek lead to a determination that Fisheries is outstandingly remarkable in this reach.

Geologic River Value: Bailey Creek's valley has been modified by glacial action. Bailey Lake, originally a small glacial pond, was greatly enlarged by a massive landslide that continues to build a natural dam at the lake's outlet. The landslide and lake are examples of recent geologic action that have high potential for interpretation.

Landscape Character: The majority of the corridor lies within a semi-primitive non-motorized setting. Even at the mouth of the creek, topography and vegetation screen the highway across the Snake River.

Blackrock Creek

Basic hydrology and basin characteristics: The Blackrock Creek watershed is 31,282 acres. The main stem flows in a generally northwesterly direction at first, bending in a more truly westerly direction in the vicinity of Togwotee Mountain Lodge. The upper end of Blackrock Creek flows through high elevation meadows. It is mostly unconfined by the valley side slopes and is highly sinuous, with extensive wetlands (isolated ponds and wetlands associated with the stream) all along the upper valley. There is a large groundwater influence in this section of stream. This reach of channel is dependent on vegetation for its stability and is exhibiting characteristics of Rosgen type E or C channels.

Downstream, valley side slope confinement increases and the stream's sinuosity decreases somewhat (to the confluence with Split Rock Creek), at which point the valley opens up again and the stream regains the sinuosity it had in its uppermost reach. Approximately 0.9 mile southeast of Togwotee Mountain Lodge, the valley becomes more confined and begins to curve more directly west as Blackrock Creek enters its largely canyon reach. The channel's plan form is controlled by the valley side slopes, and shallow landslides are common where the stream undercuts the base of valley walls. Approximately 2.7 miles east of the Buffalo Ranger District office, the valley bottom opens slightly, allowing the channel to deposit some of the sediment load (sand, gravel, and cobble) it has transported from the valley upstream, and the channel becomes braided to its confluence with the Buffalo Fork. Many of the geologic materials through which Blackrock Creek flows are highly erosive, and the stream carries a high sediment load.

The Forest Service estimated stream flows in 2003, 2004, and 2005. The most reliable peak flows were 538 cfs (June 5, 2003) and 981 cfs (June 6, 2004). Base flows were approximately 30 to 40 cfs (late September/early October) in 2003 and approximately 30 to 50 cfs in 2004 and 2005.

Peak stream flows result from snowmelt in the spring. Estimated peak discharges of various recurrence intervals were calculated using Miller (2003), and are summarized in Table 2.3(discharges were calculated for the mouth of Blackrock Creek).

Table 2.3. Estimated Peak Discharges for Various Recurrence Intervals

Peak Flow Recurrence Interval (years)	Discharge (cfs)
1.5	422
2	499
5	715
10	845
25	1011
50	1112
100	1221

Free-flowing Character: There are a number of flow diversions on Blackrock Creek that affect its free-flowing character. There are also several road crossings and locations where roads encroach on the stream or its floodplain; these are locations where the stream's free-flowing character may be affected.

Water Quality: There are 62 miles of road in the watershed, for a road density of 1.27 miles per square mile. Besides delivery of sediment from the natural sediment sources in the watershed, reconstruction of the Togwotee highway in the later years of the decade 2000 to 2010 caused elevated delivery of sediment to Blackrock Creek in several locations.

Scenic River Value: Blackrock Creek has distinctive scenic values, including background views of the Teton Range and middle ground views of Breccia Cliffs and other nearby mountains. Scenic features vary from the wide expanses seen at Blackrock Meadows to the narrow incised canyon just downstream. This segment is characterized by interspersed confined canyons with conifers, and meandering sections through sub-alpine moist meadows.

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The lower sections afford spectacular views of the Teton Range. This is one of the few areas on the forest where gnarled whitebark pine can be viewed from a paved, readily accessible road, and diversity of subalpine vegetation is high. The meandering reaches and confined canyons offer distinctive 4-season water features and colors. With a segment of the Wyoming Centennial Scenic Byway (U.S. 26) running parallel to the creek and within its corridor, there are numerous opportunities for interpretation and scenic turnouts; currently there are several interpretive sites, campgrounds, and resorts along this highway, with more being constructed as part of the ongoing highway reconstruction project.

The opportunity to see wildlife in the area is outstanding. Deer, elk, and black bears frequent the upper part of the corridor, moose congregate in the lower section in winter, and the occasional wolf or grizzly bear makes an appearance along the highway.

Recreation River Value: Flowing alongside the Wyoming Centennial Scenic Byway of State Highway 26/287, this scenic tributary provides numerous opportunities to recreationists driving for pleasure. The Togwotee Pass highway gives the traveler from the east a spectacular first look at the Teton Range, made possible by the way the creek has created alternating wide valleys and meadows with narrow forested canyons. Interpretive sites, photographic pullouts, year-round resorts and seasonal campgrounds are among the facilities enjoyed by many as they take advantage of the paved access through rare alpine terrain shared with the distinctive charismatic wildlife of the high Rockies. In winter, resorts and trailheads in the area become hubs for snowmobiling and skiing activity along the Continental Divide Snowmobile Trail and other groomed, marked routes.

Cultural Resources River Value: Togwotee Pass, named after a Sheepeater Indian chief, was an important travel corridor over the continental divide from prehistoric times through the early exploration and settlement of the Jackson Hole area. Trapper William Sublette led a pack train and 60 men to Jackson Hole over the pass in 1829. Chief Togwotee led the U.S. Government expedition of Captain William Jones over the pass in 1873. Famed photographer William Henry Jackson, traveling with the Hayden Survey in 1878, photographed the Teton Mountain Range from the Togwotee Pass area in 1878. Around 1900, the federal government constructed a military road from Fort Washakie to Fort Yellowstone over Togwotee Pass and down the Blackrock Creek drainage. This road departed from Blackrock Creek near Fourmile Meadow and headed north to the Buffalo Fork River before continuing towards Yellowstone.

The Old Blackrock Office at the Buffalo Ranger District was constructed in 1904 and is the oldest administrative structure in the Bridger-Teton National Forest. It was used by the first forest ranger, Rudolph Rosencrans, and is open for viewing adjacent to the District Office.

Wildlife/Ecological River Value: Blackrock Creek supports a mix of wet meadows, small ponds, and extensive willow communities—habitats that attract a rich diversity of wildlife, including protected and special-status birds and mammals and seasonally-migrant wildlife such as elk, mule deer, and moose. Due to the easy access to the corridor from the Wyoming Centennial Scenic Byway this segment offers outstanding opportunities for viewing wildlife and enjoying the flora and fauna characteristic of subalpine habitats and unique high-elevation (> 9,000 feet) riparian zones. The corridor is used by Sandhill Cranes, Bald Eagles, Trumpeter Swans, many species of passerine birds, Red-tailed Hawks and Osprey. It is also an important stop-over area for neotropical migrants, waterfowl, and shorebirds.

The old growth forests within the corridor are important to Great Gray Owls and other cavity nesting birds. Whitebark pine stands exist in the upper meadows, and wetlands near the source provide important habitat for sensitive native amphibian species such as boreal toads and spotted frogs. This is an important area for grizzly bears, gray wolves, wolverines, snowshoe hares, and the federally threatened Canada lynx that all use the Togwotee Pass area for foraging and as a movement corridor. Moose winter range is found within the lower corridor. The canyon section below Blackrock Meadows has potential for harboring harlequin ducks, although no surveys have been conducted.

During highway reconstruction, the Wyoming Department of Transportation installed underpasses designed to accommodate safe travel of wildlife, and retaining walls that greatly reduced roadway effects on the corridor's extensive riparian zones. The area is a very popular snowmobile recreation area during the winter, but this activity does not appear to have compromised the ecological integrity of the corridor, particularly during the late spring, summer, and fall seasons.

Blackrock Meadows is of particular interest from a plant ecology standpoint. Its undulating topography and mix of wet meadows, wetlands and riparian areas, and dry, rocky uplands provide a variety of habitats; its elevation of over 9,000 feet places it in the subalpine zone but it harbors plant species more typically seen in the alpine, including the following:

Alpine pussytoes	*Antennaria alpinum*
Boreal sagewort	*Artemesia borealis*
Ballhead sandwort	*Arenaria congesta*
Field chickweed	*Cerastium arvense*
Mat milkvetch	*Astragalus kentrophyta*

Many-flowered phlox	*Phlox multiflora*
Sky pilot	*Polemonium viscosum*
Parry's lousewort	*Pedicularis parryi var purpurea*
Beautiful paintbrush	*Castilleja pulchella*
Mountain forget-me-not	*Myosotis sylvatica*

In addition to alpine/subalpine plant species the area harbors a rich and diverse riparian area including wildflowers, sedges, and willows. Some of the species noted in these places include:

Planeleaf willow	*Salix planifolia*
Grayleaf willow	*Salix glauca*
Shortfruit willow	*Salix brachycarpa*
Pink agoseris	*Agoseris lackschewitzii*
Sharptooth angelica	*Angelica arguta*
Rose Crown	*Sedum rhodanthum*
Mountain bluebells	*Mertensia ciliata*
Swamp buttercup	*Ranunculus cymbalaria var alpina*
Elkslip marsh-marigold	*Caltha leptosepela*
Shrubby cinquefoil	*Potentilla fruticosus*
Dwarf hesperochiron	*Hesperochiron pumilis*

The high elevation of Blackrock Meadows combines with geologic and hydrologic variability to create a mosaic of wet and dry areas, each with a distinct plant community. Along the stream margins a suite of willow species typical of sub-alpine riparian areas lies adjacent to a sagebrush-grassland community composed of species typically indicative of much drier areas at lower elevations. Within and sometimes between these two ecotypes are spring-fed moss-dominated waterways with yet another distinct set of plant species including vascular and non-vascular plant species.

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The semi-braided channel of Blackrock Creek shapes plant communities within the river corridor. Small abandoned channels and oxbows create mosaics of water availability expressed as different riparian communities.

In lower Blackrock Creek, near the confluence with the Buffalo Fork, there is a population of Teton wire-lettuce (*Stephanomeria fluminea*) growing on gravel bars and terraces. For the most part, the lower creek shoreline is crowded with willows including *Salix boothii*, *S. lasiandra* var. *caudata*, and *S. melanopsis*, but there are occasional open gravel bars that provide good habitat for *Stephanomeria*. Two such sites were discovered (Markow, 2004), one with 211 plants, the other with 7 plants; prior to Stuart Markow's 2004 survey this plant had not been previously reported in Blackrock Creek. Teton wire-lettuce is endemic to the Gros Ventre and Absaroka Ranges, and lower Blackrock Creek is one of the few streams within the BTNF harboring this plant.

Because of its vegetative diversity, its importance to wildlife and uniqueness as a high-elevation area with a well-developed riparian zone, this river segment offers outstandingly remarkable ecological and wildlife values.

Fisheries River Value: Blackrock Creek contains at least five native fish species (Snake River cutthroat trout, mottled sculpin, longnosed dace, speckled dace, and mountain sucker). This segment contains both Snake River and Yellowstone cutthroat trout, Forest Service designated "Sensitive Species" and Wyoming species of concern. While the overall health of Snake River cutthroat trout populations is strong in the segment, localized populations of brook trout impact the native fishery through competition and predation. The segment has high species diversity and habitat for natural reproduction of native species. Sensitive amphibian species the Columbia spotted frog and boreal toad as well as the indicator species boreal chorus frog are all found in this segment.

Landscape Character: The creek flows through sections visible from the highway and gorges hidden from the developed sites and roadways. The Recreation Opportunity Spectrum class featured is Roaded, Natural-appearing due to the concentration of use along the scenic byway but there are parts of the creek that are well separated from this setting and fit more into a Semi-primitive non-motorized setting. A corner of private land lies within the corridor at the lower end; it is under a conservation easement as well as both scenic and natural resource overlays in the Teton County Comprehensive Plan.

Buffalo Fork

Basic Hydrology and Basin Characteristics: The designated segments in the Buffalo Fork comprise one 5th-field Hydrologic Unit (in this case, a watershed) as cataloged by the U.S. Geological Survey: 1704010106—Buffalo Fork. The Buffalo Fork River watershed is 370

square miles (236,880 acres) in size as calculated using GIS; the watershed includes Blackrock Creek, another designated segment that is described separately. The river flows in a generally westward direction from its headwaters at the Continental Divide in the Teton Wilderness to its confluence with the Snake River near Moran Junction in Grand Teton National Park. The National Forest segment ends at the National Forest boundary.

Valley bottom gradients do not always correspond directly to stream gradients, but they provide an indication of the stream gradients that occur in a given location. Valley bottom gradients are less than 2.5% on the mainstem Buffalo Fork, when generalized on a reach scale. On the North Buffalo Fork, valley gradient classes range from roughly 0.5% to 5.0%, reaching 10% in the upper five miles of channel. On the Soda Fork, gradients range from approximately 1% to about 10%. Gradients on the South Fork range from less than 0.5% in the lower reaches to approximately 10% in the headwaters. Where gradients are steep they are invariably in timbered reaches, although the converse is not true (i.e., all timbered reaches are not steep).

North Buffalo Fork is mostly a meandering stream that flows through a mix of meadows and timber. It has moderate to high sinuosity and width/depth ration, and appears to be mostly a Rosgen “C” type channel, and for most of its length this seems valid, except for timbered sections of its upper reaches where valley gradients would be too steep for this to be the case and where the stream is quite straight—likely a “B” channel. Meadow reaches show evidence of being especially dynamic via oxbows, fresh sediment deposits, and old segments of channel that are still visible, many of them still filled with water due to high water tables. Approximately the lowest four miles of stream above the confluence with the Buffalo Fork are more confined than the previous sections of stream (i.e., less able to meander freely).

Soda Fork is similar to North Buffalo Fork, although its lowermost reach above the confluence with North Buffalo Fork is a laterally active, meadow-type reach.

South Buffalo Fork carries a high, coarse, sediment load due to the large amount of exposed bedrock along its valley walls. Because of the load it carries, much of the stream’s length is a braided (multi-channel) stream, which is described by a Rosgen "D” type. These channels change position frequently within their valley bottoms in response to the pulses of sediment fed to them from valley walls and from upstream channel reaches. The adjacent slopes vary along the length of the stream, from flat meadows, to stable forested slopes, to bare slopes in excess of 80% steepness with numerous gullies on their faces that effectively transport water and sediment to South Buffalo Fork.

The character of the mainstem of the Buffalo Fork changes in the vicinity of Turpin Meadows. Upstream from the meadow the river is a relatively stable meandering stream that flows through a confined, timbered valley/canyon upstream from Clear Creek. Downstream from Turpin Meadows the channel’s floodplain opens up into a broad, flat alluvial valley that

allows the stream to meander freely. The stream is a Rosgen "C" type channel displaying classic channel and floodplain features at a variety of scales. The channel is wide and shallow, has a very high sinuosity and a gentle gradient. It carries a high amount of sediment and changes its lateral position readily in response to changes in sediment supply and/or discharge. Lateral changes are accentuated where riparian vegetation is removed. Air photos reveal that the channel has occupied virtually the entire Buffalo Valley floor over time and many of the relict channels still hold water due to high water tables.

National Wetlands Inventory maps show wetlands scattered throughout the Buffalo Fork watershed. They are both associated with active stream channels in the designated reaches, and scattered as isolated wetlands, including lacustrine, or lake-type wetlands that are shallow enough to support vegetation. Many of the wetlands are described as seasonal or intermittent, meaning that they dry up at times due to seasonal water level fluctuations or due to other causes (e.g., beaver presence). Most of the wetlands directly associated with designated stream reaches are palustrine wetlands, which are generally described as nontidal wetlands having relatively shallow water. They are small in size and located on the boundaries of the other wetland systems. Palustrine systems include vegetated wetlands such as marshes, bogs, intermittent or perennial ponds, fens, etc.

The U.S. Geological Survey (USGS) operates a stream gage on the Buffalo Fork (station number 13011900, Buffalo Fork above Lava Creek near Moran, Wyoming). The gage has operated continuously since 1965, and operated discontinuously in 1906, 1917-1918, and 1944 -1960 at sites approximately three miles downstream from the current site. The drainage area above the site is 323 square miles. Maximum peak discharge (to date) for the period of record at the current site occurred on June 9, 1981, when streamflow reached 6,540 cfs. The minimum daily flow at the current site was 70 cfs on February 27, 2002.

Peak streamflows result from snowmelt in the spring because there are no dams on the Buffalo Fork River. Estimated peak discharges of various recurrence intervals are based on gage data from the Buffalo Fork gaging station for the period 1966 to 2000, as reported in Miller (2003), and are summarized in Table 2.4.

Table 2.4. Peak Discharges, Buffalo Fork above Lava Creek near Moran, Wyoming

Peak Flow Recurrence Interval (years)	Discharge (cfs)
1.5	3760
2	4140
5	4990
10	5490
25	6080
50	6490
100	6870

Free-flowing Character: The magnitude of alterations to the free-flowing character of the Buffalo Fork River depends on the amount of water withdrawn from the stream via diversions. Impacts to flow hydraulics from structures in the bed and banks of the river consist mainly of rock bank stabilization structures and flow deflectors installed along the lower reaches of the Buffalo Fork to prevent the stream from migrating laterally. Such stabilization has often been installed to protect private property and improvements, and may be altering sediment transport and channel form for some distance downstream of the works. Impacts to the free-flowing character of the stream from roads along the main stem and trails along the tributaries are generally localized in nature, and few roads have been constructed close to the stream because of its highly dynamic character. Overall, the Buffalo Fork River and its tributaries have the appearance of free-flowing streams.

Water Quality: There are no municipal supply watersheds within or immediately downstream from the designated reach.

There are no 303(d) designated streams within or immediately downstream from the designated reach. These are streams where Wyoming DEQ has determined that water quality is either impaired or threatened: the list is updated every two years as required by Section 303(d) of the federal Clean Water Act. There are no municipal supply watersheds within or immediately downstream from the designated reach.

The state of Wyoming has classified all the non-Wilderness designated reaches of the Buffalo Fork as 2AB streams, based on the designated uses they are supporting or are supposed to support. According to the State water quality standards:

> Class 2AB waters are those known to support game fish populations or spawning and nursery areas at least seasonally and all their perennial tributaries and adjacent wetlands and where a game fishery and drinking water use is otherwise attainable. Class 2AB waters include all permanent and seasonal game fisheries and can be either "cold water" or "warm water" depending upon the predominance of cold water or warm water species present. All Class 2AB waters are designated as cold water game fisheries unless identified as a warm water game fishery by a "ww" notation in the "Wyoming Surface Water Classification List". Unless it is shown otherwise, these waters are presumed to have sufficient water quality and quantity to support drinking water supplies and are protected for that use. Class 2AB waters are also protected for nongame fisheries, fish consumption, aquatic life other than fish, recreation, wildlife, industry, agriculture and scenic value uses. (WDEQ, 2007—available at http://soswy.state.wy.us/Rules/RULES/6547.pdf.)

The segments of the Buffalo Fork that are in the Teton Wilderness are Class 1 waters. For these segments, the following applies:

> Class 1 [Outstanding] waters are those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. Pursuant to Section 7 of these regulations, the water quality and physical and biological integrity which existed on the water at the time of designation will be maintained and protected. In designating Class 1 waters, the Environmental Quality Council shall consider water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archaeological, fish and wildlife, the presence of significant quantities of developable water and other values of present and future benefit to the people. [available at http://soswy.state.wy.us/Rules/RULES/6547.pdf]

Further direction in the Wyoming Water Quality Rules and Regulations, Chapter 1, for Class 1 Waters includes the following:

> (a) Except as authorized in paragraph (b), no new point sources other than dams, may discharge, and no existing point sources, other than dams, may increase their quantity of pollution discharge, to any water designated as Class 1.
>
> (b) Storm water and construction-related discharges of pollution to Class 1 waters may be authorized and shall be controlled through applicable water quality permits, Section 401 certifications and/or by the application of best management practices. Such discharges shall not
> degrade the quality of any Class 1 water below its existing quality or adversely affect any existing use of the water. Temporary increases in turbidity that are within the limits established in Section 23 of these regulations and that do not negatively affect existing uses can be permitted. For purposes of this section, temporary increases in turbidity shall not exceed the
> actual construction period. The department shall impose whatever controls and monitoring are necessary on point source discharges to Class 1 waters and their tributaries to ensure that the

existing quality and uses of the Class 1 water are protected and maintained.

(c) Nonpoint source discharges of pollution to Class 1 waters or tributaries of Class 1 waters shall be controlled by application of best management practices adopted in accordance with the Wyoming Continuing Planning Process. For Class 1 waters, best management practices will maintain existing quality and water uses. [available at http://soswy.state.wy.us/Rules/RULES/6547.pdf]

The USGS collected water temperature, air temperature, and specific conductance data on the Buffalo Fork above Lava Creek from October 1985 to October 1998; the site is approximately two miles upstream from the mouth of Lava Creek. Because there are also non-Forest lands upstream from the sampling site, impacts from non-Forest lands are included in the results. WDEQ collected water quality data once on the main stem Buffalo Fork in August 1994, just downstream from the Teton Wilderness boundary. Sampling results are summarized here:

Stream water temperatures measured by the USGS varied widely between winter and summer. Temperatures reached a low of 0°C (frozen) every winter for the period of record. High temperatures peaked at 17°C one year (1988), but most summer water temperatures peaked between 15.5°C and 16.5°C. Water temperature met this standard for the entire period of record. Maximum summer water temperatures were usually reached in late August. When air temperature rose or fell, water temperature followed suit.

The USGS measured specific conductance at the Buffalo Fork site. This parameter reflects the dissolved ionic content of water due to local geology and human inputs. Specific conductance values generally varied between about 80 uS/cm and 300 uS/cm, with one abnormally high value of 424 uS/cm on February 13, 1996. These values rose and fell on a cyclical basis: values peaked in winter and early spring (when stream discharge was lowest) and were near or at their lowest values when discharge was peaking. This indicates a dilution effect on specific conductance which probably reflects natural impacts. There is no state standard for this parameter.

Turbidity was not measured by USGS. WDEQ measured turbidity at 0.5 NTU, which is very low. Total suspended solids were non-detectable.

USGS did not sample for nutrients. WDEQ found that nitrite (NO_2) + nitrate (NO_3) were "undetectable", as were levels of phosphorus.

The Bridger-Teton National Forest collected continuous water temperature data on the Buffalo Fork, just upstream from the USGS gage during summer 2009. Water temperatures reached a high of 16.4˚C (61.5˚F) on August 21; this meets the cold water fisheries water quality standard and maximum temperatures are the same as those previously measured by the USGS.

Wyoming DEQ collected water quality data on the Buffalo Fork at a site near the Turpin Meadows Campground and Trailhead (MRW9) on two dates—in August 1994 and August 2008. Both samples met State water quality samples for all constituents having standards. The sample reach was also surveyed in 2008 for a variety of physical parameters, which will provide a baseline for conditions at the time of designation and will be useful for the evaluation of condition and trend at a later date. The survey reach was characterized as a meandering, wide (C-type) cobble-dominated stream. It had very stable, well-covered banks.

The Buffalo Fork is in the Sedimentary Mountain Bioregion for WDEQ bioassessment purposes, using WY RIVPACS (Hargett, 2012) and the Wyoming Stream Integrity Index (WSII) (Hargett, 2011) assessment methodologies. Ratings from the two methodologies are used in combination to arrive at a narrative designated use support rating. In 1994 the designated use support rating on the Buffalo Fork reach was "full support" and in 2008 the rating was "indeterminate" due to the WSII rating of "partial/non-support". This means that in 2008 it was not clear if water quality standards were being met to support all designated uses, but that they were in 1994.

Scenic River Value: The scenic segment is well known for its spectacular views of the Teton Range and the pastoral setting of the Buffalo Valley. Classic point bars, meanders and oxbows add to the beauty of this gravelly, braided stream and offer habitat for birds and wildlife that are easily seen from the Buffalo Valley Road. Outstanding scenic features in the wild segment include views of imposing peaks of layered volcanic rocks, many spectacular water features (South Fork Falls is an example), and wide wet meadows that provide outstanding opportunities to see wildlife in a wild setting.

Recreation River Value: The lower segment is served by the Buffalo Valley Road, along which there are numerous river access points, resorts, visitor services, campsites and trailheads. Resorts offer float trips, horseback rides, and other front-country activities, as well as snowmobiling in winter. This section of the river corridor is a gateway to the Teton Wilderness, with the most heavily used campgrounds and trailheads near its boundary. Over 80% of the Buffalo Fork is in the wilderness; its forks penetrate the Teton Wilderness and head in the alpine country of the Continental Divide.

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Horse packing, hunting, fishing, day rides and other wilderness activities are centered on this river and its forks. The river is accessed by trails for most of its length and numerous outfitter-guides are available to lead people into the area. Wildlife resources are superlative, with the full complement of native species represented, and little in the way of invasive plants or animals. Because of the size and remoteness of the Teton Wilderness, as well as the adjacent wilderness lands in Yellowstone National Park and the Shoshone National Forest, this river is exemplary in providing recreation visitors with a true wilderness experience.

Cultural Resources River Value: The Rosencrans Cabin Historic District is located on the south bank of the Buffalo Fork River's scenic segment and is on the National Register of Historic Places. Constructed around 1915, the cabins are particularly well built and are representative of early Forest Service administrative buildings. The structures are also associated with Rudolf "Rosie" Rosencrans, the first ranger at Buffalo District, who played a vital role in the early history of the Forest Service. Rosie's grave is also located at the site.

Wildlife/Ecologic River Values: The Wild River segment includes wildlife resources and habitats of regional and national significance, owing to their location within the vast 585,000-acre Teton Wilderness, a pristine headwaters ecosystem that supports some of greatest native wildlife diversity and abundance in the nation. The trophic interactions between the geological, vegetative, and wildlife resources occur in a setting largely uninfluenced by humans and that is lacking in exotic fauna. The habitat types in the river corridor support a complete assemblage of seasonal or resident wildlife, including several listed or recently de-listed species (grizzly bears, gray wolves, occasional Canada lynx), de-listed and nationally significant raptors (Bald Eagle, Peregrine Falcon), five native ungulates and their associated predators and scavengers, and an abundance of passerine birds, shorebirds and waterfowl such as Spotted Sandpipers, American Dippers, and breeding pairs of the rare Harlequin Duck. Trumpeter Swans and Sandhill Cranes nest in oxbows of the Buffalo River and in some upper elevation wetlands. The river bottoms are used as movement corridors by river otters and wolverines, and they help support one of the longest moose and elk migrations (35 miles and 55 miles respectively) in North America. Because of their pristine condition and the extraordinary diversity and abundance of wildlife, these river segments provide outstandingly remarkable ecological and wildlife values.

The Scenic River segment is characterized by broad riparian zones situated along a braided river channel with numerous well-watered oxbows and side-channels. These habitats support extensive willow (and other deciduous shrub) communities mixed with conifers and cottonwood galleries that, similar to the wild segment of the Buffalo Fork, support a complete assemblage of seasonal and resident wildlife. This river segment provides important winter range for moose and a critical migration corridor for elk. Teton wire-lettuce (*Stephanomeria fluminea*) is found in the lower segment of the Buffalo Fork.

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Fisheries River Value: The Wild River section of the Buffalo Fork includes the North, Soda and South Fork drainages, all free flowing with well-developed and stable channels. A good pool-riffle ratio (40-75% pools), a fair amount of large woody debris accumulation, and pocket/plunge pools can be found in canyon reaches with boulders. Meadow reaches and small tributaries provide most of the spawning and nursery habitats. Joy Creek runs through a hanging meadow in the headwaters and is extremely cold. The North Fork Falls are a barrier to migration to the upper reaches. There is good habitat above the South Fork Falls that supports a strong self-sustaining population of fish. Fish species in the North Fork of the Buffalo Fork include Snake River cutthroat trout, mountain whitefish, mottled sculpin, bluehead sucker and speckled dace. Non-native fish include brook trout that are present but uncommon.

The Scenic River segment of the Buffalo Fork runs from Turpin Meadows to the boundary with Grand Teton National Park. From its confluence with Blackrock Creek to the confluence of the North and South Forks, the channel is fairly stable with large woody debris and a fair pool-riffle ratio. There are adequate spawning sites for a stream with a high annual stream flow variation. Water exchange in lakes is limited to spring runoff. The segment contains Snake River cutthroat trout, mottled sculpin, longnosed dace, speckled dace, leatherside chub, redside shiner and mountain sucker, all native fish species that were historically present in the Greater Yellowstone Ecosystem.. Sensitive amphibian species Columbia spotted frog and boreal toad, as well as the management indicator species boreal chorus frog are present in this segment.

Both the wild and scenic river segments provide a connectivity corridor for Snake River cutthroat trout as they move between the main stem of the Snake River and upstream colder-water tributaries to spawn.

Geologic River Value: The Buffalo Fork valley was the route of a major ice sheet that flowed into Jackson Hole, joining another ice sheet that flowed south from Yellowstone during multiple glacial events within the past 150,000 years (Pleistocene geologic epoch). This ice sheet was important in creating current landscape features in Jackson Hole, and in creating east-west trending lakes such as Two Ocean and Emma Matilda Lakes (in Grand Teton National Park). Relict glacial valley features are evident in both the Wild and Scenic segments of the Buffalo Fork. There are also noteworthy waterfalls along South Buffalo Fork.

The scenic segment of the Buffalo Fork downstream from Turpin Meadows is a classic braided stream, with features that include oxbows, multiple channels, active lateral point bars, and mid-channel bars.

Landscape Character: Over 80% of the river is in a wilderness or primitive setting, and has a high degree of natural character. The remaining segment is within a Rural or Roaded-

natural appearing Recreation Opportunity Spectrum class, with open space on private lands enhancing the views and setting. Most of the private land in the corridor is zoned Rural in the Teton County Comprehensive Plan; about 35% of the private land is also under conservation easement. Both natural resource and scenic overlays apply in the lower corridor.

Crystal Creek

Basic Hydrology and Basin Characteristics: The Crystal Creek watershed is 71 square miles (45,276 acres) in size as calculated using Forest Service GIS. The river flows north from its headwaters in the Gros Ventre Range, which was formed by a 50-70 million year old compressional event, to its confluence with the Gros Ventre River. Its major tributaries are Jagg Creek, which flows in from the east, and Shorty Creek, which flows in from the west further downstream.

Valley bottom gradients along the designated reach vary from approximately 9% in the headwaters (upstream from The Meadows) to approximately 1% in the vicinity of Red Rock Ranch. While valley bottom gradients are not exactly the same as stream gradients, they do provide an indication of stream gradients.

The upper reaches of Crystal Creek flow are fairly steep and are confined in a narrow floodplain. After the confluence with the West Fork, the gradient lessens and confinement also decreases. The stream meanders more freely and carries a considerable sediment load as seen by the fresh point bars along its length. Exposed cliffs along its east valley side are prime sources for the sediment. Approximately one mile upstream from the confluence with Jagg Creek, the Crystal Creek landslide partially dams the stream. This is an ever-changing scenario in which the stream is ponded and works its way through and around the toe of the slide as the slide continues to advance. Downstream from here, the stream adjusts its gradient and form to the changing sediment inputs from the slide, as well as to the additional sediment and water inputs from Jagg Creek, which is steeper than Crystal Creek. For approximately two miles downstream from the Jagg Creek confluence it maintains a straight, low-gradient profile without appreciable riparian development. It may be downcut, without access to its floodplain here. But after this point the stream is actively meandering, with mapped wetlands and riparian vegetation and looks like a Rosgen “C” type channel with a broad active floodplain. It is transporting large quantities of sediment—largely gravel and cobbles—through this reach, and downstream to the Gros Ventre River. There is a narrow bedrock and boulder canyon upstream from the trailhead, after which the stream changes between a Rosgen “C” and “D” (braided, or multi-channel) stream to the confluence with the Gros Ventre River.

Although National Wetlands Inventory maps show wetlands scattered throughout the Crystal Creek watershed, the great majority of wetlands are concentrated along stream channels. The Six Lakes are mapped as wetlands, but apart from them wetlands are generally classified as riverine, emergent, or freshwater forested/shrub. Where the valley bottom opens up along the Scenic reach of Crystal Creek, the lateral extent of wetlands expands, too, into a broad wetland bottom.

Peak stream flows result from snowmelt in the spring because there are no dams on Crystal Creek. Estimated peak discharges of various recurrence intervals are based on peak flow calculations for Region 1 as reported in Miller (2003), and are summarized in Table 29. Calculations were made at the road/stream crossing, approximately 0.6 miles upstream from the mouth.

The Bridger-Teton National Forest has a stream gage on Crystal Creek at the trailhead, approximately four miles upstream from the mouth, which allowed Log-Pearson Type III peak flow calculations. Those results are shown in Table 2.5 for comparison with the values obtained from the Miller calculations.

Table 2.5. Peak Discharges, Crystal Creek

Peak Flow Recurrence Interval (years)	Discharge (cfs)—Miller (2003)	Discharge (cfs)—Log-Pearson Type III Method
1.5	660	--
2	766	341
5	1060	1360
10	1220	2610
25	1430	4950
50	1560	7270
100	1690	10,100

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As can be seen from the above table, peak flow estimates vary widely between the two estimation methods, especially at higher flows (longer recurrence intervals). Flow estimates for the 25-year peak and above appear to be unreasonably high using the Log-Pearson III method and should probably be viewed with great caution. Continued gauging by Forest personnel will be needed to validate or improve peak flow estimates.

Free-flowing Character: There have been no notable alterations to the free-flowing character of the Wild segment of Crystal Creek. This segment of stream is within the Gros Ventre Wilderness and impacts to the free-flowing character of the stream from trails and trail crossings along the stream are localized in nature. The magnitude of alterations to the free-flowing character of the Scenic segment of Crystal Creek depends on the amount of water withdrawn from the stream via diversions. A series of vortex rock weirs was constructed in the early 2000s in the Red Rock Ranch segment of Crystal Creek. These serve to decrease bank erosion in the reach and should not affect the free-flowing character of the stream although they change local flow characteristics. The piers of the bridge at the Gros Ventre Road may be affecting hydraulics in the vicinity of the bridge; the bridge is scheduled for replacement. Overall Crystal Creek has the appearance of a free-flowing stream.

Water Quality: Water quality data on Crystal Creek were collected upstream from the trailhead by WDEQ on September 5, 1996 and August 29, 2007 and at the Red Rock Ranch on August 31, 2004. Data from the ranch were collected in T42N, 113W, sec. 28, NE1/4, upstream from the main ranch operations. (USEPA STORET database). Results that relate to water quality standards are summarized in Table 2.6, along with pertinent Wyoming water quality standards (N/D = not at detectable levels).

Table 2.6. Selected Water Quality Data from Crystal Creek

Constituent (units)	9/5/96	8/31/04	8/29/07	State Standard
Specific conductance (umhos/cm)	237	250	143.5	None
Chloride, total (ug/l)	N/D	N/D	N/D	Aquatic life: 230,000 (chronic), 860,000 (acute)
Total suspended solids (mg/l)	N/D	4	2.7	Shall not be present in quantities that degrade designated

Constituent (units)	9/5/96	8/31/04	8/29/07	State Standard
				uses.
Turbidity (NTU)	0.68	0.9	Not measured	Human activities shall not result in an increase of more than 10 NTU.
Phosphate-phosphorus as P, total (mg/l)	N/D	N/D	0.021	No standard -- Total P recommended <0.1 and <1.0 by different sources
Nitrate + Nitrite as N (mg/l)	N/D	N/D	0.03	Human health, fishing and drinking water: 10 mg/l
pH	8.4	8.85	8.9	6.5-9.0
Dissolved Oxygen (mg/l)	9.9	6.96	7.56	Depends on aquatic life stage. 8.0 mg/l within the water column and 5.0 mg/l intergravel concentration These are minimum instantaneous concentrations to be achieved at all times.
Water Temperature (deg. C)	10.1	11.1	13.0	Under no circumstance shall maximum water temperature exceed 20 degrees C in the case of cold water fisheries.

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Constituent (units)	9/5/96	8/31/04	8/29/07	State Standard
E. coli bacteria (#/100 ml)	Not measured	Not measured	3.1	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 ml based on a minimum of not less than 5 samples obtained during separate 24 hour periods for any 30-day period.

All results reflect very good water quality conditions which is likely a function of the site's location immediately downstream from the Gros Ventre Wilderness. The relatively high pH is a function of the large amount of limestone in the watershed, and whether the dissolved oxygen levels are problematic depends on the life stage present in late summer. Stream temperatures, which are an important determining factor of dissolved oxygen, are well within state standards, however. Total nitrogen and Kjeldahl nitrogen do not have state standards, but they were measured in 2007 at 374 ug/l and 344 ug/l, respectively. It is difficult to interpret these results but the other indicator of nitrogen, nitrate + nitrite, was very low compared to standards.

The Crystal Creek slide is one of the largest active landslides in the lower 48 contiguous United States, according to local geologists. It is located on Crystal Creek, upstream from the confluence with Jagg Creek, and periodically introduces large amounts of sediment into Crystal Creek. Suspended sediments from the slide are transported downstream to the Gros Ventre River. Such episodes of sediment delivery commonly occur during spring runoff and may last several months, as was the case during the high-runoff spring of 2011. During such times turbidity is very high due to this natural occurrence.

The reach upstream from the trailhead was surveyed for a variety of physical parameters in 2007 which will provide baseline information for conditions at the time of designation, and will be useful for the evaluation of condition and trend at a later date. The survey reach was

characterized as a moderately steep and somewhat sinuous stream (a "B" type), with cobble-dominant bed material. The banks were well covered (with rock or vegetation) and were very stable.

Crystal Creek is in the Sedimentary Mountain Bioregion for WDEQ bioassessment purposes, using WY RIVPACS (Hargett, 2012) and the Wyoming Stream Integrity Index (WSII) (Hargett, 2011) assessment methodologies. Ratings from the two methodologies are used in combination to arrive at a narrative designated use support rating. In all three evaluations at both sites, the designated use support ratings were "full support". This means that water quality standards were being met to support all designated uses.

Scenic River Value: In the corridor of the lower section of Crystal Creek, outstanding scenery includes the pastoral ranch setting and meanders of the lower creek, and views of the surrounding landscape, including the middle-ground Gros Ventre Wilderness and the background Teton Range. The wilderness section includes scenic features of various kinds—multi-colored cliffs, landslides, deep pools and riffles in the creek, and views of the surrounding high peaks of the Gros Ventre Range. Near the headwaters, in the alpine zone, are fine examples of limestone topography, wildflower fields, and views to distant mountain ranges.

Recreation River Value: Increasingly popular for hunting, especially bighorn sheep in its higher reaches, this segment attracts people with steep, boldly-colored cliffs. Crystal Creek has also become one of the Headwaters' most popular areas for its wild fishery. Advocates of the new sport of packrafting have found this waterway extremely appealing. The upper reaches epitomize backcountry explorations, following the waterway's path into an open and untamed past, with few signs or sounds of the modern world. A large, active landslide highlights the dynamic nature of these wild landscapes, and visitors have experienced the requirement of adjusting their expectations to accommodate changes dictated by nature. In the scenic segment, lush bottomland meadows and rural ranchlands provide the backdrop for fishing or trailhead camping.

Ecological/Wildlife River Value: The diversity of habitat in the Wild River segment is outstanding. The stream corridor includes numerous broad riparian zones and landslide sites with diverse micro-topography that strongly enhances vegetation and wildlife diversity. Raptors such as peregrine and prairie falcons nest and forage among the cliffs and riparian habitat. Elk, bighorn sheep, and mule deer also use the corridor for migration, seasonal range, and parturition. Crystal Creek offers important breeding grounds and seasonal movement corridors for neotropical migrants, wading birds, and waterfowl. Predators such as grizzly and black bear and mountain lion regularly forage or hunt along the creek. The tremendous topographic, vegetative, and wildlife diversity of Crystal Creek, and its association with the Gros Ventre River corridor, qualify it as an outstandingly remarkable ecological and wildlife value.

The Scenic River segment is likewise important for year-round wildlife habitat, perhaps more so than the Wild River segment in winter and spring. The traditional migration route used by pronghorns to move between the upper Green River and Grand Teton National Park includes the lower stretch of Crystal Creek; this route has received special designation under the Forest Plan as the Path of the Pronghorn. Nesting habitat for Trumpeter Swans and one of the oldest occupied Peregrine Falcon nests in the area is found here. This segment contains an open creek channel that flows through several broad riparian zones with extensive stands of willow, sedge meadows, and uplands that support breeding and migration of neotropical migratory birds, wading birds, and waterfowl. Raptors, including Bald Eagle, Golden Eagle, Peregrine Falcon, Prairie Falcon and Osprey, nest and forage along the cliffs, and hunt in the riparian habitat and adjacent uplands that border the Crystal Creek and the Gros Ventre River. The agricultural fields and sagebrush communities near the mouth of Crystal Creek are particularly important for pronghorn for feeding and resting during the non-winter months.

Fisheries River Value: Crystal Creek is known as an outstanding native trout fishery. It contains Snake River cutthroat trout, a nationally significant species of concern, along with mountain whitefish and mottled sculpin. Exceptional habitat quality occurs throughout the scenic and lower wild sections of the stream and provides important spawning habitat for Snake River cutthroat trout and recruitment to the Gros Ventre River. Fast-water habitats and confined stream character in rocky canyons alternate with wide meanders in open meadows. Multiple pocket pools created by large boulders or large woody debris are present in some stretches. Substrate varies, generally distributed between boulders, a large amount of cobbles and gravel, and a small amount of fines. Boreal chorus frog, a management indicator species, is present in both segments. Given the high quality habitat and abundance of Snake River cutthroat trout, both segments of Crystal Creek are determined to exhibit an outstandingly remarkable value for Fisheries.

Geologic River Value: Crystal Creek penetrates deep into the Gros Ventre Wilderness, nearly bisecting it north-to-south between the mouth and the drainage divide with Swift Creek to the south. Because it extends so far into the wilderness it passes through many of the geologic features that were part of the reason the Gros Ventre Wilderness was designated. An expanse of rare alpine Karst topography is found in the headwaters. Below, cascades, falls and clear pools abound. Classic glacial features and landslides are seen along the corridor. In 2007, and again each year since, a major landslide has occurred in the corridor, moving the creek and providing an outstanding example of the large slides typical of this area. The Crystal Creek slide is one of the larger landslides in Wyoming and is a textbook example of a large rock landslide.

The Scenic River segment of Crystal Creek is a high-bedload stream with braided and meandering reaches. There is a narrow canyon just above the parking area and spectacular exposed sedimentary geology throughout the watershed that makes the stream exceptional.

The landslide, the exposed sedimentary geology, and the nature of the stream make geology an outstandingly remarkable value for both the Wild and Scenic segments of Crystal Creek.

Landscape Character: The segment of Crystal Creek from its source to the Crystal Creek trailhead is entirely within the Gros Ventre Wilderness, a primitive setting with no development other than trails and established campsites. The Scenic River section is in a Rural Recreation Opportunity Spectrum setting, with ranchland and associated structures. Much of the private land is covered by conservation easement and/or natural resource overlay. The creek has been altered slightly on private lands for fish habitat improvements and diversions. Private land in the corridor is zoned Rural.

Granite Creek

Granite Falls

Basic Hydrology and Basin Characteristics: The Granite Creek watershed is 85 square miles (54,375 acres) in size as calculated using Forest Service GIS. The stream flows in a generally southerly direction (bowing in an easterly arc) to its confluence with the Hoback River. Its two major tributaries include Little Granite Creek and Boulder Creek (which is tributary to Little Granite). The stream's headwaters are in the Gros Ventre Mountains, which were formed by a 50-70 million year old compressional event. Valley bottom gradients along mainstem Granite Creek are generally less than 5% at a broad scale of evaluation. Valley bottom gradients at the headwaters of some tributaries steepen to 10 to 20% slope.

The Granite Creek headwaters channels flow through glacial cirques in an alpine and subalpine environment. Numerous intermittent and ephemeral channels coalesce to form highly-meandering streams that flow through wet meadows and shrublands. Moving downstream, the glacial valley becomes more confined and while the stream still meanders

freely and has an extensive floodplain, its general path is more laterally confined. The valley gradient steepens at the Box Creek confluence, accompanied by a change in channel character at this point. The channel is downcut and no longer has an extensive floodplain from this point downstream, and is largely confined by its immediate sideslopes. Downstream from the Bunker Creek confluence Granite Creek changes character again, this time acquiring a braided form as it transports large amounts of coarse sediment transported to the channel from valley side slopes and from tributary channels. Channel form continues to vary down to the Wilderness boundary, responding to variable inputs of rock from valley walls and confinement by valley walls and bedrock along its path.

Downstream from the Wilderness boundary, Granite Creek is mostly a meandering Rosgen "C" type channel that carries large quantities of coarse sediment, from gravel to boulder in size (although most of the material ranges up to cobble in size). Portions of it become braided where deposits build up and multiple channels form, and there are also overflow channels that only carry water during high flows. Old, abandoned channels are also visible where the channel has moved to the opposite side of the valley, leaving portions of channel that now only contain groundwater or water from precipitation and often support riparian vegetation.

National Wetlands Inventory maps show wetlands varying along the length of Granite Creek. In the headwaters there are a variety of wetland types, including lakes, ponds, wetlands with emergent vegetation, and wetlands with forested and shrub vegetation. These are all associated with the upstream-most channels in the watershed and are spread throughout the headwater cirque. Moving downstream, drainage is better-developed, valley sideslopes steepen, and wetlands are almost exclusively confined to mainstem Granite Creek. Roughly halfway through the drainage there are still extensive shrub/scrub wetlands, ponds, and riverine wetlands along Granite Creek. They are mapped for the rest of the designated reach, though their extent abruptly declines in the southwest corner of section 30, T39N, R113W.

Peak stream flows shown in Table 11 result from snowmelt in the spring because there are no dams on the Granite Creek. Estimated peak discharges of various recurrence intervals are based on regional equations as reported in Miller (2003), and are summarized in the following table.

Table 2.7. Peak Discharges, Granite Creek

Peak Flow Recurrence Interval (years)	Discharge (cfs)
1.5	636
2	749
5	1060
10	1250
25	1490
50	1630
100	1790

Free-flowing Character: The magnitude of alterations to the free-flowing character of Granite Creek may depend on the amount of water withdrawn from the stream via diversions. Impacts to flow hydraulics from structures in the bed and banks of the river include three bridges that cross the creek within the designated reach and portions of the toe of fill from road 30500 that may encroach on the creek for 0.8 miles upstream from the Little Granite Creek confluence. Overall, however, impacts to the free-flowing character are minimal and Granite Creek has the appearance of a free-flowing stream.

Water Quality: Water quality data on Granite Creek were collected above and below Granite Hot Springs from June 1971 to May 1972. While the data collected below the hot springs showed degradation due to overflow from outdated sanitation facilities that have since been replaced, data from above the hot springs may provide useful baseline information, especially since the summary report notes state that "The complete chemical reports on this station reflect excellent quality of water and can be used as a guideline in establishing standards for this area." Unfortunately, most of the data parameters were not collected in the same form as state standards, so it remains to be seen if the information is useful. Summarized information for the site upstream from the hot springs is provided in the following table.

Table 2.8. 1971-1972 Water Quality Data, Granite Creek above the Hot Springs

Constituent	Units	Range	State Standard
Biological Oxygen Demand	BOD (mg/l)	0.2-1.2	None
Phosphate	PO4 (mg/l)	0.01-0.25	None-- Total P recommended <0.1 and <1.0 by different sources
Nitrate	NO3 (mg/l)	0.08-0.37	10 mg/l (NO3 as N)
Coliform	MPN/100ml	<3 to 40, with one instance of 150	Bacteria are in terms of E. coli.
Fecal Coliform		"negligible" to <1	Bacteria are in terms of E. coli.
Fecal Strep		"negligible" to <1	Bacteria are in terms of E. coli.
Total Solids	mg/l	110.0-132.0	Standards are in terms of degradation of designated uses
Total Chlorides	as Cl (mg/l)	5.0-18.0	Acute=860, chronic=230

On May 24, 1972, the hot water inlet to the pool was recorded as having coliform=250/ml (possibly should have been 250/100 ml).

Sediment: A macroinvertebrate report on stream conditions between 2002 and 2007 in the area (Marshall, 2011) found that "[b]enthic communities of Granite Creek appear to be influenced by some form of disturbance that introduced sediment and nutrients to the stream". With caveats about the need for caution in interpreting data from unreplicated samples, the author determined that the taxonomic composition of Granite Creek's macroinvertebrate community appears to be adjusting to fire-derived sediment from the 2000 Boulder Creek fire.

Sandra Ryan and William Emmett collected extensive sediment transport data on Little Granite Creek between 1982 and 1997, characterizing sediment transport processes in this sub-watershed of Granite Creek. These data provided baseline information to assess the impact of wildfire on runoff and sediment loads when the 2000 Boulder fire burned portions of the Little Granite Creek watershed (burning mainly occurred in the portion that feeds

Boulder Creek). Sandra Ryan and Kathleen Dwire have been evaluating these changes since 2000, confirming that there have been notable increases in post-fire sediment loads in Boulder Creek, mainly due to increased channel instability from large woody debris loading (Ryan and Dwire, 2009).

Other Water Quality Data: No water quality samples have been collected on mainstem Granite Creek. Two samples were collected on Little Granite Creek, based on STORET records. One sample was collected on September 1, 1993 and the other was collected on August 27, 2002. Sampled constituents having water quality criteria are summarized in the following table.

Table 2.9. Little Granite Creek Water Quality Data and State Standards

Criterion	Values	State Standard	Standard met?
Turbidity (NTU)	1.39-2	The discharge of substances attributable to or influenced by the activities of man shall not … result in a turbidity increase of more than ten (10) nephelometric turbidity units (NTUs).	Yes
Water Temperature (deg C)	8.0-8.1	under no circumstance shall maximum water temperature exceed 20 degrees C in the case of cold water fisheries	Yes
pH	8.42-8.6	6.5-9.0	Yes
Nitrate + nitrite as N (ug/l)	100 (no data in 2002)	10,000	Yes
Dissolved oxygen (ug/l)	5-9.8	8.0 (5.0 for species that have early life stages exposed directly to the water column). These are instantaneous concentrations to be achieved at all times.	Depends on life stage present

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Scenic River Value: Scenery in the Wild River segment includes a classic U-shaped glaciated valley, evident for the length of the upper river segment and visible from the roadway and campground. Imposing cliffs and high peaks as well as the beauty of the river itself and surrounding talus slopes, wildflower fields, and forest contribute to outstanding scenery. Turquoise Lake is one of two alpine tarns within the Snake River Headwaters system (the other being Shoal Lake to the east). The lake, the upper end of the creek, and surrounding mountains of over 11,000 feet contribute to outstanding scenic values in the Wild River segment. Below the wilderness boundary in the Scenic River segment roadside views of the meandering creek, whitewater runs, cascades such as Granite Falls, surrounding cliffs, and mountains in the southern Gros Ventre Range all contribute to scenic values.

Recreation River Value: Recreation use includes fishing, hiking, camping and kayaking, scenic driving, hunting, horseback riding and winter sports. In the wild segment, Turquoise Lake is one of only two alpine tarns within the Snake River Headwaters system. This piece of the Snake River Headwaters provides access to many other trails throughout the Gros Ventre Wilderness, dispersing visitors for few encounters even during the summer tourist season and fall hunting season. At the upper end of the scenic segment, Granite Hot Springs is a major attraction, unique within the Bridger-Teton National Forest. A Civilian Conservation Corps-built bathhouse exists at the site. Outfitter-guides operate in winter in the lower segment providing dogsled rides and snowmobile tours that terminate at the hot spring. Granite boulders and bedrock also loom over a picturesque 30-foot+ waterfall with undeveloped hot springs at the base. Class V whitewater above and Class III whitewater below the falls make the drainage unique at many water levels. This tributary of the Hoback River is one of the most recreationally diverse sections in the Headwaters, with many activities available within a small area.

Cultural River Value: The Granite Hot Springs Pool and Bath House are located on the east bank of Granite Creek at the end of the Granite Creek Road. The site consists of a concrete swimming pool and log bathhouse, both of which were built by the Civilian Conservation Corp (CCC's) during the 1930's. The Granite Hot Springs Pool and Bathhouse are historically significant not only because of their association with the Civilian Conservation Corp, but also because these facilities enhanced recreation opportunities on the Forest during and immediately following World War II.

Ecological/Wildlife River Value: The Wild River segment has several prominent riparian zones interspersed with large forb and grass meadows and extensive conifer stands. Several sections contain springs, oxbows, and side channels. These habitats support waterfowl, neotropical migratory birds, wading birds, and several aquatic mammals. Numerous waterfowl, including an occasional harlequin duck, forage the length of the creek. American dippers and spotted sandpipers are common summer residents. Nesting and foraging Peregrine and Prairie Falcons use adjacent cliffs and riparian habitat. Northern Goshawk, Cooper's Hawk and Sharp-shinned Hawks nest in adjacent uplands and forage frequently

along the creek. Turkey Vultures, once a rare species in the Greater Yellowstone region, are now common summer residents and can be observed soaring over the drainage. The wild upper section provides important habitat for large numbers of moose, elk, and mule deer, and the creek corridors support numerous beaver. The upper corridor thus qualifies as having an outstandingly remarkable ecological and wildlife value at both a regional and national scale.

The Scenic River segment has broad riparian zones and sagebrush steppe communities along most of its length. The riparian zone contains numerous ponds, side-channels, and oxbows that provide habitat for beaver and moose, and the willow communities and stream channel are used by neotropical migratory birds, waterfowl, and shorebirds. Active beaver colonies that visitors can view from the roadway provide remarkable examples of the ecological functioning of wetlands, complete with waterfowl, including occasional Harlequin Ducks. Hawks, Turkey Vultures and a nesting pair of Peregrine Falcons commonly use the riparian corridor and/or the adjacent uplands seasonally for foraging. Pronghorn are occasionally found within the river corridor.

Fisheries River Value: In the Wild segment, from Darwin Ranch to Ouzel Falls (.5mi) has an active fishery. Ouzel Falls is a barrier to fish passage. All fish above the falls have been planted. Forest Service records indicate that brook trout were found above the falls in small numbers. Fish are considered an ORV in the portion of the segment downstream from Ouzel Falls due to the presence of cutthroat trout and other native species, high species diversity, and natural reproduction of native species.

The Scenic classification of the Gros Ventre River from Darwin Ranch to the boundary with GTNP is the most productive fishery in the Forest Service managed portion of the river. The segment has been stocked with cutthroat trout and brook trout. This segment contains Snake River and Yellowstone cutthroat trout, Forest Service designated Sensitive Species and Wyoming species of concern. The segment includes at least nine native fish species (Snake River and Yellowstone cutthroat trout, mountain whitefish, mountain sucker, bluehead sucker, mottled sculpin, longnose dace, speckled dace, redside shiner) that were historically present in the Greater Yellowstone Ecosystem. Amphibians likely include Management Indicator Species boreal chorus frog.

Geologic River Value: Granite Falls and Granite Hot Springs are geologic features of special interest; rock formations in the cliff bands include the Open Door and a natural bridge just upstream from the hot springs area. The creek cuts through a variety of geologic strata from thick layers of limestone to more ancient granitic and metamorphic rocks. The creek is clear, running a translucent green as it enters the chocolate-brown Hoback River during high water. It is cold even in late summer when water is low. A classic glacial valley with steep canyon walls and a remnant tarn at its head is visible from the Granite Creek Road and accessible via trail. Evidence of glaciation includes house-sized erratics left near the creek as

the glacier retreated. Opportunities for interpretation of the glacial history of Granite Creek are outstanding.

Landscape Character: The Wild segment of Granite Creek, from its source at Turquoise Lake to Granite Hot Springs, is within the Gros Ventre Wilderness. The setting is semi-primitive along the trail corridor due to its popularity with hikers; there are no developments other than trails and established campsites, including an assigned camp for an outfitter. The Scenic River section is in a Rural and Roaded-natural appearing Recreation Opportunity Spectrum setting, with small ranches, resorts and camps with their structures

Current conditions are compatible with the stream designation for both the Wild River and Scenic River segments.

Gros Ventre River

Basic Hydrology and Basin Characteristics: The Gros Ventre watershed is 624 square miles (399,375 acres) in size as calculated using Forest Service GIS. The portion on the Forest is 606 square miles (387,875 acres). The river first flows northeast and east from its headwaters in the Gros Ventre Range, then turns north at the confluence with Kinky Creek, and flows northwest when it encounters the base of Bacon Ridge, bending to the southwest at the Forest/ Grand Teton National Park boundary before making its way to the Snake River. Its major tributaries are Fish Creek, Cottonwood Creek, Slate Creek, and Crystal Creek.

The upper reaches of the Gros Ventre River meander freely through meadows and shrub-dominated wetlands, and have many abandoned meanders/oxbows that are typical of a Rosgen "C" type channel. Where forested vegetation dominates the floodplain, the stream becomes more confined and meanders less. North of Kinky Creek, the stream flows north through old landslide deposits and is confined to a course with a narrow floodplain, in a forested valley. As the stream bends to the northwest and flows along the base of the south-facing slope of Bacon Ridge, the valley opens up and it begins to transport more sediment, and more bedload (coarse material—cobble, gravel) in particular. This leads the channel to assume a braided, multi-channel form (Rosgen type D), which is more efficient at transporting large amounts of coarse material than a single-thread channel. Continuing downstream to the

northwest, the channel becomes single-thread and assumes more of a Rosgen "C" type channel roughly downstream from Lloyd Creek. It maintains this form to the confluence with Fish Creek, at which point it becomes steeper and begins to braid again due to the high coarse sediment contribution from Fish Creek. Fresh point bars become less prominent and the channel becomes less braided in the downstream direction, until, near Upper Slide Lake, it once again assumes a single-thread form. From here to Lower Slide Lake the stream becomes significantly more confined by valley side slopes, comprised of bedrock, glacial deposits, and materials that have been deposited by water and gravity off the higher surrounding peaks. Below Lower Slide Lake, landslide material from the Gros Ventre Slide fills the valley bottom and the channel, and the river flows in a confined valley setting to the Forest boundary.

National Wetlands Inventory maps show concentrated areas of wetlands along the Gros Ventre River from the headwaters to the unnamed stream approximately 0.75 miles downstream from Kinky Creek. These wetlands are classified as either Freshwater Forested/Shrub or Freshwater Emergent Wetlands based on aerial photo interpretation of their vegetation. From this point downstream almost to the Jones Creek confluence there are virtually no wetlands along the Gros Ventre; instead, there are scattered ponds in the valley on either side, extending far up the slopes. For the remainder of the designated reach, especially downstream from the Fish Creek confluence, wetlands are plentiful along the Gros Ventre, and are classified as Riverine, Freshwater Forested/Shrub, or Freshwater Emergent Wetlands. Wetlands are scattered throughout the rest of the watershed, with a notable concentration of ponds in the headwaters of the South Fork Fish Creek portion of the drainage.

The U.S. Geological Survey (USGS) operates a stream gage on the Gros Ventre River (station number 13014500, Gros Ventre River at Kelly, Wyoming) in cooperation with the Wyoming Game and Fish Department. The gage was operated discontinuously from 1918 to 1958. Data collection resumed in 2008 and the gage has been operated since then when funds have been available. Drainage area above the site is 622 square miles. It is noted in the USGS records that discharges are affected to an unknown degree by regulation or diversion upstream from the gage site. The maximum recorded peak discharge to date at the site occurred on June 16, 1918, when streamflow reached 6,960 cfs. The lowest mean daily flow (estimated) was 102 cfs on December 16, 1944.

Estimated peak discharges of various recurrence intervals are based on peak flow calculations for Regions 1 and 5 (because the site is near the boundary of the two regions) as reported in Miller (2003), and are summarized in Table 34. Calculations were made at the Kelly gauge, approximately 2.8 river miles downstream from the Forest boundary.

Because the USGS has a stream gage on the Gros Ventre River at Kelly, Log-Pearson Type III peak flow calculations are also presented. Those results are shown in Table 2.10 for

comparison with the values obtained from the Miller calculations. As stated in the USGS data for the gauge, the effect of upstream diversion on peak flows is unknown.

Table 2.10. Peak Discharges, Gros Ventre River

Peak Flow Recurrence Interval (years)	Discharge (cfs)—Miller (2003)—Region 1 Equations	Discharge (cfs)—Miller (2003)—Region 5 Equations	Discharge (cfs)—Log-Pearson Type III Method
1.5	3650	1380	--
2	4140	1780	3410
5	5460	2820	4340
10	6200	3520	4950
25	7100	4390	5720
50	7570	4970	6290
100	8100	5580	6860

As can be seen from the above table, peak flow estimates vary between the estimation methods. Continued gaging by the USGS will be needed to validate or improve peak flow estimates.

The Federal Emergency Management Agency (FEMA) has designated 100-year floodplains along the designated reach of the Gros Ventre River, from the Forest boundary to a point upstream from Bear Cabin Creek in the Gros Ventre Wilderness. Individual Flood Insurance Rate Map panels and seamless floodplain boundaries may be viewed on the Teton County Map server at http://www.tetonwyo.org/gis. 100-year floodplains are those areas having a 1% chance of flooding in a given year.

Free-flowing Character: There have been no notable alterations to the free-flowing character of the Wild segment of the Gros Ventre River. This segment of stream is within the Gros Ventre Wilderness and impacts to the free-flowing character of the stream from trails and trail crossings along the stream are localized in nature.

The magnitude of alterations to the free-flowing character of the Scenic segment of the Gros Ventre River depends on the amount of water withdrawn from the stream via diversions. As stated in the USGS flow records, flows have been altered by diversions although there are no

dams on the river. Changes to the free-flowing character of the river may have also resulted from instream alterations to the channel made by irrigators to facilitate use of their diversions. Other changes may have been made to the channel bed and banks to reduce bank erosion or for other purposes. There are proposals to create wetlands that would alter the river banks and divert flow from the channel; these would have to undergo Section 7 analysis to ensure that the free-flowing character of the river is not affected. Stream crossings at bridges alter local hydraulics where piers or footings are within the bank-full channel. The original Gunsight Bridge that had several piers was recently replaced by a wider span with one pier. There are five bridges, total, on the designated segment of the Gros Ventre River that is on National Forest System lands. Overall, however, the Gros Ventre River has the appearance of a free-flowing stream.

Water Quality: There are no municipal water supplies associated with the Gros Ventre River. Water quality data on the Gros Ventre River were collected at three locations and listed in the USEPA STORET database. Results that relate to water quality standards are summarized in Table 2.11 below, along with pertinent Wyoming water quality standards (N/D = not at **detectable** levels).

Table 2.11. Selected Water Quality Data from Gros Ventre River

Constituent (units)	Upstream from Horn Ranch (2002)	Near Soda Lake (2002)	At NP/FS Boundary (2006-2007)	State Standard
Ammonia (mg N/l)	Not measured	Not measured	N/D	Varies with pH
Apparent color	None	None	Not observed	Human activities cannot visibly alter the natural color of the water or cause water to impart color to skin, clothing, vessels or structures
Arsenic	Not measured	Not measured	N/D	Most restrictive: 10 ug/l for human health, fish, and drinking water.
Specific conductance (umhos/cm)	456	546	180 to 927	None
Chloride, total (ug/l)	N/D	N/D	Out of six samples, 5 were N/D, one was 1040 ug/l	Aquatic life: 230,000 (chronic), 860,000 (acute)
Copper	Not measured	Not measured	N/D	Hardness-dependent
Iron	Not measured	Not measured	N/D	Most restrictive: 300 ug/l for human health, fish, and drinking water.
Nitrate (as N)	Not measured	Not measured	N/D	10,000 ug/l
Nitrate + Nitrite as N (mg/l)	0.1	N/D	N/D	Human health, fishing and drinking water: 10 mg/l
Total suspended solids (mg/l)	3	3	2 to 4	Shall not be present in quantities that degrade designated uses.
Turbidity (NTU)	0.51	1.13	Not measured	Human activities shall not result in an increase of more than 10 NTU.
Phosphate-phosphorus as P, (mg/l)	N/D	N/D	5 samples: 3=N/D, 1=0.026, 1=0.037	No standard -- Total P recommended <0.1 and <1.0 by different sources
Selenium	Not measured	Not measured	N/D	Most restrictive: Chronic value for aquatic life = 5 ug/l (total recoverable metal). This equates to 4.61 ug/l dissolved metal.
pH	8.7	8.38	8.15 to 8.33	6.5-9.0
Dissolved	6.23	8.78	8.3 to 8.78	Depends on aquatic life

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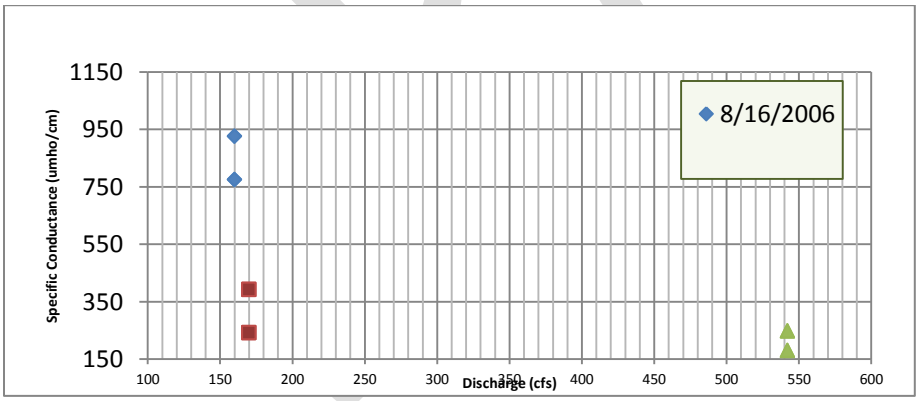
Constituent (units)	Upstream from Horn Ranch (2002)	Near Soda Lake (2002)	At NP/FS Boundary (2006-2007)	State Standard
Oxygen (mg/l)				stage. 8.0 (5.0 for species that have early life stages exposed directly to the water column). These are instantaneous concentrations to be achieved at all times.
Water Temperature (deg. C)	14	9.1	4.94 to 16.5	Under no circumstance shall maximum water temperature exceed 20 degrees C in the case of cold water fisheries.

All results reflect very good water quality conditions. Specific conductance values reflect dissolved solids in the system. This parameter often increases with decreasing discharge due to dilution effects. Flows were measured on three of the dates that specific conductance was measured at the Grand Teton National Park/Forest boundary; plotting the two values against each other produces the relationship shown in Figure 3, which appears to validate the dilution effect. Flows were similar on August 16 and October 23, 2006, but specific conductance varied substantially, so other factors may have been involved.

Figure 2.2. Discharge vs. Specific Conductance, Grand Teton NP/Bridger-Teton NF Boundary



Scenic River Value: The valley of the Gros Ventre River contains expansive open terrain with exposed sedimentary rock layers of many colors; cliff banks, dense forest, and narrow canyons. The river alternates between a broad cottonwood-lined bottom and narrow incised canyons. Distant views of the Teton Range are spectacular, as are local features such as the Red Hills, cascades and waterfalls in the Wild River segment, and an outstanding example of subalpine parklands in the uppermost reach of the river. Surrounding peaks and cliffs add to

the beauty of this river throughout its length. The variety of landscape features surrounding the river is unique.

Recreation River Value: Recreation is a year-round affair in the river corridor from spring kayaking to fall hunting, summer camping to winter sports, easily accessible via the Gros Ventre Road, which runs for most of the Scenic River segment. With the current travel regulations in effect the road is closed beyond Slate Creek until June 1, offering a unique opportunity to experience the valley via foot, horseback, or mountain bike while the spring wildlife migrations are going on. In the Wild River section, hunting, camping, and fishing via horseback is the primary activity, with several outfitters and guest ranches operating in the corridor.

The Scenic River section of the Gros Ventre is particularly notable for its rustic yet accessible recreation. This long river corridor offers a remote feel and is highly valued by people whether the activity is scenic driving on a primitive road, viewing wildlife, photography, fishing, hunting, kayaking, camping, all-terrain-vehicle riding or snowmobiling.

In both river segments, this river exemplifies the overall extraordinary value identified for the Snake River Headwaters system. It has a remarkable diversity of recreational experiences available, tied together within a single waterway, and made more distinctive by the wealth of other resource values that contribute to this experience.

Cultural Resources River Value: Values include prehistoric sites: one with artifacts up to 10,000 years old, another with the only known petroglyph on the forest. Large stone circle sites of undetermined age are also found in the river corridor. The river corridor has been used for millennia by humans, and has the most potential to yield important archeological information on the forest.

The river corridor also served as one of the main transportation routes into Jackson Hole during historic times. The President Chester Arthur expedition of 1883 traveled down the valley on its way to the Yellowstone country. The early 1900s saw the establishment of a number of homesteads in the valley, including the Darwin Ranch and the Dew Homestead, the remains of which can still be seen on the banks of the Gros Ventre River just upstream from the confluence of Fish Creek. Other historic structures include the Gap Puche outfitting cabin, which is on the National Register of Historic Places.

Wildlife/Ecological River Value: Known as the ‘little Serengeti’ of Jackson Hole, the Gros Ventre corridor has many wildlife resources and habitats that are exceptional for the Yellowstone Ecosystem and that are rare at the regional and national scale. The river corridor supports a diverse array of aquatic birds, mammals, and amphibians—many federally endangered or sensitive. These species rely on the unique habitats which have developed in association with the area’s many landslides, slumps, and waterways impounded by unstable

topography, including the Upper Slide Lake. The steep cliffs (near Lower Slide Lake; Lavender, Red, and Grey Hills) provide nesting habitat for several raptor species (including falcons, buteos and Osprey) which depend on the river corridor for crucial foraging habitat. The braided waterways, broad riparian zones, and the upper meanders of the Gros Ventre River provide excellent breeding habitat for shorebirds, waterfowl and passerine birds including both year-round residents and seasonal, and neotropical migratory birds. The Gros Ventre River provides an important bird and mammal migratory corridor between the Snake and Green River drainages and also provides important stop-over sites for migratory birds including Common Loon, White-faced Ibis, and many species of ducks. In addition, Trumpeter Swans have nested for many years on Upper Slide Lake and subadult swans summer on Lower Slide Lake and the broader reaches of the river.

Much of the river segment encompasses the National Pronghorn Migration Corridor, an important travel route and summer breeding ground for a small (< 200) population of pronghorn. Moose winter range is found along the river, and bighorn sheep will move down to the lower Gros Ventre in the winter as well. The Jackson bighorn sheep herd, designated a Wyoming core herd, utilizes the upper Gros Ventre; this herd has never received a supplemental transplant and has thus been continuously self-sustaining. Taller browse shrub species, such as mountain sagebrush, bitterbrush, and willow provide critical winter benefits.

The corridor also supports a small number (< 100) of Upland Sage Grouse, a species recently identified as a candidate for endangered status under the Endangered Species Act. These birds are unique among members of this species because they occupy sagebrush habitats at the interface with conifer forests at high (> 7,500 feet) elevations. This population also serves to provide a genetic link between the Jackson Hole and Upper Green River populations. Many of the habitats used by the grouse are within the river corridor. The strong diversity and abundance of fauna along the river, coupled with the pristine and diverse wildlife habitat, constitute an outstandingly remarkable ecological and wildlife value.

Fisheries River Value: From Darwin Ranch to Ouzel Falls the Wild River segment has an active fishery, but Ouzel Falls is a barrier to fish passage. All fish above the falls have been planted. Forest Service records indicate that brook trout were found above the falls in small numbers. The Scenic River segment has been stocked with cutthroat trout and brook trout. This segment contains Snake River and Yellowstone cutthroat trout, Forest Service designated “Sensitive Species” and Wyoming species of concern. The

segment contains eight native fish species (Snake River cutthroat trout, mountain whitefish, mountain sucker, bluehead sucker, mottled sculpin, longnose dace, speckled dace, redside shiner,) that were historically present in the Greater Yellowstone Ecosystem. Boreal chorus frog, a management indicator species, is present in both segments. Fisheries are considered an outstandingly remarkable value due to the presence of cutthroat trout and other native species, high species diversity, and natural reproduction of native species.

Geologic River Value: The river environment and adjacent hillsides have unique geologic features which include the Gros Ventre Slide Geologic Area (some of which is outside the designated corridor). The Grey, Red, and Lavender Hills provide scenic interest unusual for the Central/Yellowstone Rockies. The colored sedimentary rocks have sparse vegetation and are therefore quite striking and unusual features; they look more typical of the Colorado Plateau. The Gros Ventre Slide is designated as a geologic area and has a developed interpretive trail. This landslide, which occurred in 1925 and is about 600 acres in size, formed Lower Slide Lake. This slide is among the largest in the United States that has occurred during historic times. The upper Gros Ventre slide has also created a lake; it is still active, a deep and slowly creeping formation of saturated clay. The upper end of the river provides a fine example of a meandering stream, with abundant oxbows. These occur in both the Wild and Scenic segments of the river.

Landscape Character: The Wild segment of the Gros Ventre River, from its source to the Darwin Ranch, is within the Gros Ventre Wilderness. The setting is primitive, with trails, some wooden allotment fences, and established outfitter camps being the only developments. The Scenic River section is in the Roaded-natural appearing and Rural Recreation Opportunity Spectrum settings. Ranches, ranch resorts and irrigated fields occur in some places. Some of the private land parcels are covered by conservation easement; all are within the natural resource overlay. For the most part, current conditions are compatible with the Wild and Scenic designation of the Gros Ventre River.

Hoback River

Basic Hydrology and Basin Characteristics: The Hoback River watershed is 571 square miles (365,440 acres) in size as calculated using a combination of information from the U.S. Geological Survey and Forest Service GIS. The river starts out flowing north from its headwaters in the Wyoming Range before turning northwest upstream from Bondurant, and finally flowing generally west in the designated reach to its confluence with the Snake River at Hoback Junction.

Valley bottom gradients are generally less than 2.5% below the point where the South Fork Hoback River and the mainstem river join. In the designated reach, the valley gradients are 0.5 to 0.7%, with gradients through the Hoback Canyon slightly steeper than those

downstream from the canyon. During the early part of high runoff in spring 2011, water surface slopes from Kozy Campground to the Snake River confluence were estimated at 0.5 to 0.6%.

The upstream end of the designated reach (in the canyon) is laterally confined by the canyon walls so meandering is restricted, i.e., the stream is pretty much confined to its current location. This is not to say that changes do not occur in this reach of channel, however. Landslides, snow avalanches, and continual smaller-scale surface hillslope erosion along this reach of stream deliver sediment directly to the channel and block portions of it, causing flow diversion and changing the instream form of channel features. This material ranges from boulders to fine materials in size. Landslides also deliver coarse wood to the stream, including whole trees, which further alter sediment delivery and transport in the channel. Channels are Rosgen "B" and "C" types through the canyon.

Downstream from the canyon, the Hoback River flows through alluvial fan and stream terrace materials. These materials, which were deposited by moving water, are easier for the stream to erode than the bedrock in the canyon, and the river has well-developed meanders here. Nevertheless, due to geologic uplift in the region, the stream has downcut vertically through these "softer" materials and so is not actively moving very far laterally now after having developed a meandering pattern, i.e., its meanders are fairly well locked in place. This describes a Rosgen "F" type channel. It appears, though, that some long-term adjustment may be taking place beginning at the mouth of the Hoback, and working its way upstream, perhaps in response to some changes in the Snake River. Active landslides in this section of the valley may also influence the stream.

Nine bridge crossings along the Hoback River within the designated reach (and more crossings upstream from the reach), affect the channel. There are also remnant abutments from bridges that are no longer functional along the river banks. While most bridge abutments span the channel, some do not, especially during high flows like those experienced during 2011. Because the river is very wide, many of the bridges also have instream piers which, along with abutments, catch instream debris, alter hydraulics, and alter sediment entrainment and deposition in the channel. Locations where the highway abuts, but does not cross the river also impact the channel, especially through the constricted canyon reach. The Lower Valley gas pipeline involved dredging through the Hoback channel at several locations to lay the pipeline under the bed of the stream, altering riparian vegetation, and disturbing soil within the bed and banks of the channel. Private development up to the banks of the river, including roads, trails, irrigation diversions (discussed elsewhere), and other features remove vegetation, harden banks, and alter channel form and function. Forest Service campgrounds along the river have also impacted the channel; the Hoback Campground and Picnic area, with its sites on the river bank and in the riparian area of the designated reach, encourages the public to recreate on a 1500-foot long reach of stream bank

adjacent to the highway, resulting in loss of riparian vegetation and alteration of channel function along the bank where it is located.

National Wetlands Inventory maps show wetlands almost exclusively associated with the active stream channel in the vicinity of the designated reach. Wetlands along the Hoback River are almost all riverine wetlands (generally defined in this situation as wetlands contained within a channel), and palustrine wetlands, which are generally described as nontidal wetlands having relatively shallow water, that are small in size, and located on the boundaries of the other wetland systems. Palustrine systems include vegetated wetlands such as marshes, bogs, intermittent or perennial ponds, fens, etc.

The U.S. Geological Survey operated a stream gage (station number 13019500) on the Hoback River near Camp Creek from 1917 to 1958 (officially known as Hoback River near Jackson, Wyoming). The drainage area above the site was 564 square miles. The maximum discharge for the period of record occurred on June 16, 1918, when streamflow reached 6,160 cfs. The minimum discharge for the period of record was 90 cfs, recorded on December 18, 1946.

Peak streamflows result from snowmelt in the spring because there are no dams on the Hoback River. Estimated peak discharges of various recurrence intervals are based on gage data from the Hoback gaging station for the period 1918 to 1958, as reported in Miller (2003), and are summarized in Table 2.12.

Table 2.12. Peak Discharges, Hoback River near Jackson, Wyoming

Peak Flow Recurrence Interval (years)	Discharge (cfs)
1.5	3350
2	3790
5	4800
10	5400
25	6110
50	6600
100	7070

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Miller's calculated peak flows apply to the period of record for the USGS gage. The gage was removed due to adverse hydraulic effects at the bridge, and the bridge has since been replaced. New data need to be used to evaluate flows on the Hoback River, and the Bridger-Teton National Forest had a stream gage near the mouth of the river (approximately 4 river miles downstream from the USGS gage site) from 2002 to 2011, at which point extremely high stream flows washed out the gage. Although the flow record is incomplete, and corrections to data were not made in a timely manner (which makes some of the data subject to interpretation), it provides valuable recent data on river flows. Peak flows up to 4,400 cfs in magnitude were recorded at the gage. The gage was replaced in 2012 in cooperative effort with the USGS.

Free-flowing Character: The magnitude of alterations to the free-flowing character of the Hoback River may depend on the amount of water withdrawn from the stream via diversions, including water withdrawn upstream from the designated reach. Impacts to flow hydraulics from structures in the bed and banks of the river, described above (mainly bridge abutments and piers) would cause changes in sediment and wood transport downstream from such features, altering channel form for some distance downstream. Overall, the Hoback River has the appearance of a free-flowing stream.

Water Quality: Chloride, nutrient, pH, and temperature data all meet State standards. The Sublette County Conservation District collects periodic water quality data at the Hoback Campground year-round. Data are currently available from 2002 to 2007 for the Campground site, although the Conservation District is still collecting data. The following summarizes available data for the Campground site, which is within the designated reach.

<u>Sediment:</u> State standards for sediment and turbidity are generally written in terms of impacts on designated uses. In the case of turbidity, human impacts cannot cause an increase of more than 10 NTU in turbidity. Sublette County Conservation District data show notable increases in turbidity only during spring runoff, which is a natural occurrence.

<u>Dissolved Oxygen:</u> Dissolved oxygen levels in the Hoback River generally met state standards. There were a number of occasions when they were lower than the one day minimum cold water criteria, which vary from 4.0 to 8.0 mg/l, depending on the life stage of aquatic life being considered. Figure 2.3 shows measured dissolved oxygen levels.

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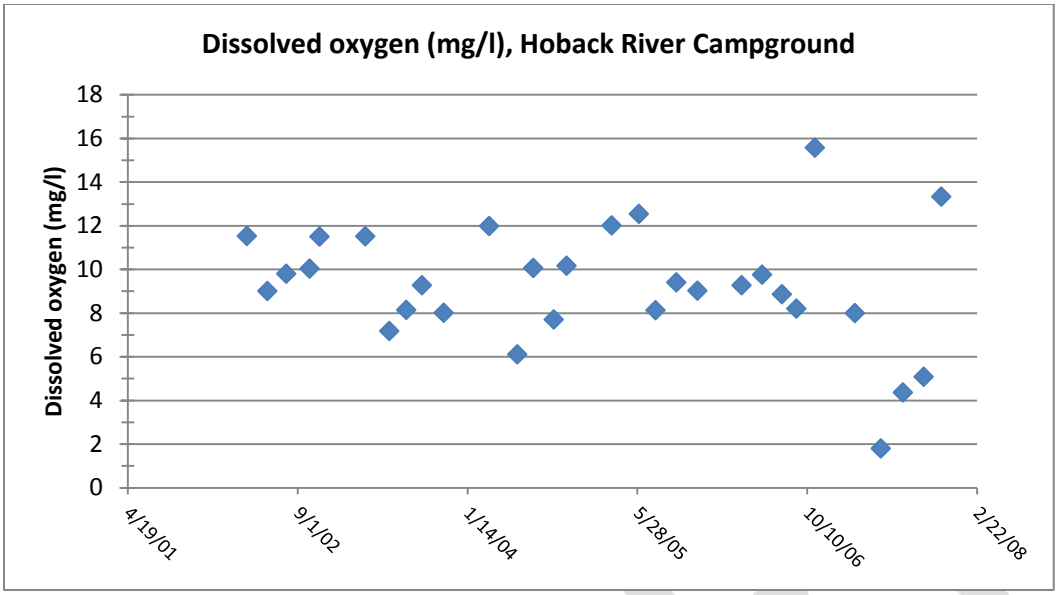
Figure 2.3. Dissolved Oxygen Levels, 2002-2007



Chloride, nutrient, pH, and temperature data all meet State standards.

Wyoming DEQ collected duplicate water quality samples at Hoback Junction on September 21, 2011. All criteria met water quality standards. The reach was surveyed for a variety of physical parameters which will provide baseline information for conditions at the time of designation, and will be useful for the evaluation of condition and trend at a later date. The survey reach was characterized as a moderately steep and sinuous stream that was overly wide for its normal "B" type, with a cobble-dominant bed material, leading to a final type description of B3c. The banks were well covered (with rock or vegetation) and were very stable.

The Hoback River is in the Sedimentary Mountain Bioregion for WDEQ bioassessment purposes, using WY RIVPACS (Hargett, 2012) and the Wyoming Stream Integrity Index (WSII) (Hargett, 2011) assessment methodologies. Ratings from the two methodologies are used in combination to arrive at a narrative designated use support rating. In the 2011 evaluation, the designated use support rating on the Hoback River was "full support". This means that water quality standards were being met to support all designated uses.

Scenic River Value: The scenic quality of the corridor is outstanding, its landscape elements and attractions highly diverse. US 191/189 runs parallel to the river; it is part of the Wyoming Centennial Scenic Byway (shown at right). Views of diverse terrain, vegetation, water features and steep mountains contribute to the outstanding scenic values. Rare among rivers with highway access is the outstanding opportunity for wildlife viewing. Bald eagles, ospreys, and waterfowl can be seen along the river; in winter bighorn sheep often congregate next to the highway.

Recreation River Value: Among the activities for which the lower Hoback River is known are fishing, climbing, floating, scenic driving, picnicking and camping and hiking from one of several trailheads in the corridor. The lower river segment is becoming increasingly popular for kayaking and draws boaters from a wide region. Interpretive displays along the Wyoming Centennial Scenic Byway add interest to scenic driving. The Hoback River provides an exceptional intermediate learning environment for those running nontechnical whitewater in a variety of crafts. This narrower river also offers bank fishing with great scenery and easy access, and an opportunity to partake of unique features such as the odiferous chalky travertine waters of Stinking Springs, the pretty blue water of the spring-fed pond by Hoback Campground, or a drink or a ride at a working dude ranch.

Cultural Resource Value: The Hoback River is named after trapper and explorer John Hoback who guided members of John Jacob Astor's American Fur Company through the Hoback Canyon in 1811. An interpretive pullout describing this expedition is provided near the community of Hoback Junction. A recently discovered prehistoric site has been investigated and reveals over 2 meters of intact archeological deposits dating to over 7,000 years ago. Floral and faunal remains from this site may provide scientific data related to changes in ecological conditions in the region over time. Battle Mountain, at the confluence of Granite Creek and the Hoback River, was the scene of a confrontation between a hunting party of Bannock Indians and local residents over hunting rights. Battle Mountain is upstream of the designated stream segment. (Note: this site and its story were part of the reason this value was assigned to the Hoback River when the inventory was done in the early 1990s; however, it is not within the designated segment. The Hoback River from current designation to the mouth of Cliff Creek remains eligible as a Recreational River.)

Wildlife/Ecological River Value: The Hoback River helps to support the exceptional wildlife values in the Snake River. Important habitat types include the extensive sagebrush steppe on the north, along with escape terrain in the rocky bluffs. Conifer stringers on both sides of the corridor provide cover, and on the south side, extensive heavy timber is available as well. The river corridor provides winter range for moose, elk, mule deer, bighorns, and mountain lions and is an important mule deer and avian migration corridor. The lower canyon provides valuable nesting habitat for many species of birds and raptors and also provides an important seasonal habitat and a migration corridor for many wildlife species, including neotropical migratory birds (fall and spring), and bighorn sheep that are frequently seen and photographed by visitors along highway 189/191. Gray wolves travelling between Jackson Hole and the upper Hoback River and its tributaries also use the river corridor, as does an occasional grizzly bear. Many species of raptors nest or forage along this segment including Bald Eagle, Golden Eagle, Peregrine and Prairie Falcon, Red-tailed Hawk, Osprey and all three species of accipiters. Other frequently viewed wildlife include river otters, waterfowl, American Dipper, Spotted Sandpiper, marmot and pika, a species recently proposed for listing under the federal Endangered Species Act. Talus in the river corridor

provides some of the lowest-elevation pika habitat within the BTNF. Because of its close proximity to the lower Snake River, its importance for many ungulates as seasonal habitat and a migration corridor, and the diversity and abundance of wildlife easily watchable by the public, the Hoback River segment qualifies as an outstandingly remarkable ecological and wildlife value.

Fisheries River Value: The designated segment of the Hoback River is a high gradient river with limited spawning material due to coarse substrate (boulders/rubble) but provides fish passage that connects 319 stream miles in the Hoback Basin to the Snake River Basin. This segment contains Snake River cutthroat trout, Forest Service designated "Sensitive Species" and Wyoming species of concern. The segment includes at least 9 native fish species (Snake River cutthroat trout, mountain whitefish, bluehead sucker, longnosed dace, mountain sucker, Paiute sculpin, Utah sucker, Utah chub, and mottled sculpin) that were historically present in the Greater Yellowstone Ecosystem. This segment is a very important connectivity corridor for Snake River cutthroat trout reproductive movement between the mainstem Snake River and the Hoback tributaries. Management Indicator species boreal chorus frog are present in this segment as well. Fisheries are considered an ORV in the segment due to the presence of cutthroat trout and other native species, high species diversity, and fish passage.

Geologic River Value: The Hoback River, along with the Snake River south of Hoback Junction, provides the best cross-sectional view of the Wyoming Thrust Belt from east to west due to the cut made by the Hoback River through the Hoback Canyon northwest of Bondurant. This thrust belt is a 65-million year old feature, formed by compressional geologic forces, that runs from the Arctic to Mexico. Features of interest include Stinking Springs, a sulfurous warm spring, conglomerate and dolomite cliffs, undeveloped caves, classic structural features such as recumbent folds, tight anticlines, and flatirons. Geologic features described during the eligibility study included Battle Mountain (an example of a high-angle thrust fault), Hoback Shield and other landmarks that are described in geologic roadside guides. While some of these features are not within the designated segment, they remain a contributing factor to this value and are still of interest to forest visitors.

Landscape Character: The corridor is in the Roaded-natural appearing and Rural Recreation Opportunity Spectrum settings. Ranches, small subdivisions, ranch-type resorts

and irrigated fields occur in some places. Some of the private land parcels are covered by conservation easement; all are within the natural resource and scenic overlays. U.S. 189/191 is a two lane highway that crosses the river three times in this segment.

Pacific Creek

Basic Hydrology and Basin Characteristics: The Pacific Creek watershed includes 108,160 acres. It flows in a generally southwesterly direction to its confluence with the Snake River. After its headwaters inception at the Parting of the Waters, Pacific Creek flows for only a short distance—approximately 0.6 mile—in a confined valley setting. After this, its character varies along its length. There are broad meadows where the stream meanders freely and other places where the channel is laterally confined by bedrock. Other channel types are also probably represented. Braided sections of stream in the lower portion of the watershed indicate high natural inputs of sediment—especially coarse material ("bedload") -- from the upstream watershed, causing the channel to adopt a multi-channel, shallow, wide form, that changes lateral position in response to changing sediment loads and stream flows.

National Wetlands Inventory maps show that wetlands are scattered throughout the watershed. While many wetlands are associated with stream channels this is not always the case, indicating high water tables in many locations. Emma Matilda Lake and Two Ocean Lake in Grand Teton National Park are in the Pacific Creek watershed, as are Enos Lake and many smaller ponds and lakes on the Bridger-Teton National Forest.

The USGS has operated a gauging station (station number 13011500) on Pacific Creek at Moran almost continuously since July 1917. The site has moved slightly over time, but it has generally been in the vicinity of its current location approximately 0.5 river miles upstream from the mouth of Pacific Creek. The maximum discharge for the period of record occurred on May 29, 1983, when peak flow reached 5,350 cfs. The minimum daily discharge for the period of record was 19 cfs on December 31, 1978.

Peak streamflows result from snowmelt in the spring. Estimated peak discharges of various recurrence intervals are based on gage data from the Pacific Creek at Moran gauging station for the period 1918 to 2000, as reported in Miller (2003), and are summarized in 2.13.

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Table 2.13. Peak Discharges, Pacific Creek at Moran USGS Gauge

Peak Flow Recurrence Interval (years)	Discharge (cfs)
1.5	2190
2	2540
5	3360
10	3870
25	4490
50	4940
100	5380

Free-flowing Character: There are no noteworthy human-made obstructions to the free-flowing character of Pacific Creek. USGS remarks for the gauging station state that "no diversion or regulation" exists upstream from the gauge.

Water Quality: The uppermost twenty miles (approximately) of Pacific Creek flow through the Teton Wilderness. Although the next reach moving downstream flows through non-wilderness National Forest System lands before reaching Grand Teton National Park, the use classification associated with the Wilderness (and the Park) takes precedence for the entire stream. All surface waters within National Parks and congressionally designated wilderness areas as of January 1, 1999 are Class 1 waters. Wetlands adjacent to these waters are also Class 1.

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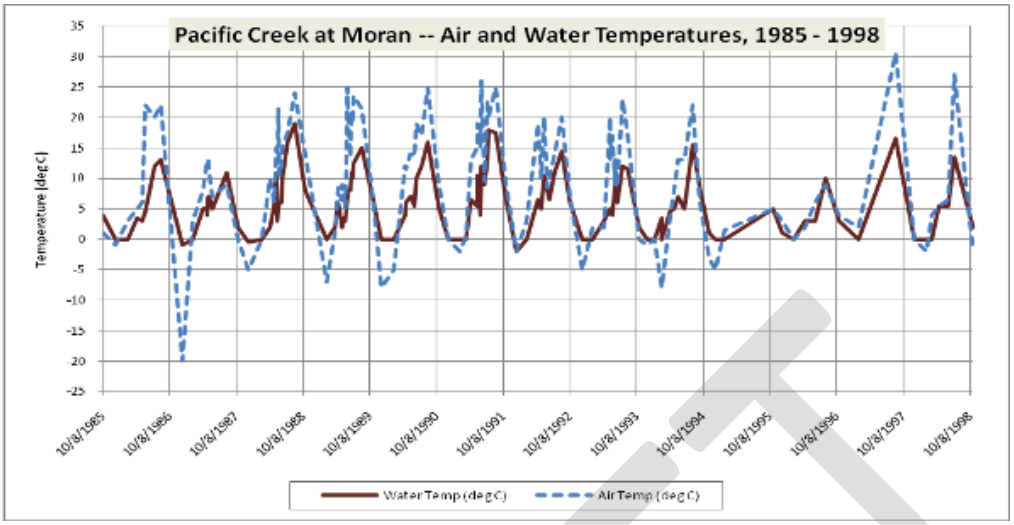
Water temperatures reached their highest value of 19˚C (66˚F) on August 23, 1988, when air temperatures were not especially high (maximum air temperature was 24˚C, or 75˚F), but were higher than in the two previous years. Maximum water temperatures declined in subsequent years, but still may have been elevated over pre-1988 temperatures for the next several years (as was the case with maximum air temperatures). 1988 was the summer of the Yellowstone fires, and two large fires burned in the upper portion of the Pacific Creek watershed that year (see the Management section, below); this may, or may not, have influenced water temperatures at the gauge site. Air temperatures rose again in 1997 and 1998 and were higher than in the late 1980s, and while maximum water temperatures also rose they were not as high as the 1988 temperatures. Air and water temperature data are shown in Figure 2.4.

Figure 2.4. Air and Water Temperature Data, Pacific Creek at Moran Gauging Station



It is interesting to note the extremely high spike in suspended sediment discharge that occurred in spring 1989, the first runoff year after the 1988 fires. The two subsequent years had smaller, but still elevated, sediment discharge compared with pre-fire values. Another spike in spring 1993 is also interesting; peak streamflow that spring was higher than it had been in the spring of 1990, 1991, or 1992, and was capable of transporting more stored sediment from the 1988 fires, if such sediment was available. The USGS collected suspended sediment samples at their gage from 1987 to 1993, during spring runoff events. Their results, as reported in terms of tons of suspended sediment discharge per day, are summarized in Figure 2.5.

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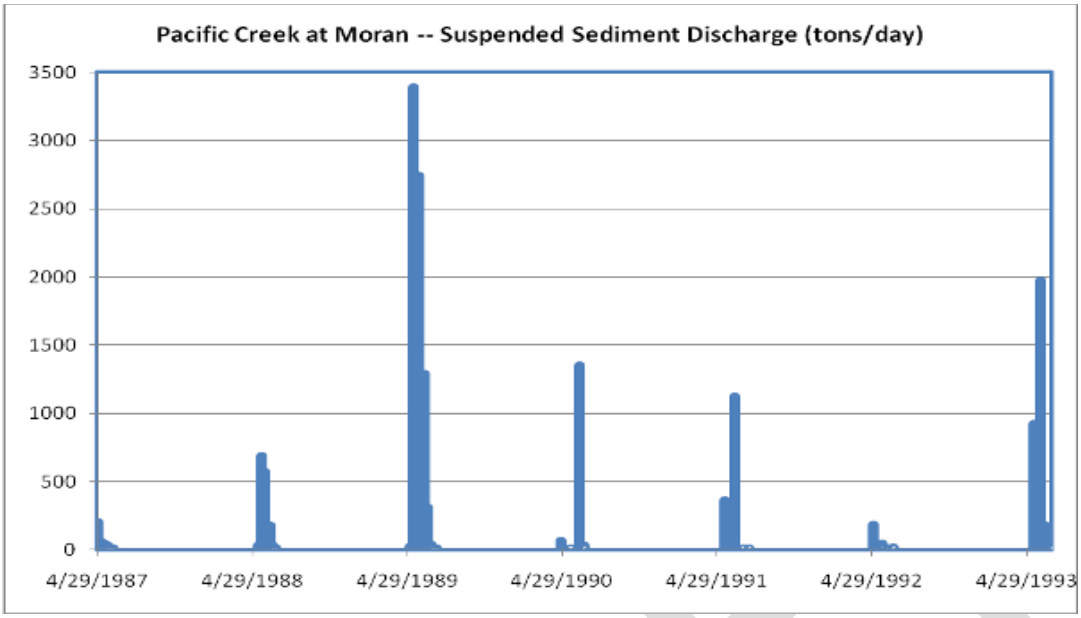
Figure 2.5. Suspended Sediment Discharge at Moran Gauging Station



A 2002 cooperative water quality sampling effort between the USGS and Grand Teton National Park (Clark et al., 2004) sampled two sites on Pacific Creek: the upper site was upstream from the Park boundary on National Forest land and the lower site was at Moran, approximately 0.25 mile upstream from the Pacific Creek mouth. Nutrient levels were generally low in samples at both sites, and all sample levels were less than the water-quality criteria for surface waters in Wyoming. Sources of nutrients were presumed to be natural because the basin is largely undeveloped, although the presence of an upstream campground and upstream campsites were noted as possible contributors. Source metals were attributed to natural sources and pesticides were lower than reporting levels. *E.* coli concentrations were substantially less than the recommended limit and the ribotype patterns most frequently matched a bovine source, most likely bison.

Grand Teton National Park sampled for various water quality parameters at two sites on Pacific Creek in 2008. Most parameters with water quality implications were at low or non-detectable levels.

Wyoming DEQ evaluated a site on Pacific Creek (MRW0130) in the Teton Wilderness in 2002 and 2009. Water chemistry was sampled in both years, and all parameters met State standards. Individual samples were taken at sites near the USGS gaging station (in 2002), at the National Forest/National Park boundary (in 2002), and on National Forest lands northwest of Davis Hill as well (in 2004), and all met State standards. The sample reach in the Teton Wilderness was also surveyed in 2009 for a variety of physical parameters, which will provide a baseline for conditions at the time of designation and will be useful for the evaluation of condition and trend at a later date. The survey reach was characterized as

borderline between a meandering (C-type) and braided (D-type) cobble-dominated stream with largely stable and well-covered outer banks.

Pacific Creek is in the Sedimentary Mountain Bioregion for WDEQ bioassessment purposes, using WY RIVPACS (Hargett, 2012) and the Wyoming Stream Integrity Index (WSII) (Hargett, 2011) assessment methodologies. Ratings from the two methodologies are used in combination to arrive at a narrative designated use support rating. In both 2002 and 2009 the designated use support rating on Pacific Creek in the Wilderness was "full support". This means that water quality standards were being met to support all designated uses in both years. "Full support" was also determined to have been achieved at the other sites where water quality samples were gathered.

Recreation River Value: Big-game hunting and wilderness travel are the primary attractions; the Teton Wilderness is well known as one of the largest and most undisturbed of wild lands in the lower 48 states. The trail along Pacific Creek gives access to some of the more popular destinations within the wilderness and offers a variety of fishing, camping and scenic viewing opportunities in its wide willow flats, meadows, incised canyons and forested uplands. Among the reasons recreation was evaluated as outstanding during the inventory in the early 1990s was the good trail access, relatively gentle terrain, and outstanding features in Pacific Creek and its tributary, Whetstone Creek. Whetstone remains eligible as a wild river but was not part of the 2009 legislation. Recreation in the Scenic River segment includes day-use and dispersed camping, hunting and fishing from these camps, a small and remote campground with shade from cottonwoods, and winter sports.

Ecologic/Wildlife River Value: The river corridor provides habitat for numerous wildlife species, and the opportunity to enjoy wildlife is outstanding. The corridor is a major historic route for wildlife movement and some of the earliest scientific studies of the Jackson Hole elk herd were conducted in this area, by notable zoologist Olaus Murie whose work in the area also contributes to its historic significance.

Pacific Creek is braided along its entire length with scattered riparian zones that support large willow complexes, backwaters, and ponds, particularly in the middle section. These habitats are important for neotropical migratory birds, shorebirds, and waterfowl such as Trumpeter Swans and Sandhill Crane. Other frequently observed species include Spotted Sandpiper, American Dippers, Bald and Golden Eagles that use the corridor as a migration route and also as nesting habitat or for foraging in late spring and summer. Harlequin Ducks utilize the complex riverine habitat of this section. The creek corridor is also part of an important migration route for elk and moose; this migration route is among the longest in the nation for these species. The river corridor provides foraging areas for abundant resident grizzly and black bears and provides foraging habitat and a movement corridor for gray wolves, wolverines, and river otters. The corridor is relatively uninfluenced by human activities.

Because of its pristine character and extremely high wildlife diversity, this river segment provides outstandingly remarkable ecological and wildlife values.

The Scenic River segment of Pacific Creek is highly braided and contains a mix of open gravel shoals, riparian (willow) shrub communities; cottonwood, lodgepole pine, spruce-fir forests and sagebrush steppe. The creek contains many well-watered side channels, vegetated islands, and slumping cut banks that add to the diversity of vegetation communities and faunal diversity. This section acts as an important travel corridor for many birds and mammals such as moose, elk and bald eagles, linking the upper (wild) section of Pacific Creek to Jackson Lake and the Snake River in Grand Teton National Park. Moose winter range is found along this segment. The area is also used by resident grizzly bears and several packs of gray wolves, cougars, black bears, Bald Eagles, Osprey, and many neotropical migratory birds for foraging or nesting. Because of its importance as a travel corridor and foraging and nesting for migratory wildlife, its relatively pristine condition, and its vegetative diversity, the scenic section of Pacific Creek provides outstandingly remarkable values at both a regional and national scale.

Both Whetstone and Pacific Creeks are associated with some of the early biological survey work conducted by Olaus Murie in the 1920s. The Pacific Creek corridor includes features of scientific interest: wildfires of various ages from 1934 to present, which are easily accessed and studied via the trail system. The 1988 fires are well-represented in this area. Among the striking features of the Pacific Creek drainage is a large part of the 1987 “Teton Tornado,” a wide area of blown-over forest that is of scientific interest as the highest-elevation windstorm of its type recorded.

Fisheries River Value: Both segments contain Snake River and Yellowstone cutthroat trout, Forest Service designated “Sensitive Species” and Wyoming species of concern. The segment includes at least 9 native fish species (Snake River cutthroat trout, Yellowstone cutthroat trout, mountain whitefish, mountain sucker, Paiute sculpin, redside shiner, speckled dace, Utah sucker, northern leatherside and mottled sculpin) that were historically present in the Greater Yellowstone Ecosystem. Management Indicator Species boreal chorus frog are present in the scenic segment. Fisheries are considered an ORV in the segment due to the

presence of cutthroat trout and other native species, high species diversity, and natural reproduction of native species.

Geologic River Value: Parting of the Waters, where Two Ocean Creek splits along the Continental Divide, is the only national natural landmark designated within the BTNF. This site forms the headwaters of Pacific Creek. Tributary stream Whetstone Creek has waterfalls, and along with Pacific Creek, flows through areas of volcanic rock, sandstone, and conglomerate; the Pinyon Conglomerate includes natural arches and other eroded features; the sandstone, of Cretaceous age, has preserved the tracks of dinosaurs. Whetstone Creek remains eligible as a wild river but is not designated.

Landscape Character: The corridor is mostly in a primitive setting with its lower few miles influenced to a minor degree by roads, campsites and other recreational developments, a power line, and a subdivision. Most of the corridor is in a forested setting, with a few large wet meadows (Pacific Creek Meadows being the largest) and mesic wildflower parks in cobbled terrace areas.

Shoal Creek

Basic Hydrology and Basin Characteristics: The entire Shoal Creek watershed is 32 square miles (20,573 acres) in size as calculated using Forest Service GIS. The watershed for the designated segment is 11.5 square miles (7,361 acres) in extent. The stream flows in a generally southwesterly direction (bowing in an easterly arc) to its confluence with the Hoback River.

Overall valley bottom gradients for the designated reach of Shoal Creek are between 5 and 10%. Measuring off a topographic map, the lowest portion of the designated reach has a gradient of approximately 1.5% while the upper reach below Shoal Lake is approximately 11.6% in steepness. The Shoal Lake basin is a localized flat area near the head of the watershed.

Headwater channels flow through thin, rocky soils where riparian vegetation has a short growing season. Upstream at approximately 9,000 feet in elevation, the stream flows over hard granitic bedrock and does not have a well-developed channel or associated riparian zone. Downstream from the granitics, bedrock sedimentary rocks are exposed (limestones and dolomites), and Shoal Creek begins to downcut through them. Shoal Falls occurs where Madison Limestone and Darby Formation stand in vertical relief and meet more-erosive landslide deposits, and also along the zone of where the Cache Creek thrust fault has been mapped. Downstream from Shoal Falls, the creek meanders through materials mapped as glacial and landslide deposits. The stream has the appearance of a Rosgen “C” type channel as it flows through a generally unconfined valley bottom for the rest of the designated reach.

National Wetlands Inventory maps show wetlands almost exclusively associated with stream channels, and they are concentrated mostly along the lower half of the designated reach, below Shoal Falls, where valley materials are conducive to vegetative growth and channel meandering. In this reach, wetlands are mostly classified as Freshwater Forested/Shrub types. Upstream from the falls, wetlands are isolated ponds with emergent vegetation, and a few shallow ponds. Shoal Lake, near the headwaters, is a notable exception.

Peak streamflows result from snowmelt in the spring because there are no dams on Shoal Creek. Estimated peak discharges of various recurrence intervals were calculated using Miller (2003), and are summarized in Table 2.14 (discharges were calculated for the downstream end of the designated reach, which is the upper portion of the Shoal Creek watershed).

Table 2.14. Peak Discharges, Shoal Creek Designated Reach

Peak Flow Recurrence Interval (years)	Discharge (cfs), Region 1 equation	Discharge (cfs), Region 5 equation
1.5	138	50.6
2	165	64.5
5	242	99.9
10	290	124
25	351	154
50	390	175
100	430	197

According to information on the Teton County Map Server, the Federal Emergency Management Agency (FEMA) has not delineated 100-year floodplains for Shoal Creek.

Free-flowing Character: Due to its location in the upper portion of the Shoal Creek watershed, the free-flowing character of the designated segment is maintained on this stream.

Water Quality: Shoal Creek is not a municipal supply watershed.

No water quality data have been gathered to date on Shoal Creek. Assumptions about existing water quality would have to be based on riparian area and stream channel conditions.

Scenic River Value: Shoal Creek is an attractive waterway with clear, cold water, beaver ponds that are large and deep enough to reflect the nearby peaks and offer hues of turquoise and deep blue, narrow gorges and deep river-scoured holes. In places the creek meanders through wide willow and sedge flats. Scenic values are high throughout the stream corridor. Views of Palmer Peak and the cliffs surrounding Doubletop Peak dominate the view to the north; more distant views of the Hoback Range are seen to the south. The foot and horse trail remains mostly in the stream corridor but does not intrude on the scenic quality. Some two-tracks and roads associated with old timber harvest approach the corridor but are not obvious from the trail. Shoal Falls, Shoal Lake, and other geologic features in the upper canyon contribute to variety and outstanding scenery; tilted cliff bands, narrow sections of cascading water, and open views characterize the lower segment. Views of the Gros Ventre Range are outstanding.

Recreation River Value: An adventurer's high country paradise, Shoal Creek lures visitors along its low-gradient beaver meadows with their popular fisheries and birdlife, up to a dramatic waterfall. Spectacular cliffs then yield only a thin route for creek and trail to climb toward the alpine tarn and fishing/camping destination of Shoal Lake, just below the jutting backbone of the Gros Ventre Range. This trail connects with several others that access overnight destinations and loop trails. Shoal Creek lies entirely within the Gros Ventre Wilderness or Shoal Creek Wilderness Study Area. The downstream section of the creek (eligible but not designated) is likewise located within the Wilderness Study Area. The primary recreation activities in the river corridor include hiking, horseback riding, day-use from the dispersed camp area at the trailhead as well as longer trips, big game hunting, fishing, photography and wildlife viewing.

Wildlife/Ecologic River Values: This segment greatly enhances the collective ecological integrity and wildlife diversity of the lower Snake River system. Upper Shoal Creek has numerous riparian zones that contain extensive stands of willow and aspen, sedge meadows, and backwater ponds that provide high quality habitat for a diverse array of water-dependent wildlife, including beaver, moose, amphibians, waterfowl, many species of passerine birds (both resident and migrant), and shorebirds. Mountain lions, grizzly bears and gray wolves occupy the upper section of the segment along with abundant summering ungulate populations. The area has documented Northern Goshawk nest sites; suitable lynx habitat has also been noted. Harlequin Ducks have been observed and there is evidence of nesting activity.

Shoal Creek passes through a landscape with a high degree of diversity and integrity. Shoal Creek rises in the Gros Ventre Wilderness and passes through the Shoal Creek Wilderness Study Area. Attributes of note include extensive stands of aspen, shrub lands in the early stages of regrowth after a forest fire, willow complexes that are ever-changing due to beaver activity and high-elevation limestone outcrops that are often associated with unusual plants

(survey data not yet available). Payson's bladderpod and fringed gentian have been identified in the area.

Fisheries River Value: Beavers have created numerous ponds and Shoal Creek has become well known for its native trout fishery. Native Snake River cutthroat trout and Paiute sculpin are present in large numbers lower in the system and decrease in abundance near the lake. Bonneville cutthroat trout have been introduced in Shoal Lake as a recreational fishery, but are not native in this drainage. Shoal Creek below the falls is an important reproductive tributary for Snake River cutthroat trout and provides recruitment to the Hoback River. Amphibian species of interest include the Management Indicator Species boreal chorus frog and sensitive boreal toad.

Geologic River Value: Geologic features include Shoal Falls, which pours from a deep defile in vertical limestone beds, Shoal Lake, a classic tarn, and limestone caves. In the area of the falls is an outstanding example of the contact between the vertical sedimentary beds and granitic intrusives.

Landscape Character: The landscape is diverse, with Ceanothus-dominated brush fields in the burns, willow and cinquefoil near the creek and sagebrush-forb parks in between. Stringers of aspen and conifer stretch to the valley floor from the hills on both sides, and there are several large tall forb parks on the east slope of Deer Ridge.

The corridor lies in a semi-primitive non-motorized Recreation Opportunity Spectrum setting with the more remote areas within the wilderness being primitive. Some old timber harvest units are visible from the corridor in the vicinity of Riling Draw trailhead, but these are growing back, are not highly intrusive, and are soon left behind as one travels upstream along the trail.

Snake River

This river is described by its individual segments because of the large area (through National Park Service designated areas and undesignated areas in and out of the Parks) separating the wild and recreational segments on the Bridger-Teton National Forest.

Wild segment

Basic Hydrology and Basin Characteristics: The Wild segment flows for its first (eastern) half in a southwesterly direction after entering the Forest from Yellowstone National Park and then abruptly turns to the northwest, reentering Yellowstone. This segment is in the Teton Wilderness on National Forest lands. The stream appears to be almost entirely a Rosgen "C" or "E" type channel, meandering freely through a mixture of timber and meadows. The eastern portion is underlain by igneous bedrock and flows through a well-defined valley, while the western portion flows through glacial deposits, with a more irregular valley bottom.

Free-flowing Character: Entirely within the Teton Wilderness, this segment has no obstructions to free-flow.

Water Quality: The state of Wyoming has classified the Wild segment as a Class 1 stream [included in "The main stem of the Snake River through its entire length above the U.S. Highway 22 Bridge (Wilson Bridge)"], based on the designated uses it is supporting or is supposed to support.

Recreation River Value: The upper segment of the Snake within the BTNF is entirely within the Teton Wilderness. A small stream in this area, it flows in wide meanders in scenic Fox Park before entering Yellowstone National Park. This section of the river is rich in wildlife of all kinds, including nesting waterfowl. Recreation in this very remote area includes horsepacking and backpacking, although major fords are required. Outfitters offer horseback trips into the area during the summer and in hunting season. The opportunity to see moose, elk, grizzly bears, and other wildlife is outstanding. The upper Snake River runs from the Teton Wilderness into the wild backcountry of southern Yellowstone National Park. There are trails and campsites nearby for much of its length, but these provide little intrusion into the wild character of the river segment. There is a high opportunity for solitude in a primitive setting.

Wildlife/Ecological River Value: The uppermost section of the Snake River meanders through a broad, high-elevation (8,200 feet) plateau and supports a mix of willow and sedge communities, lodgepole pine and spruce-fir forests, and open grassy parks. This reach contains at least four major riparian complexes with numerous side channels and oxbows that add to flora and fauna diversity. These communities provide very important habitat for threatened grizzly bears and gray wolves, and numerous neotropical migratory birds, shorebirds, passerines, waterfowl, including Harlequin Ducks and raptors. Because of its extreme importance to grizzly bears, gray wolves, and a variety of birds, its extensive riparian zones, and its pristine condition, this segment offers outstanding ecological and wildlife values at both a regional and national scale.

Fisheries River Value: The headwaters segment has a limited variety of native fish species present but is important for natural reproduction of Snake River cutthroat trout. This segment includes at least two native fish species, Snake River cutthroat trout and mottled sculpin. Boreal chorus frogs are present in this segment. Fisheries are considered an outstandingly remarkable value in this segment due to the presence of cutthroat trout and other native species, and fish passage that connects tributaries to the Snake River Basin.

Landscape Character: The upper segment of the Snake flows in wide meanders through willow flats surrounded by volcanic mountains and ridges. Much of the corridor was burned in 1988 and the area provides opportunities to see forest revegetation in a natural area. Some sections of the river carve through bedrock in rapids and narrow gorges, and a trail follows the entire segment to its headwaters in Fox Park. The opportunity to see moose, elk, grizzly bears, waterfowl and other wildlife is outstanding. The trails and established campsites in the corridor do not intrude on the wild character of the river segment. There is a high opportunity for solitude in a primitive setting.

Snake River

Recreation segment

The lower segment was studied for inclusion in the Wild and Scenic Rivers system in the early 1980s, and the lower 13.5 miles were recommended as a Scenic River by the Secretary of Agriculture in 1982. The landscape's variety is distinctive, and the lower Snake attracts great numbers of visitors during a two-month summer period when whitewater rafting is a popular pursuit.

Basic Hydrology and Basin Characteristics: The upper portion of the Recreational reach is a low-gradient, moderately entrenched channel with low sinuosity, likely a Rosgen "B" type channel. It is confined by a narrow valley and by human structures that have attempted to keep it in place such as the highway. Downstream, past Astoria, the valley bottom opens up and stays open to approximately 1.5 miles upstream from the Bailey Creek confluence (also known as the Elbow). This is the reach with most of the wetlands. It has many overflow channels, braided channels that change position during high flows, vegetated islands, and occupies the full valley bottom. Downstream from the Elbow, the designated reach flows

through a canyon. It is likely classified as a Rosgen "F" type channel with relatively low to moderate sinuosity and a low overall gradient, while having localized steep pool-riffle complexes due to rockfall from the canyon walls.

National Wetlands Inventory maps show non-riverine wetlands restricted to the upper portion of the Recreational reach, ending at the Bailey Creek confluence, due to confinement by canyon walls downstream from this point. In the upper portion of the Recreational reach, ponds and forested/shrub wetlands are scattered along the main channel and overflow channels on both sides of the highway, as are small areas of emergent vegetated wetlands. The forested wetlands include cottonwood gallery forests that depend on flood regimes to perpetuate. Riverine wetlands are mapped along the entire designated reach. Wetlands are mapped along almost the entire Wild reach. They are mapped as almost exclusively emergent vegetation along the river segment that trends northeast-southwest. Along the lower segment, which trends southeast-northwest, vegetation is a combination of forested/shrub and emergent types.

The U.S. Geological Survey operates two stream gages in the vicinity of the Recreational reach. Snake River below Flat Creek near Jackson (station number 13018750) is upstream from the designated reach and upstream from the Hoback River confluence. It has operated continuously since November 1975. Drainage area above the site is 2927 square miles. Maximum peak discharge (to date) for the period of record occurred on June 11, 1997, when streamflow reached 30,200 cfs. The minimum daily flow (to date) was 690 cfs on January 19, 1988. The other gage is at the downstream end of the designated reach; it is on the Snake River above the Reservoir near Alpine, Wyoming (station number 13022500). It operated from March 1937 to March 1939 as "above Greys River, near Alpine", and has operated continuously since July 1953 under its current designation. The drainage area above the gage is 3,465 square miles. Maximum peak discharge (to date) has been 38,600 cfs on June 11, 1997, and the minimum daily flow (to date) has been 740 cfs on November 16, 1955. There are no gages in the vicinity of the Wild segment.

Peak streamflows in the Recreational reach of the Snake River result largely from releases from Jackson Lake Dam in the spring, reflecting a combination of snowpack in the basin, reservoir storage in the Minidoka system, and expected irrigation needs in Idaho. The U.S.

Bureau of Reclamation manages dam releases to balance these contributions and needs. Flows in the reach also reflect inputs from the Hoback River, Gros Ventre River, Buffalo Fork, and contributions from other tributary streams as a result of snowmelt. Flows the rest of the year reflect releases from Jackson Lake Dam and baseflow contributions from tributaries in the system. Flows in the Wild reach are solely a result of snowmelt and baseflows because there are no dams in that portion of the watershed.

Free-flowing Character: The magnitude of alterations to the free-flowing character of the Recreational reach of the Snake River also depends on the amount of water withdrawn from the stream via diversions. Additional information on water availability and use in the Snake River Basin is provided in the Snake/Salt River Basin Plan, a document prepared by Sunrise Engineering for the Wyoming Water Development Commission (WWDC) in 2003 and available at http://waterplan.state.wy.us/plan/snake/snake-plan.html. The WWDC is in the process of updating the Snake/Salt River Basin Plan. The update is expected to be available to the public in Fall, 2013. In addition to water withdrawal, private landowners have constructed irrigation diversion features (e.g., longitudinal berms) within the active channel of the designated reach. These have been permitted due to being associated with maintenance of existing irrigation structures. Such features alter the free-flowing character of the river by changing channel dynamics for an extended reach, and by changing floodwater access to the floodplain.

Road fills may impact free-flowing character of the river where floodplains and wetlands have been altered, changing the ability of these features to store and dissipate floodwaters.

Water Quality: There are no 303(d) designated streams within or immediately downstream from the designated reaches, but Flat Creek, which is a 303(d) stream, enters the Snake approximately 5.5 river miles upstream from the Hoback River confluence. There are no municipal supply watersheds within or immediately downstream from the designated reach. WDEQ collected one set of water quality data on September 1, 1994 near the Alpine gage. The U.S. Geological Survey collected periodic water quality data at the Snake River gage below Flat Creek between October 1985 and October 1998. The USGS also collected data at the Alpine gage for the same time period. Results are summarized below.

Stream temperatures measured by the USGS at the Flat Creek and Alpine gages peaked between July 10 and August 28 (with one odd peak of October 25, 1995, although all temperatures were low that year). Neither site consistently had higher temperatures than the other, and minimum temperatures at the two sites were similar as seen in the following figure.

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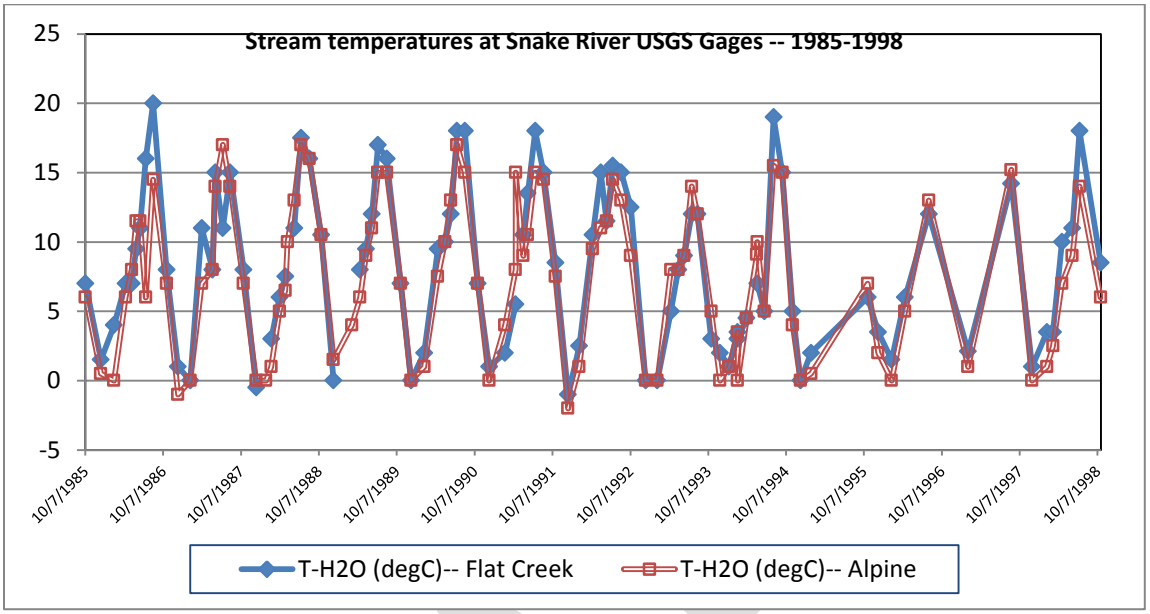
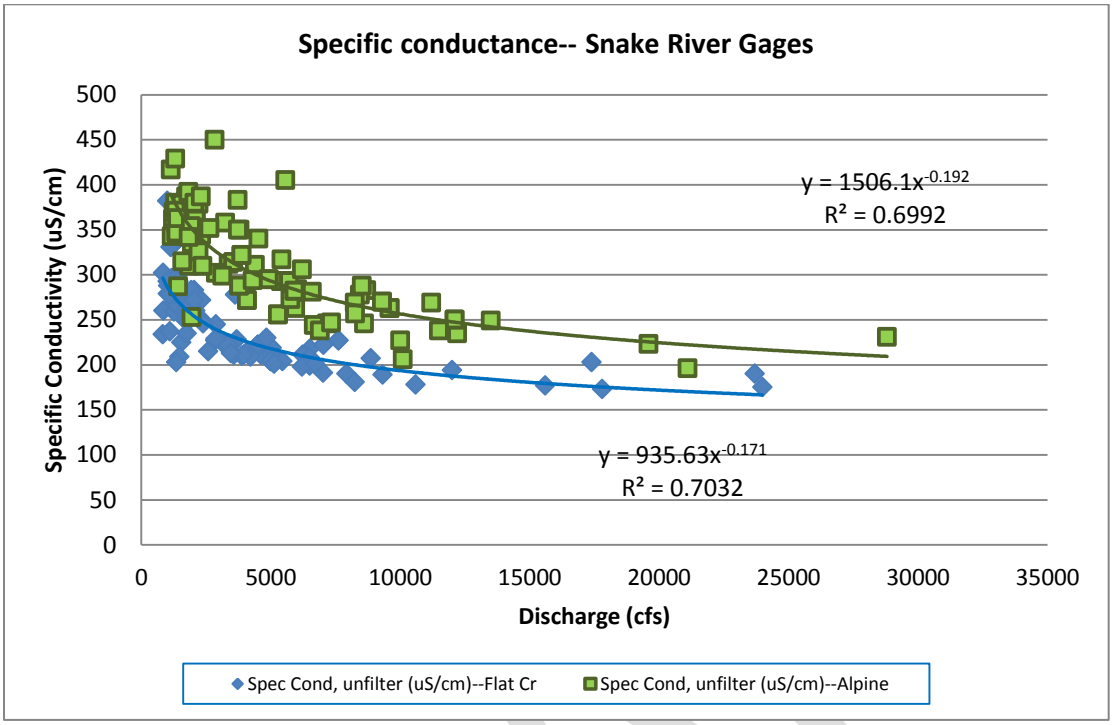
Figure 2.6. Stream Temperatures at the USGS Gages below Flat Creek and at Alpine, 1985-1998.



Specific conductance at the two USGS gages decreased in the downstream direction, as is generally the case due to dilution effects. At a given discharge, specific conductance was higher at Alpine than at Flat Creek as shown in Figure 2.7.

Figure 2.7. Specific Conductance at the USGS Stream Gages, below Flat Creek and at Alpine, 1985-1998.



Information presented in Table 2.15 is from the rest of the data gathered by WDEQ and USGS. State standards are presented where applicable.

Table 2.15.Water Quality Data, Recreational Segment of the Snake River

Criterion (sample units)	Sampled Values	State Standard	Standard met?
Turbidity (NTU)	1	The discharge of substances attributable to or influenced by the activities of man shall not …result in a turbidity increase of more than ten (10) nephelometric turbidity units (NTUs).	Yes
Water Temperature (degree C)	One value of 20C at Flat Creek gage.	Under no circumstance shall maximum water temperature exceed 20 degrees C in the case	Yes

Criterion (sample units)	Sampled Values	State Standard	Standard met?
	Maximum recorded temperature at Alpine gage was 17C.	of cold water fisheries	
pH	7.8 – 8.4	6.5-9.0	Yes
Nitrate + nitrite as N (ug/l)	< 50, non-detectable	10,000	Yes
Dissolved oxygen (ug/l)	8.8 – 9.7	8.0 (5.0 for species that have early life stages exposed directly to the water column). These are instantaneous concentrations to be achieved at all times.	May have exceeded

Total nitrogen was less than 250 ug/l (i.e., below detection limits) on May 23, 1994 at Alpine, as measured by the USGS. Total phosphorus as phosphorus was 0.2 mg/l as measured by WDEQ in 1994 at Alpine and 0.03 mg/l on May 23, 1994 at the same site as measured by the USGS. There are no state standards for these constituents.

Scenery River Value: Contributing to the outstanding scenery in the river corridor are views of the nearby mountains, including a dramatic panorama of Ferry Peak and other high points in the Snake River Range; the variety of vegetation in the canyon which changes seasonally from wildflower parks to stunning fall colors; the riffles and rapids of the river itself, and the colors in the deep pools. Scenery is outstanding from the point of view of river floaters and those using US 89/26 between Alpine and Hoback Junction. Numerous highway turn-outs allow visitors to enjoy scenic features of the river including Lunch Counter Rapid and Taco Hole overlooks, and short nature trails give access from the highway to the river itself.

Recreation River Value: Recreation activities include fishing, whitewater and scenic floating, camping at one of several Forest Service campgrounds in the canyon, scenic driving, and access to backcountry in the Palisades Wilderness Study Area to the north and Bailey Lake, a popular fishing, hunting and camping destination to the south. Boat ramps, outfitter assigned sites, picnic and camp areas and other recreational facilities are found along

the river to serve people who visit during the short summer season. Several outfitters offer floating and fishing trips on this section of the river. The canyon section of the Snake River is known nationally as an important trout fishery and whitewater river. Rapids such as Big Kahuna and Lunch Counter are well known among whitewater floaters. World class rapids, a native cutthroat trout fishery, and hydrology that offers exciting whitewater features at varied water levels make this section ideal for learning river-related skills (fishing, rafting and kayaking). The river offers ideal roadside locations to observe or photograph whitewater boating activities and also offers "park and play" kayak spots throughout the summer; locations for these activities are relatively rare within the region.

The proximity to a busy summer tourist destination, high demand for water activities, existing capacity of the river and facilities (from 70,000 to 120,000 client trips per summer), and easy access/length traditionally has allowed for outfitters to charge a much lower price than for a comparable river trip elsewhere. This makes the Snake unique in its ability to serve a wide range of visitors.

Wildlife often enjoyed by river floaters include ducks, geese, osprey, deer, moose, smaller creatures such as badgers, and the bald eagle, a year-round resident of this section of the river. In winter and spring, the lower Snake River Canyon is known as a place to see mountain goats, an introduced species.

Wildlife/Ecological River Value: The recreation class segment of the Snake River provides unparalleled viewing of raptors, waterfowl, ungulates and other species for the many boaters, cyclists, and automobile travelers (Highway 26/89) that use the river corridor. The cottonwood galleries near Pritchard contribute to the ecological value of this corridor. Roosting, foraging, and nesting Bald Eagles, Golden Eagles, Peregrine and Prairie Falcons, Red-tailed Hawks, accipiters, and Ospreys are common. Trumpeter Swans (in winter), river otters, and moose also frequent the river corridor.

This river segment provides a major migration corridor for neotropical migratory birds, raptors, waterfowl, and shorebirds both in spring and fall. These species depend on the river itself, the riparian habitats, and the cliff habitat adjacent to the river. Ungulate winter ranges adjacent to the river provide important winter and spring food for resident and migrant bald and golden eagles. The rare wolverine has been reported occasionally near the road or in associated canyons. Canada lynx have also been documented crossing through the drainage. Gray wolves and grizzly bears are also occasionally seen.

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When commenting on the draft Snake River Recreation Plan prepared by the U.S. Forest Service in 2002, the public consistently referred to the aesthetic values, the exceptional faunal diversity, and the need for protecting wildlife in this river corridor. The tremendous diversity and abundance of wildlife, coupled with its high visibility to recreationists and highway users, constitutes an outstandingly remarkable ecological and wildlife value.

Fisheries River Value: The recreation segment of the Snake River includes at least twelve native fish species: Snake River cutthroat trout, Yellowstone cutthroat trout, mountain whitefish, mountain sucker, bluehead sucker, longnosed dace, Paiute sculpin, redside shiner, speckled dace, Utah sucker, Utah chub and mottled sculpin. Management Indicator Species boreal chorus frog are present in this segment. Fisheries are considered outstandingly remarkable in this segment due to the presence of cutthroat trout and other native species, high species diversity, and fish passage that connects tributaries to the Snake River Basin.

Landscape Character: This segment of the river is entirely within the influence zone of U.S. 26/89, and is the most highly developed recreation corridor within the Bridger-Teton National Forest. Campgrounds, trailheads, turnouts and boat launches serve the large numbers of people who come every year to float this section.

Willow Creek

Basic Hydrology and Basin Characteristics: The Willow Creek watershed is 45,949 acres. Main stem Willow Creek flows in a generally northwesterly direction, bending to the northeast for approximately the final 1.5 miles before its confluence with the Hoback River. Valley confinement varies along the length of the stream: some reaches are confined in canyon settings, while other reaches are in wide flat valley bottoms where the channel meanders freely.

Willow Creek carries a high amount of bed load, mostly cobble and gravel. It is laterally dynamic, with a high bank-full width-to-mean depth ratio that is adjusted to move the coarse sediment supplied to it from the valley side slopes. The channel has high sinuosity, especially where it is unconfined by valley side slopes. It has multiple channels and fresh sediment

deposits and mid-channel bars are common, which is proof of the highly dynamic nature of the channel. Given its characteristics, Willow Creek would be a C3 or C4 channel under the Rosgen classification system for most of its length. Wetlands in the watershed are almost exclusively associated with Willow Creek; there are few isolated wetlands.

Peak streamflows result from snowmelt in the spring. Estimated peak discharges of various recurrence intervals were calculated using Miller (2003), and are summarized in the table below (discharges were calculated for the mouth of Willow Creek):

Table 2.16. Willow Creek Peak Discharge

Peak Flow Recurrence Interval (years)	Discharge (cfs)
1.5	363
2	438
5	616
10	728
25	861
50	949
100	1038

Free-flowing Character: There are no human-made obstructions to the free-flowing character of Willow Creek above the quarter-mile overlay at the confluence with the Recreational class Hoback River.

Water Quality: Management activities that have the potential to impact water quality include recreational crossings and grazing. There are 67 miles of system trail in the watershed, for a trail density of 0.9 miles of trail per square mile of watershed. Roads are a minor feature in the watershed. There is approximately 1.1 mile of road in the watershed and it is located more than a mile from Willow Creek, although it crosses one tributary and comes close to Adams Creek. Overall, riparian and channel conditions are very good.

One site on Willow Creek, near the mouth, was evaluated by Wyoming DEQ (MRW13) to see if designated uses were being attained (i.e., to see if water quality standards were being met). Various indicators were used to evaluate instream conditions. Two water quality samples were analyzed—one taken on September 1, 1994 and another on September 9, 2002.

Water quality standards were met for the components that have standards, although an oil sheen was seen on the water in 2002. Willow Creek is in the Sedimentary Mountain Bioregion for WDEQ bioassessment purposes, using WY RIVPACS (Hargett, 2012) and the Wyoming Stream Integrity Index (WSII) (Hargett, 2011) assessment methodologies. Ratings from the two methodologies are used in combination to arrive at a narrative designated use support rating. In 1994 the designated use support rating on Willow Creek was "indeterminate" and 2002 it was "full support". This means that in 1994 it was not clear if water quality standards were being met to support all designated uses, but that they were in 2002.

Recreation River Value: Willow Creek offers a unique mix of conditions, ready access from a paved highway near Jackson Hole and primitive conditions on the trails. The creek penetrates the heart of the Grayback Roadless Area. At 313,000 acres, it is the largest backcountry area within the BTNF outside of wilderness. It is easily accessed via Bryan Flat trailhead, although there is no direct public access to the lower end of the creek (where a Forest Service trail exists). Outstanding opportunities for backcountry recreation exist here, and the area is known for abundant big game. Primary activities include traditional horse-based camping and hunting, fishing, hiking and backpacking, as well as mountain biking and winter sports.

Conditions along the corridor are consistent with Willow Creek's Wild River status, yet the creek is not within a designated Wilderness and access to the area is easy from the Bryan Flat trailhead. This trailhead serves as the northern access to the 70-mile long Wyoming Range National Recreation Trail. After crossing Elk Ridge and descending to Willow Creek the rest of the trail follows the creek closely to its head near Pickle Pass before continuing south along the crest of the Wyoming Range. In addition to the Wyoming Range Trail, Willow Creek is served by a network of forest trails, some of which offer loop opportunities and are increasingly enjoyed by day-use hikers, mountain bikers, and guided horseback riders. Although recreation use is moderate in the lower (northern) part of the creek, in much of the drainage there is an outstanding opportunity for solitude and primitive recreation, and the area attracts visitors from all over the country, particularly during the big game hunting season. Fishing, hunting, and day rides are among the activities offered by the several commercial outfitters that operate in the area.

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Wildlife/Ecological River Value: This tributary of the Hoback River enhances the ecological and wildlife values associated with the lower Snake River system. Wildlife habitat diversity within this segment is very high due to a mix of riparian zones, aspen stands, sagebrush and grassland steppe, and conifer forests. The upper reach is dominated by subalpine parks and scattered timber that provides summer habitat for elk, mule deer, black bears, and a variety of small mammals and nesting birds. Willow Creek meanders through wide willow flats, over braided gravel shoals, and cuts through sections of bedrock where it forms riffles and cascades. Several ponds in the creek corridor provide habitat for amphibians, including boreal chorus frogs, spotted frogs, and tiger salamanders. A number of bat species forage over the creek and pond habitat as well.

Birds that nest in the willows include Yellow Warbler, Wilson Warbler and Willow Flycatcher. Willows also provide foraging habitat for the Red-naped Sapsucker, which nests in aspen or conifer cavities in the uplands. Williamson's Sapsuckers and Northern three-toed Woodpeckers use the forest surrounding Willow Creek as well. Also seen along the creek are American Dippers, Common Mergansers, Song Sparrows, Orange-crowned Warblers, Olive-sided Flycatchers, Lazuli Buntings, Canada Geese, and Belted Kingfishers. This area is also used by Sandhill Cranes (nesting), river otters, mink, moose, and numerous neotropical birds and waterfowl.

Wildlife diversity near the confluence with the Hoback River is exceptional due to high habitat diversity. This section supports nesting Bald Eagles and foraging Goshawks, Cooper's Hawks, occasional gray wolves, and bobcats. Owing to its contribution to the lower Snake River system, its high diversity of vegetation and wildlife, and its pristine condition, this segment represents and an outstandingly remarkable wildlife and ecological value.

Fisheries River Value: Snake River cutthroat trout are abundant and occupy nineteen miles of stream from the confluence with the Hoback River, and Paiute sculpin are common throughout the system. The dominant habitat type along the stretch is low gradient riffles with an abundance of large woody debris providing ample spawning and rearing habitat. Management Indicator Species boreal chorus frogs are present in this segment. Willow Creek provides an important spawning and recruitment stream for native cutthroat trout for both the Hoback and Snake Rivers.

Landscape Character: The character of the landscape is mostly semi-primitive, non-motorized backcountry, although light motorized use occurs in winter. The lower end is within the corridor of U.S. 189/191, although well separated from sights and sounds of the highway except at the confluence with the Hoback.

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Wolf Creek

Basic Hydrology and Basin Characteristics: The Wolf Creek watershed is 13.6 square miles (8,686 acres) in size. Wolf Creek flows in a southerly direction to its confluence with the Snake River. Headwaters for the stream are defined by Wolf Mountain (elevation 9,483 feet), Indian Peak (9,683 feet), and Red Peak (9,771 feet). Valleys are steep and confined throughout the watershed, with valley bottom slopes starting at about 5.6% near the mouth to above 15% near the headwaters. Streams are likewise steep, confined, and boulder/cobbly/gravelly, for the most part. They are generally characterized as Rosgen "B" type channels, which tend to form rapids, steps, and scour/plunge pools more than lateral meanders as they dissipate energy. Sediment comes from material that has fallen from valley side slopes, as well as rock that has been transported downstream during high spring flows. Instream wood plays an important role in maintaining aquatic habitat via single logs and log jams, as well as providing "roughness" to slow down high, fast peak streamflows.

Wolf Creek's floodplain is narrow due to the valley confinement, which does not allow for broad dispersion of spring runoff. This leads to little dispersion of spring runoff and, with the steepness of the watershed, produces high, "flashy" peak flows. While there are no structures needed in most of the watershed to accommodate these flows, the crossing at Highway 26/89 was reconstructed by the Wyoming Department of Transportation (WYDOT) to pass such discharges. The crossing structure at the highway is a 9-foot x 9-foot reinforced concrete box culvert, buried two feet, with baffles to allow for fish passage to and from the Snake River. The structure was also sized to account for potential obstruction by logs and branches. Remnant parts of diversion structures were present in and along the lower reaches of the stream in 2009, but the water rights were no longer active.

The National Wetlands Inventory mapped just two small freshwater ponds (less than 0.2 acres each) in the watershed, along upper Wolf Creek. No other wetlands were mapped in the watershed, which is in keeping with the well-drained nature of the setting; streams are efficient at moving water through the system. Forest vegetation mapping from 2007 identified riparian vegetation mostly along stream channels, where moisture and soil conditions would provide favorable conditions for plant growth. Stands of riparian vegetation were also mapped in a small west-facing draw high on the east side of the watershed.

Peak streamflows result from snowmelt in the spring and are unaltered by diversions. Estimated peak discharges of various recurrence intervals are based on calculations from Miller (2003), and are summarized in Table 2.17.

Table 2.17. Peak Discharges, Wolf Creek at Mouth

Peak Flow Recurrence Interval (years)	Discharge (cfs)
1.5	107.9
2	126.7
5	169.8
10	196.5
25	227.7
50	248.7
100	269.6

In calculating design flows for the Wolf Creek box culvert, WYDOT used a 25-year design discharge of 275.1 cfs and a 100-year flow of 350.3 cfs (Bailey, 2000).

Free-flowing Character: The only potential noteworthy human-made obstruction to the free-flowing character of Wolf Creek is the culvert at the highway. This culvert was replaced to provide better fish passage. Excessive water velocities at the outlet were determined to be an impediment to migrating fish during high flow periods, so the new culvert was installed at a lower gradient and baffles were used to "roughen" the floor of the culvert and slow down water flowing through it, as well as providing resting pools for fish. Additionally, notched baffles in the culvert would allow organism passage during low flow periods. The trail up Wolf Creek also encroaches on the stream in some locations, potentially impacting floodplain and stream channel function locally where the channel, vegetation, and soils are affected by this feature.

Water Quality: A search of the USEPA STORET database did not find any water quality data in the watershed going back to 1981, and the Forest has no data either. Riparian area condition appears to be in very good condition, however, and this can provide a surrogate indicator of water quality where potential impacts to water quality are due to non-chemical sources (e.g., grazing, roads, and recreation).

Scenery River Value: The trail passes through a lush, narrow canyon with diverse vegetation, cliffs, and long talus slopes, with views of the overturned red and grey rock strata on Peak 90471. Wolf Creek appears to be very wild and undisturbed. Scenic features include

the narrow, cliff-hemmed canyon in the lower drainage, and subalpine meadows at its upper end. Cascades and low waterfalls along this high-gradient creek provide a constantly changing set of water features for those who hike the streamside trail. Predominantly light-colored limestone along the lower creek reflects the light through this clear water and creates beautiful emerald-turquoise pools. Peaks of the Snake River Crest, including Indian Peak and Red Mountain, frame the headwaters of Wolf Creek. Wildflowers in summer and fall colors add to the scenic diversity and interest of this creek.

Recreation River Value: This is one of the longer creeks draining the Palisades Wilderness Study Area, with good trail access that links to other drainages and allows for extended trips by foot or horseback. The corridor and watershed surrounding the creek comprise an exemplary and easily accessed backcountry area, giving visitors a taste of the Wilderness Study Area. A wildfire in the lower section has left a diverse understory of mountain shrubs and Douglas-fir snags, a haven for wildlife and with opportunities for interpretation. The deciduous shrubs provide a wide palette of colors in fall.

Wolf Creek offers an opportunity to step off a busy paved highway in the Snake River Canyon and enter a quiet wild world within a few steps. The canyon is narrow and thus isolated from the sounds and sights of the nearby activity along the Snake River. The trail is well maintained but there are eight fords, some of which are daunting during high water, so this drainage offers a high degree of challenge and opportunities for solitude and primitive recreation. Primary recreation activities include day hiking, horseback riding, camping, and hunting. The opportunity for winter sports is limited by extreme avalanche hazard.

Wildlife/Ecological River Value: The stream is relatively narrow due to steep mountain slopes that often reach to the margin of the creek. Several well-developed riparian zones with beaver dams and ponds along the lower three miles are used by foraging Bald Eagles, Peregrine Falcon, and Osprey. The broadest riparian zones are in the lower section. The entire segment is used by gray wolves and mountain goats, moose, mule deer, and elk. A wildfire on the west slope of the creek has resulted in an extensive deciduous brush field with standing Douglas-fir snags for cavity nesting birds. Talus slopes along the sides of Wolf Creek offer some of the lowest-elevation habitat within the BTNF for American pikas. Although this area provides important habitat for several ungulate species, the stream corridor itself does not provide extensive habitat for a diversity of river-related wildlife. Owing to a limited acreage of riparian habitat and limited use by river-related wildlife, this segment provides an outstandingly remarkable ecological value for the lower three miles only.

Fisheries River Value: This high gradient stream is a tributary to the Snake River. The species present here include Snake River cutthroat trout, Paiute sculpin, and mottled sculpin, the majority of which are concentrated in the lower reach closest to the Snake River. While there has been documented spawning of cutthroat trout in Wolf Creek, the habitat is limiting,

but the presence of this native species meets the criteria for fisheries outstanding value in the lower 3 miles of this segment.

Landscape Character: The character is primitive for nearly all of the creek's length. Only the trail and a few established campsites exist. Although access is directly adjacent to a paved highway the primitive character of the creek ensues immediately after leaving the parking area.

Land Uses & Facilities 3

Chapter 3: Land Uses and Facilities

This section presents information known about the current uses along each river, including private lands. Many of the rivers included in the Snake River Headwaters Legacy Act are within National Forest Wilderness, Wilderness Study Areas, or backcountry areas managed for dispersed recreation and wildlife values. Further, there is no private land within the river corridors of Bailey Creek, Shoal Creek, Wolf Creek, nearly all of Willow Creek, and the Wild River segments of the Buffalo Fork, Crystal Creek, Granite Creek, the Gros Ventre River, Pacific Creek, and the Snake River. Table 3.1 displays the acreage in private land within the remaining recreation and scenic class river corridors.

Table 3.1. Acreage in Private Land within Each River Corridor

NAME	Total acres	Private acres
Blackrock Creek	5,915	16
Buffalo Fork	3,792	523
Crystal Creek	1,264	465
Granite Creek	2,872	94
Gros Ventre River	10,840	2,067
Hoback River	3,160	1,059
Pacific Creek	2,057	82
Snake River	7,255	898
Willow Creek	4,340	5

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Baseline Activities and Infrastructure

In the first half of this chapter, each river-specific discussion is organized as follows (where information is available):

- Water rights
- Type and amount of permitted uses, rights-of-way, and easements
- Land ownership and activities on private land
- Existing infrastructure and activities on national forest lands
- Historic activities, including fire history
- Availability and compatibility of future development with the wild and scenic character of the river segment

In the second half of this chapter, the required Visitor Use Assessment is presented, detailing the kinds and amounts of recreation uses.

Bailey Creek

Water Rights: There is one adjudicated water right that withdraws water from Bailey Creek. The beneficial use is for mining operations. Historically, this ditch was used for a gold mine operation.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: The Bailey Creek Sheep Allotment includes most of the watershed, although the primary grazing areas for the sheep are in the uplands beyond the corridor. Outfitter-guides with day-use permits operate in the area; one commercial outfitter has a base camp near the trailhead in the Little Greys drainage, but this is not within the corridor.

Land Ownership and Activities on Private Land: The corridor lies entirely within National Forest System lands.

Existing Infrastructure and Activities on National Forest System Lands: Land uses emphasized in the Forest Plan include dispersed recreation and wildlife habitat, and river-based recreation in the lower part of the creek where it meets the Snake. The Recreation Opportunity Spectrum class featured is Semi-Primitive, Non-motorized. To maintain this setting the trail in the Bailey Creek corridor is managed to exclude motor vehicles except snowmobiles in winter. No winter trail grooming occurs, so snowmobile use is sporadic.

There is one established campsite on the north shore of Bailey Lake and several other camping spots in the area.

Historic Activities or Past Uses: Archeological evidence in the McCain Meadows area suggests that Bailey Creek was used as a long-term travel corridor for prehistoric people. It provides the easiest access between the Elbow area of the Snake River and the drainage of the Little Greys. It has served as a recreational travel route in more recent times, with a trail traversing its length and joining a trail on the south side of the Snake River. Camping, fishing, and picnicking remain popular activities in the drainage, primarily at Bailey Lake. Water from the creek has been extracted for small-scale placer mining.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: This is unlikely to be a concern since the entire watershed is on National Forest System lands, in a roadless category, and no development is being contemplated.

Blackrock Creek

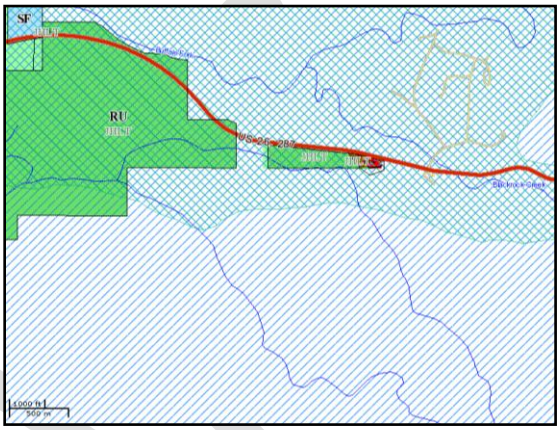
Water Rights: Blackrock Creek is diverted above the Blackrock Ranger Station to irrigate the Hatchet Ranch area. There are six water developments located on Blackrock Creek, five ditches and one water haul. The ditches permitted water uses are for irrigation, storage, and domestic use.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: U.S. 26 passes through the national forest, most of it within the river corridor. The Blackrock-Spread Creek cattle allotment has been closed and is currently managed as a Forage Reserve. Eleven easements or uses permitted by the BTNF are as follow:

- Qwest telephone lines
- Four water conveyance easements to private landowners
- WYDOT Highway reconstruction easement along Rosie’s Ridge
- WYDOT batch and mixing plant
- Teton County Emergency Agency Private Mobile Radio Service
- One 10-foot wide road easement
- One livestock area of 160 acres
- Lower Valley Energy power line

Land Ownership and Activities on Private Land: The corridor lies within National Forest System lands until its confluence with the Buffalo Fork, where 16 acres of private land intersect the corridor. Agricultural uses include pasture for cattle grazing on private ranches that in the past were largely used for raising cattle and hay. These are restricted to the small acreage of the corridor that is at the lower end. Much of the private ranchlands in the Blackrock Creek drainage are under a conservation easement or have been transferred to the Forest Service (notably the Hatchet Ranch). The Blackrock-Spread Creek cattle allotment is currently not stocked.

Right: map of lower Blackrock Creek, showing private land, conservation easements (green), and county comprehensive plan scenic and natural resource overlays (cross-hatching). Source for all maps: Teton County GIS website.



Existing Infrastructure and Activities on National Forest System Lands: Land uses emphasized in the Forest Plan include dispersed recreation, wildlife habitat, and grizzly bear conservation. Forest roads cross Blackrock Creek in several places as they give access to the Mt. Leidy highlands to the south. No timber harvest has occurred in the immediate river corridor other than that necessary to clear for highway reconstruction. Some timber harvest has taken place along tributary streams and small patch cuts are visible from the creek corridor and nearby highway.

Fisherman trails take off from bridges or roads near the creek, but there are no formal trails in the corridor. Hatchet Campground has 9 sites. Seven snowmobile unloading sites along Highway 26 support space for 120 vehicles with trailers. Near the Buffalo Ranger District office a multi-season parking area offers 25 spaces. The residential compound and work area for the Forest Service occurs at the lower end of Blackrock Creek where it meets the Buffalo Fork.

Historic Activities or Past Uses: A variety of historic uses include livestock grazing, some small coal mining operations, efforts to manage vegetation through fire for the benefit of wildlife, particularly wintering deer and elk, and recreation. Recreation includes scenic driving (Togwotee Pass is historically known as the east entrance to the Grand Teton National Park region), big game hunting, fishing, and scenic viewing. Some exploratory wells have been drilled in the area but not in the immediate river corridor. Two formerly active gravel pits are now closed. One was overcome by high water in 2009 and the access

route is no longer functional; the other was utilized for storing waste material from outfitter corrals until it reached capacity.

The Forest Service ranger station at the Buffalo Ranger District is a historic structure, the original cabin used by the first forest ranger, Rudolph Rosencrans, and is open for public viewing adjacent to the Buffalo District office.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: Foreseeable development in this drainage would be compatible with river values, since it is subject to Forest Plan standards to protect river values and scenic quality. Private acreage is minimal and county land development regulations are fairly protective.

Buffalo Fork

Water Rights: The Buffalo Fork has 14 water developments within the designated segment. Most water developments are associated with irrigation or stock watering.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: Some minor diversions for irrigation exist in the lower reach. A former gravel pit at Turpin Meadows was used by district outfitters to dispose of corral waste, which became infested with weeds. The district has now disallowed that use. One cattle allotment exists at Lava Creek. Twenty currently permitted uses or easements are listed below.

- Transportation Commission of Wyoming, Department of Transportation easement
- Water conveyance easements to private landowners
- Livestock areas permitted to 4 individuals or resorts
- Buffalo Valley Water District well, water transmission pipeline, and water storage tank for community use
- Teton County road easement
- Qwest telephone lines (3 easements)
- Yellowstone Trail Road Maintenance Association easement
- One private well easement
- Lower Valley Energy power line

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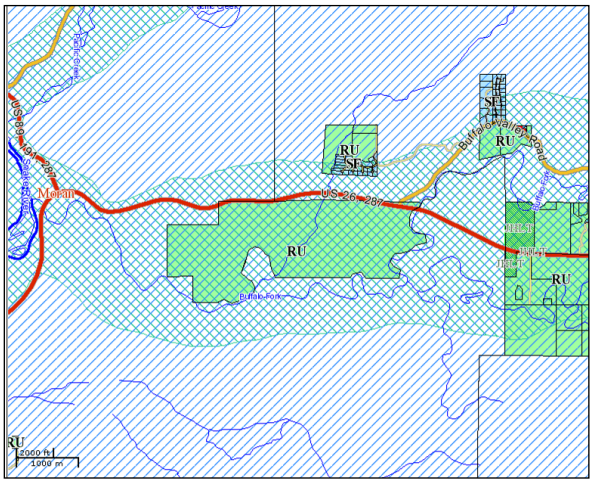
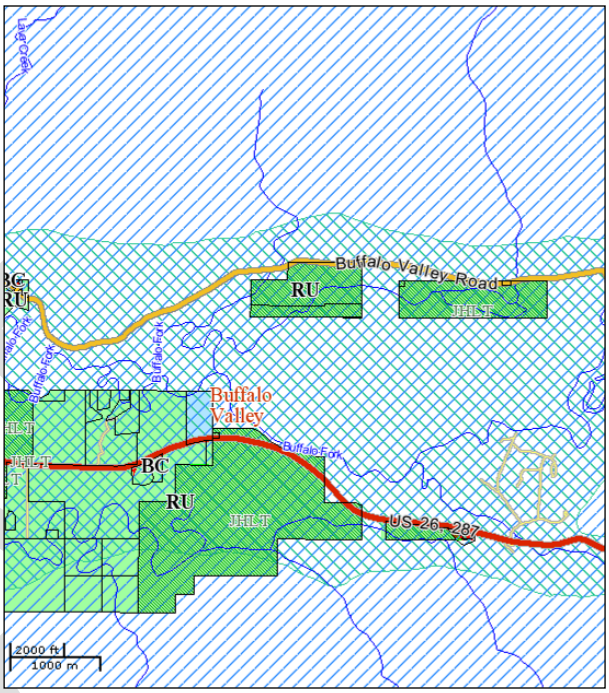


Land Ownership and Activities on Private Land: Several parcels of private ranch lands, guest ranches and resorts, and residences occur within the corridor of the Buffalo Fork; the total acreage of private land is about 543 acres, 14% of the corridor.



Existing Infrastructure and Activities on National Forest System Lands: The Buffalo Valley Road and forest roads leading to facilities from it lie within the river corridor. The main road is paved from its western end to Turpin Meadows. Turpin Meadows Campground is a primary destination for campers, fishermen, and those heading into the Teton Wilderness. It has 19 developed campsites and also 40 parking spaces. Horse facilities include corrals, hitching racks and water troughs. A recreation residence tract is located nearby; these homes are under special-use permit on the national forest. Box Creek Campground offers an additional 6 sites. Box Creek and Clear Creek Trailheads give access to the Teton Wilderness, each with parking for 8-10 vehicles.

Historic Activities or Past Uses: A variety of historic uses in the section below Turpin Meadows include working ranch and dude ranch developments, livestock grazing, some small gravel quarrying operations, and recreation. Recreation includes scenic driving, big game hunting, fishing, wildlife viewing, floating the lower river. The segment upstream from Turpin Meadows' trailhead is entirely within the Teton Wilderness, an area that has been managed as a primitive area since the 1920s.

Approximately 10,300 acres have burned within the watershed (approximately 2700 acres via prescribed burn) since 1974. This comprises 4.3% of the area of the watershed. The burning has been exclusively within the northwest half of the watershed.

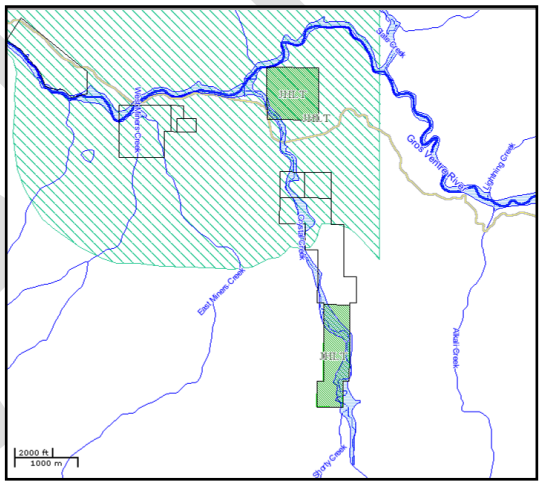
Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: Most activities that are foreseeable in the lower segment could be compatible with river values, subject to Forest Plan standards to protect river values

and scenic quality. There is continued potential for sale and subsequent development of private lands in the lower river segment. Development potential and approval for these private lands falls under Teton County. Increasingly, landowners in this area have been placing their property under conservation easement, which will have a positive benefit to river values.

Crystal Creek

Water Rights: Crystal Creek has three water developments that are permitted to divert flow from the creek. There are three ditches that have beneficial uses for irrigation, domestic, storage, and mining.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: Red Rock Ranch has an active cattle and horse allotment. One irrigation water ditch is permitted by the BTNF. Lower Valley energy has a (1.5 mile) power line easement into the ranch.



Land Ownership and Activities on Private Land: Roughly 487 acres (37%) of the lower segment are in private ownership; the remainder is entirely within the Bridger-Teton National Forest. Land uses on private land include agriculture, dude ranching, and some alterations of Crystal Creek for fish habitat and bank stabilization.

Existing Infrastructure and Activities on National Forest System Lands: Developments along the scenic stretch of stream include the trailhead for the Wilderness (on National Forest System land); the Red Rock Ranch, which has a private operation along approximately two miles of stream bottom; another small private irrigated parcel near the mouth; a bridge that is scheduled for 2013 replacement that crosses Crystal Creek on Forest Road 30400; and a couple of dispersed campsites downstream from the bridge. Crystal Creek campground is a small (8-unit) campground at the confluence of Crystal Creek and the Gros Ventre River. The Gros Ventre road crosses Crystal Creek and an access road exists to the Crystal Creek trailhead. The road was improved during the fires of 2011.

Most management activities within the Crystal Creek watershed are centered on recreation and livestock (cattle and horse) grazing use. The Wild segment of Crystal Creek is entirely within the Gros Ventre Wilderness, which encompasses approximately 43,100 acres (95%) of the Crystal Creek watershed. Impacts to Crystal Creek and its riparian area within the

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Wilderness are scattered, and most grazing is directed along Jagg Creek, a tributary. The wilderness section of the creek is accessed via forest system trails. Other than an assigned site for outfitting, there are no constructed features beyond trails.

Historic Activities or Past Uses: There is evidence that prehistoric people used this area for summer hunting, fishing, and part time residency. More recent historic uses along the scenic segment include cattle grazing, pasture and hay production and dude ranch operations.

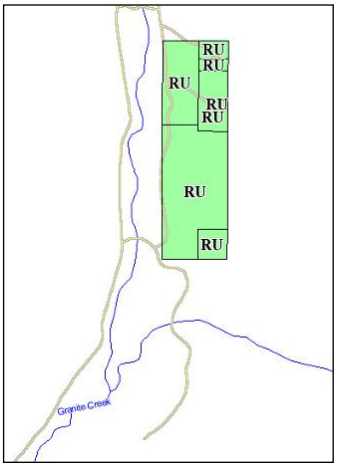
Two recent fires have burned within the Crystal Creek watershed. The Crystal fire burned approximately 540 acres in the center of the watershed in 2010 and approximately 100 acres of the Red Rock fire burned into the northeast side of the watershed in 2011. The East Miner fire burned to the northwest boundary of the watershed in 1994. No notable downstream hydrologic effects from fire have been documented.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: Most activities that are foreseeable in the lower segment could be compatible with river values, subject to county regulations to protect scenic and water quality. There is potential for sale and subsequent development of private lands in the lower river segment, although much of the private land is currently under conservation easement.

Granite Creek

Water Rights: No water rights are currently in the state database. The Forest Service is working to complete the process to establish rights to water for the Granite Hot Springs concession. Most private property owners that live along Granite Creek divert water from Jack Pine Creek or have wells.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: The Granite Creek cattle/horse allotment is under permit.. Exploratory gas wells have been drilled within the river corridor. One water transmission pipeline is under permit to a private landowner.



Land Ownership and Activities on Private Land: The Wild River segment is entirely within the Bridger-Teton National Forest. Several parcels of private land exist in the Scenic River corridor, including small ranches and American Wilderness Leadership School, a private organization camp. The total private ownership in the corridor is 94 acres, or 3%

of the Scenic River corridor acreage. Private land in the corridor is zoned Rural by Teton County.

Existing Infrastructure and Activities on National Forest System Lands: No infrastructure exists in the Wild River segment other than the Granite Creek trail, which stays within the corridor for its length to Turquoise Lake. In the Scenic River segment the Granite Creek Road, Forest Road 30500, is located on a terrace. It is generally at least 100 to 200 feet from the edge of Granite Creek's riparian vegetation and active floodplain, except for the confined reach upstream from the confluence with Little Granite Creek. Here the road is within 50 feet of the channel. Granite Creek Road and spur roads, including two bridges over the creek, provide the primary transportation system. There is also a road/trail along the east side of the creek that provides access to the special uses facilities, the stream, and the riparian area along that side.

A trail between the Swift Creek/Shoal Falls trailhead and Granite Hot Springs runs along the east side of the creek for about 2 miles. The hot spring is a developed area run by a concessionaire and includes the pool, caretaker residence, and supporting structures. Granite Campground has 52 units. Granite Falls picnic area is a small day-use site with space for 12 vehicles. Winter parking at the base of Granite Creek Road can hold 50 snowmobile trucks and trailers. Lower Valley Energy has 5.86 miles of power line in the lower segment.

Historic Activities or Past Uses: Granite Hot Springs has a historic pool with a bathhouse built by the Civilian Conservation Corps. Current uses are similar to past uses, recreation and livestock grazing. Energy exploration has taken place in the past as noted above.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: Because private acreage in the area is minimal, most activities that are foreseeable in this drainage are subject to Forest Plan standards to protect river values and scenic quality and would be compatible with river values.

Gros Ventre River

Water Rights: There are nine developments that withdraw water from the Gros Ventre River within the designated section. Beneficial uses include irrigation, domestic use, stock watering, and industrial.

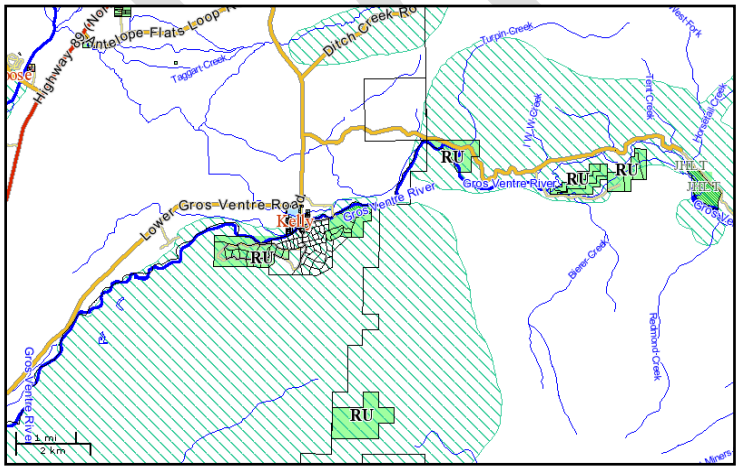
Type and Amount of Other Permitted Uses, Rights-of-Way, and Easements: Ditch Creek cattle and horse allotment, some of which includes the lower Gros Ventre drainage, is vacant. Redmond-Bierer Creek, Miner's Creek, Big Cow Creek, Lower Slide Lake, and Upper Gros Ventre are all active cattle allotments. Taylor Ranch, Red Rock Ranch and

Robinson Ranch all utilize permitted horse allotments. The Bacon-Fish Creek allotment has been closed and is now used as a forage reserve.

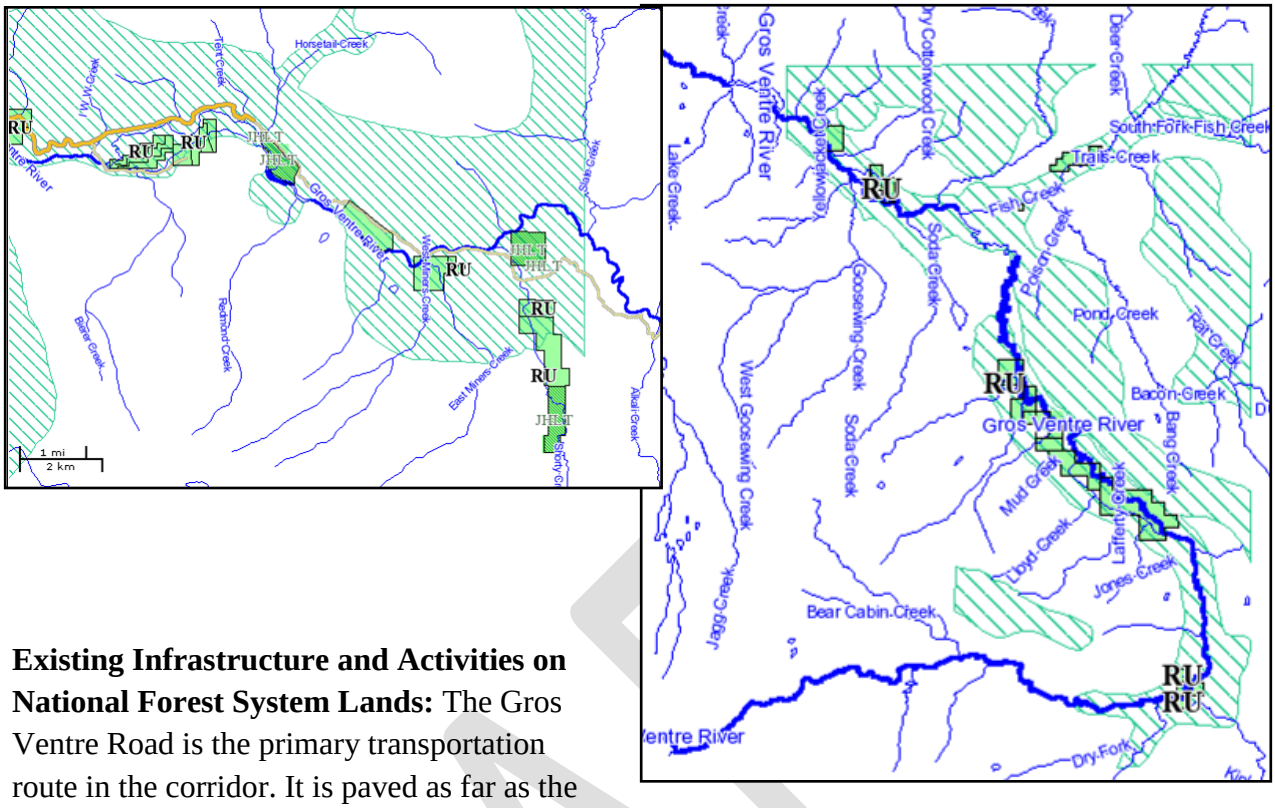
Other uses for which easements or permits have been granted by the BTNF include the following.

- Four road rights-of-way to private parcels
- Four water transmission pipelines
- Five additional water conveyance easements
- Two Wyoming Game and Fish elk feedgrounds (Alkali and Fish Creek)
- Lower Valley Energy power line
- Gros Ventre Slide research project
- Various wildlife research permits

Land Ownership and Activities on Private Land: The Darwin Ranch is directly downstream from the Wild River segment. It is a historic guest ranch and has an outfitter-guide permit for the adjacent national forest. Additional permits are held with the Pinedale Ranger District for non-recreation uses such as water transmission and pasture within the corridor. Wyoming Game and Fish Commission-owned lands at Patrol Cabin fall within this corridor. The Scenic River segment includes about 19% private land. The parcels are private ranch lands, some of which are operated as guest ranches, with associated outfitter-guide and cattle/horse grazing permits on the adjacent national forest. Some of the private parcels have conservation easements and most of the corridor is within the natural resource overlay of the Teton County Comprehensive Plan.



Maps: Gros Ventre River segments arranged west to east, showing private land, conservation easements (green), and county comprehensive plan scenic and natural resource overlays (cross-hatching).



Existing Infrastructure and Activities on National Forest System Lands: The Gros Ventre Road is the primary transportation route in the corridor. It is paved as far as the Atherton Creek gate; beyond that point it is a two-lane road with gravel surface as far as the Slate Creek gravel pit, that was once a historic gold mine. Beyond, the road becomes narrow although still two lanes; surfacing is intermittent. The Devil's Dip area, also a historic gravel pit, and the Cottonwood bridge were reconstructed in 2010; other than these new improvements the Gros Ventre Road beyond this point is primitive. Numerous side roads give access to private land, trailheads and forest areas beyond the river corridor.

Management activities within the Gros Ventre watershed include roads, recreation, agriculture and irrigation diversions, livestock (cattle and horse) grazing use, elk feedgrounds, mineral prospecting and use (the latter, gravel), permitted access to private homes and ranches, and prescribed fire. Existing Wyoming Game and Fish Department feedground operations occur on permitted areas, as well as on non-Forest Service lands at Patrol Cabin.

Road density in the Gros Ventre watershed is 0.42 miles per square mile, which is a low value according to Quigley et al. (1996). Sections of the Gros Ventre Road are in need of repeated maintenance and a number of tributary crossing structures are undersized. At the same time, the Gunsight Bridge (2010) was recently replaced and Crystal Creek Bridge is scheduled for 2013 replacement, with structures having fewer piers and a longer span. The Jackson Ranger District has been closing unauthorized, motorized trails in the drainage, and improving conditions on the system trails. This will result in improved watershed conditions. Infrastructure other than roads, bridges, and trails include campgrounds, trailheads, and one patrol cabin (Goosewing). The ranger station at Goosewing is a historic structure. Game and

Fish feedgrounds are noted above under permitted uses, plus another on state land at Patrol Cabin.

The Wild River segment of the Gros Ventre is served by a trail system with cross trails and a trail that parallels the river between the Darwin Ranch and the Gros Ventre Divide. Geologic and scenic features such as Ouzel and Upper Falls are also reached via trail. Established outfitter camps and the trail system are the only constructed features in this segment of the river. Outfitter and guide use along the Wilderness portion of the Gros Ventre River is managed by the Forest Service, and where camps are too close to the river (or where stock have been picketed or enclosed too close to the river), patrollers have successfully requested recreationists to change locations.

Grazing on private and public lands in the watershed takes place within the designated corridor. In surveys conducted along the designated reach in the Gros Ventre Wilderness, riparian conditions on the public portion of the river appear to be in overall good condition. Riparian and stream channel conditions where the stream flows through private ranches are unknown. Impacts to the stream channel are being monitored. Private landowners have expressed interest in restoring some streambank and wetland conditions on the scenic segment of the Gros Ventre River, where past manipulations occurred to decrease mosquito populations and increase livestock pasturage.

Ongoing efforts to manage vegetation through fire for the benefit of wildlife occur in the corridor, with a focus on Bighorn sheep and elk, along with migratory species such as pronghorns that use the Gros Ventre as part of their bi-annual route between the upper Green and Grand Teton National Park.

Historic Activities or Past Uses: The Gros Ventre River valley has been used since prehistoric times for travel to Jackson Hole from the upper Green River, hunting and human occupation. A variety of historic uses include homesteading and ranchland settlement, livestock grazing, small coal mining operations, placer gold mining (non-patented claims), and access to the upper Green River via primitive roads that have since been converted to trails.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: Most activities that are foreseeable in this drainage could be compatible with river values, subject to Forest Plan standards to protect river values and scenic quality. There is some potential for sale and subsequent development of private lands in the area; dense development could detract from the scenery. The most likely type of development is additional facilities at existing ranches and high-end residential developments which could be compatible with river values.

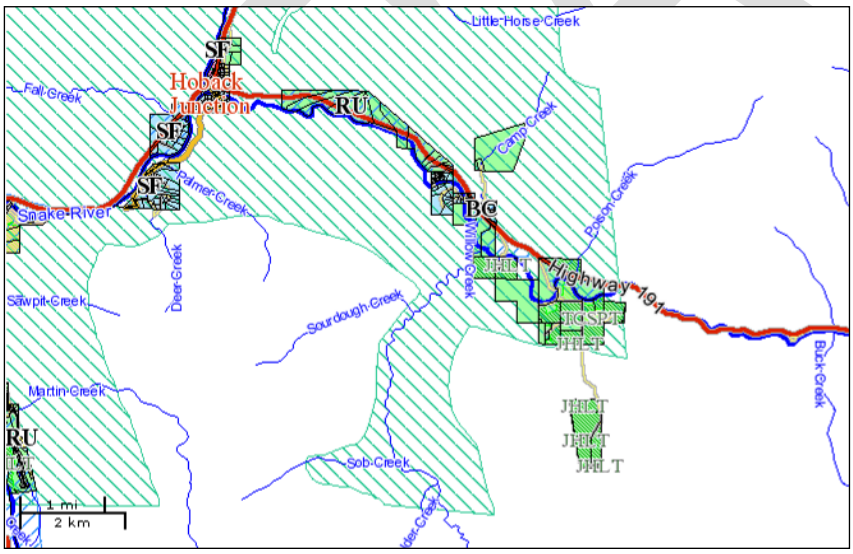
Hoback River

Water Rights: Thirteen ditch/pipeline permits, primarily for domestic uses, have been issued along this stretch of the Hoback. Four reservoirs are permitted, which primarily supply water for fish and wildlife habitat. Hoback Vistas subdivision permit-use is listed as wildlife and fire.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: Reconstruction, bridge replacement and other improvements to U.S. 189/191 is ongoing each year. Other easements or permits for private uses in the river corridor are listed below.

- Four water transmission pipelines
- One livestock pasture
- Qwest telephone line
- Eight road rights-of-way
- One shed and corral
- Lower Valley Energy power line (19.98 miles) and natural gas pipeline

Land Ownership and Activities on Private Land: About 31% of the land within the corridor is private. The 1,059 acres of private land is zoned either Rural or Business conservation (Camp Creek vicinity), and it is all within Teton County's natural resource and scenic overlays. Conservation easements exist on some parcels.



Hoback River, showing private land, conservation easements (green), and county comprehensive plan scenic and natural resource overlays (cross-hatching).

Existing Infrastructure and Activities on National Forest System Lands: Recreation activities and permitted uses as noted above; forest roads and the scenic byway are primary infrastructure here. Bryan Flat guard station and associated pasture are outside the corridor.

Historic Activities or Past Uses: The Hoback River has been used as a human travel corridor since prehistoric times. More recently ranching, dude ranching, pasture and hayfields, and some diversions for irrigation have taken place in the corridor. Some of the original highway roadbed on the north side of the river can be seen.

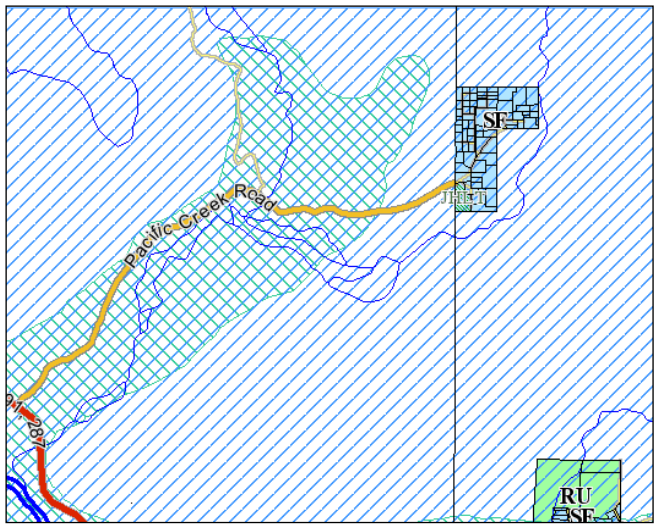
Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: Private land in the lower canyon has been subdivided and developed since the Bridger-Teton National Forest completed its rivers study in the early 1990s, but the development to date is not incompatible with Recreational River status. Fiber-optic cable has been installed in the past decade as well; this is all buried and does not detract from the river. Reconstruction and relocation work on U.S. 189/191 could affect the scenic quality of the lower river though this will be subject to Section 7 and other analysis under the Wild and Scenic Rivers Act.

Pacific Creek

Water Rights: Two water developments are permitted. The beneficial uses include fisheries propagation, domestic use, and storage.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: Pacific Creek cattle allotment has been vacated. Several claims for placer gold exist, both outside and just inside the wilderness boundary.

Land Ownership and Activities on Private Land: There is a private subdivision between Pacific Creek and the Grand Teton National Park boundary that lies within the river corridor (see map). Otherwise, the creek is entirely within the Bridger-Teton National Forest or Grand Teton National Park.



Other than the placer gold claim, human uses in the Wild River segment are consistent with the history of the Teton Wilderness, managed as a Forest Service primitive area since the late 1920s. They include some landmark

wildlife studies (along with structures such as exclosures that have since been removed) conducted in the 1920s by Olaus Murie and others.

Existing Infrastructure and Activities on National Forest System Lands: Pacific Creek Campground includes 9 family units, horse-holding facilities, and a trailhead of adequate size to accommodate 10-12 trucks with trailers. Bear-resistant food hanging poles are included in the campground and trailhead facilities. Permitted outfitters also have facilities at or near the trailhead. The Pacific Creek Road is shared with Grand Teton National Park.

Historic Activities or Past Uses: The primary use of the area has been recreational over time. A minor amount of cattle grazing and one placer gold mine have operated in the past.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: Most of the river is within the Teton Wilderness. Any future activity on the existing placer gold claims would be managed under the 1872 mining legislation. Neither wilderness nor wild river status would restrict the right of the owners to operate a placer gold operation; although it must be conducted in such a manner as to protect the values of the creek.

Shoal Creek

Water Rights: No diversions exist on Shoal Creek with water rights.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: The corridor is within the Hoback cattle allotment.

Land Ownership and Activities on Private Land: This segment of Shoal Creek is entirely within the BTNF and Shoal Creek Wilderness Study Area.

Existing Infrastructure and Activities on National Forest System Lands: The Riling Draw Road and several trails give access to the trailhead and Shoal Creek. The trailhead is not developed but it has user-built corrals, parking for 10-15 vehicles, and two food hanging poles.

Historic Activities or Past Uses: Virtually the entire designated segment's watershed is within the Gros Ventre Wilderness and Shoal Creek Wilderness Study Area. Cattle graze in the entire watershed as part of the Hoback cattle and horse allotment, but use is concentrated in lower elevations. Reconnaissance level observations along lower Shoal Creek in 2006 found some impacts to riparian area vegetation and stream banks from grazing, but impacts were relatively light and localized. The main recreational trail in the designated segment's portion of the Shoal Creek watershed follows the creek but, aside from crossings, generally stays at least 100 feet away from the stream and its riparian areas and wetlands. The only

historic fire to have burned within the designated segment's portion of the watershed is the 1973 Shoal Creek fire; approximately 290 acres of it burned within the lowermost portion of the segment's watershed, burning over the stream, as well.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: No foreseeable development is likely to affect river values. If the Shoal Creek Wilderness Study Area is added to the Gros Ventre Wilderness by legislative action, management of the creek corridor is not likely to change.

Snake River - Wild Segment

Water Rights: None.

Type and Amount of Permitted Uses: Wyoming Game & Fish Department operates a patrol cabin at Fox Park under agreement with the BTNF.

Land Ownership and Existing Management of the National Forest in the Corridor. This segment of the Snake River lies within federal wild lands; the segment administered by the Forest Service is entirely within the Teton Wilderness, managed as a Forest Service primitive area since the late 1920s. Land uses are outfitting and public recreation.

Historic Activities or Past Uses: Not substantially different than those of the current time.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: No foreseeable development is expected to have an effect on river values.

Snake River - Recreation Segment

Water Rights: Five ditch/pipeline permits are registered for the upper portion of the Snake River Canyon, plus one enlargement, which primarily allow irrigation activity, although one is listed for domestic water. An additional pipeline shows as domestic supply, and another as industrial use. Five reservoir permits are also registered, primarily for stock use. The Idaho Compact has priority water rights which retain water flowing in-channel and downstream across the state line.

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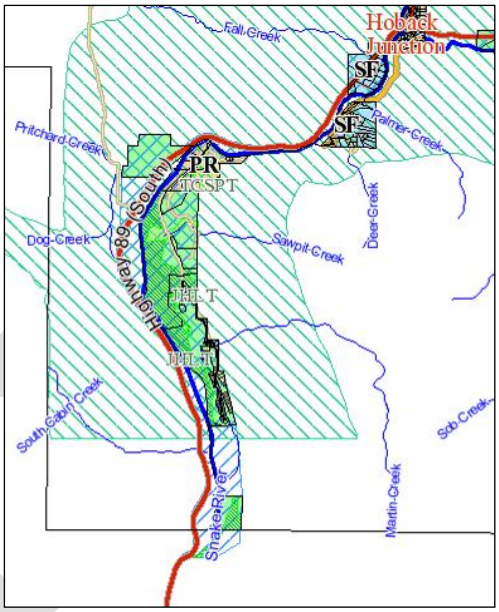
Type and Amount of Permitted Uses, Rights-of-Way, and Easements: U.S. 26/89 passes through the river corridor, utilizing a Forest Service easement. Other uses for which permits or easements have been granted by the BTNF follow.



- Qwest telephone lines (2 easements)
- Three road rights-of-way
- Lower Valley Energy power line

Land Ownership and Activities on Private Land: The river corridor is shared between the Bridger-Teton and Caribou-Targhee National Forests, with the BTNF being the administrating forest for everything except livestock management. About 12% of the river corridor is in private land. The map at right displays private lands and their zoning within the river corridor. Teton County natural resource and scenic overlays apply. Residential and resort development are primary uses of private land. The Snake River water, although not diverted in this section, is important irrigation water for downstream use in Idaho. Palisades Reservoir at full pool inundates the lowermost part of the canyon above the Alpine bridge and this has a temporary seasonal effect on the river flow.

Existing Infrastructure and Activities on National Forest System Lands: Boat ramps are critical to the primary purpose of river recreationists, and all include accessible 'Sweet-smelling Toilets' (SSTs). Wader and boat wash facilities are being piloted to control the spread of aquatic invasive species. The Astoria boat ramp has 16 parking sites, Pritchard has 20, Elbow has 20, East Table has 15, and Lunch Counter provides 20 sites for visitor/viewer vehicle parking. The two largest areas are at West Table, where 85 parking spots are divided between commercial and private parties, and at Sheep Gulch, with 100 sites available, as well as a developed trail for guests to safely walk up to the parking area from the boat ramps. Lunch Counter, too, has a developed trail for spectators who enjoy watching the boats handle the rapid, and for photographers.

Campgrounds in the Canyon are all managed by concession contract, and no dispersed camping is allowed during the high-use season. East Table has 18 individual campsites, Station Creek 17, and Wolf Creek has 21. A group camp site at Station Creek provides gathering space for 40 people, and another at Little Cottonwood can also serve a group up to 40, both of which are on the national reservation system.

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There is a sheep allotment on the north side of the highway that is managed by the Caribou-Targhee National Forest, though most of the time livestock are located outside of the designated river corridor.

Historic Activities or Past Uses: This section of the Snake River has been a transportation corridor since prehistoric times and was on the route that some of the region's first trappers used, along with the Hoback River. It has been used for recreation and irrigation for many decades. Roads/highways, utility corridors, private homes, Forest Service facilities, fire, irrigation diversions, grazing, and recreation (including campgrounds) have all taken place or exist along the designated reaches. US Highway 26/89 follows the Recreational segment for the entire reach, providing ready access to the river for recreationists and allowing for scenic views of the river and canyon. It is also affected by (and may affect) natural mass movements/landslides along the river corridor, as was seen in the spring of 2011. Roads along the corridor, including the highway, also change sediment transport and delivery within the local corridor area, as well as potentially altering floodplain features and functions when they encroach on the floodplain. Private landowners manipulate the channel, as described above, and some have lawns that extend to the water's edge, which would potentially add nutrients and sediments from runoff to the river. Forest Service recreation sites concentrate visitor use along the river, impacting stream banks, riparian vegetation, and potentially producing point sources for petroleum inputs and other pollutants (e.g., sediment). By concentrating use, constructing sites to accommodate visitors, and carefully managing use at the sites, it is thought that overall impacts to the reach of stream are within acceptable limits.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: Most activities that are foreseeable in this drainage could be compatible with river values, since they would be subject to Forest Plan standards to protect river values and scenic quality. Flood control and private land development could have an effect on downstream values. Persistence of noxious weeds, especially where disturbance has taken place, is a concern. Activities and development on private land within the upper portion of the corridor have the potential for affecting the river's scenic and wildlife value. Most activities that are foreseeable in this drainage could be compatible with the river values through mitigation and careful design, along with a strong partnership with Lincoln and Teton planning departments.

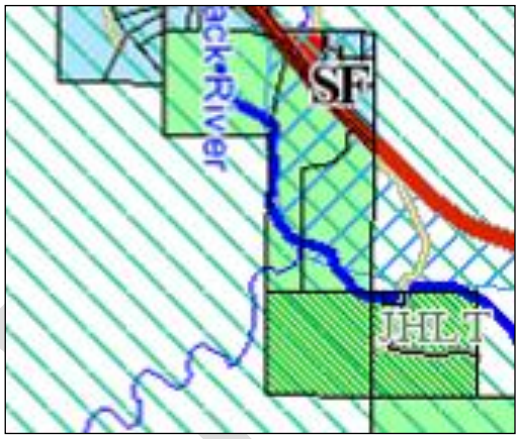
Willow Creek

Water Rights: Two irrigation ditches exist in the lower section of the drainage.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: Most of the watershed is either outside of active grazing allotments or part of the Upper Grayback-Pickle

Pass allotment complex that is now closed. One of the irrigation ditches cited in the water rights section above is permitted by the BTNF.

Land Ownership and Activities on Private Land: All except five acres at the lower end of the creek where it meets the Hoback River is within the BTNF. The private parcel is zoned Rural in the Teton County Comprehensive Plan.



Existing Infrastructure and Activities on National Forest System Lands: The trail system is the primary infrastructure in the corridor; one large trail bridge exists at Alder Creek and several bear-resistant food poles have been installed near popular dispersed campsites.

Historic Activities or Past Uses: Recreation; ranching and cultivation in lower end. Some cattle and sheep grazing have occurred in the drainage in the past. Outfitting from private dude ranches, recreational horseback riding, hiking and fishing along with rural home sites and recreational/tourist facilities have long been in this area.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: No foreseeable development is expected to alter river values, although increasing private land development and residences near the area could result in higher recreation use.

Wolf Creek

Water Rights: Three wells are permitted, including two to the Forest Service, and the other to the state highway department.

Type and Amount of Permitted Uses, Rights-of-Way, and Easements: Part of the Lower Valley Energy power line passes over the creek corridor. Sheep grazing is permitted in the watershed, administered by the Palisades District of the Caribou-Targhee National Forest. One band of sheep is grazed in the Dog, Pup, and Wolf Creek drainages from June 16 to September 20, and the allotment encompasses the entire Wolf Creek watershed (to the highway).

Land Ownership and Activities on Private Land: The corridor is entirely within the Caribou-Targhee National Forest (recreation administered by the BTNF).

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Existing Infrastructure and Activities on National Forest System Lands: There are 15.5 miles of system trail in the watershed, for a trail density of 1.14 miles of trail per square mile of watershed. The impacts of trails increase where they are next to streams and in the floodplain, and the general alignment of trails is up valley bottoms. There are no roads in the watershed except for the highway crossing at the outlet. The trailhead parking area is used year-round.

Historic Activities or Past Uses: The Wolf fire is the only recent fire in the watershed. It burned the lower, west side of the watershed in 2001. No prescribed fires have been ignited in the watershed.

Availability and Compatibility of Future Development with the Wild and Scenic Character of the River Segment: No developments are foreseen that would have an effect on the river values of Wolf Creek. There is a possibility that the creek corridor could be included in recommended or designated wilderness since it is part of the Palisades Wilderness Study Area but no anticipated change in condition or management would result.

Kinds and Amounts of Visitor Use

A. Visitor Capacity

The Wild and Scenic Rivers Act directs that agencies address visitor capacities to protect the free-flowing conditions, water quality, and outstandingly remarkable values of designated rivers. To meet this requirement, interagency guidelines for river management (1982) note that: *Management plans will state the kinds and amounts of public use that the river can sustain without impact to the values for which it was designated. Studies would be made during preparation of the management plan and periodically thereafter to determine the quantity and mixture of recreation and other public uses, which can be permitted without adverse impact on the resource values of the river area.*

Authority. In addition to the Act and the interagency guidelines pertaining to implementation of the Act, the Ninth Circuit Court of Appeals issued a 2008 ruling regarding visitor capacity decisions in the revised Comprehensive River Management Plan for the Merced River in Yosemite National Park. Among the findings, the court ruled that the Merced CRMP must (1) discuss the maximum number of people that can be received in a river corridor and describe an actual level of visitor use that will not adversely impact or degrade river values, (2) make an explicit tie between the kinds and amounts of visitor and other public use and the protection and enhancement of river values, (3) specify an appropriate quantity of use based on an analysis of resource values and desired conditions, not necessarily previous or current use levels, and (4) conduct periodic and on-going studies to determine whether the quantity and mixture of use leads to adverse impact on the resource values of the river area (NPS 2011, IWSRCC 2010). Although this ruling was made relative to the Merced River, the findings provide clarification for addressing the visitor capacity provision for designated rivers within the Snake River Headwaters.

Definition. The Wild and Scenic Rivers Act does not define "visitor capacity". The concept of recreation visitor capacity has been explored since at least 1936 (Sumner 1936) and specifically discussed in the recreation management literature since 1964 (Wagar 1964). While there are varying definitions of visitor capacity, all include the concepts that (1) desired resource conditions or values must be protected, and (2) the quantity or amount of use must be addressed. For the purpose of addressing "visitor capacity" within the CRMP, the 1982 Interagency Guidelines for Wild and Scenic Rivers definition is used. Per these guidelines, "visitor capacity" is defined as: *"The quantity of recreation use which an area can sustain without adverse impact on the outstandingly remarkable values and free-flowing character of the river area, the quality of recreation experience, and public health and safety".*

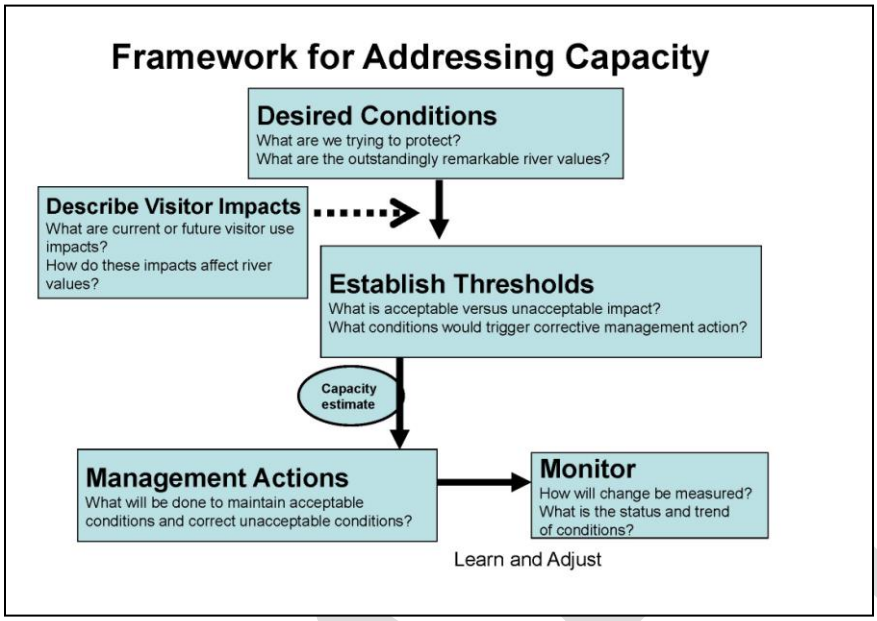
The term "capacity" in the recreation context has been confusing due to the tendency to use this term as a short-hand for the entire concept of visitor use management. Thus, a few key points must be noted:

- Visitor capacity is not the same as use limits. Limiting use is a specific management tool, whereas visitor capacity is an overall estimate of how much use an area can sustain while achieving desired conditions. Limiting use is only one of many tools available to managers to ensure visitor use does not cause adverse impact to desired conditions. Other tools available to managers include providing visitor education, offering information about alternative opportunities, changing where or when use occurs, re-designing sites, re-distributing use, limiting the type(s) of use, limiting group size, and many others.
- Visitor capacity is about the maximum amount of use that can be sustained, not how much use is desired.
- Visitor capacity is not a value-free, inherent attribute of the land. Rather, it is dependent on desired biological, experiential and managerial conditions and decisions about desired infrastructure.
- The term visitor capacity as used in this document is synonymous with 'user capacity," "carrying capacity," "recreation capacity,' and similar terms.

Estimating Visitor Capacity

Since the early 1980s, visitor capacity has been increasingly recognized as a sub-set within a larger framework to effectively plan and manage visitor use using all strategies and tools available to managers (Washburne 1982, Haas 2002, Cole and Carlson 2010). The Ninth Circuit Court ruling regarding the Merced River recognized that the Wild and Scenic Rivers Act "does not mandate one particular approach to visitor capacity". As described in the visitor capacity literature, capacity estimates must flow from decisions about desired conditions, including the desired experiential opportunities, managerial setting and infrastructure development (Figure 3.1). More specifically, capacity estimates must flow from established thresholds to ensure no thresholds would be violated if the amount of use were to increase (Cole and Carlson 2010).

Figure 3.1. Framework for Addressing Visitor Capacity



Often, visitor capacity is an estimate, not a precise number. This is particularly true in situations where the amount of use is low and does not threaten desired conditions or river values. In these situations, capacity estimates yield visitor use numbers that are far higher than current amounts of use, thus decisions about capacity do not result in near-term management actions to regulate use levels. The amount of investment devoted to determining visitor capacity needs to be commensurate with the consequence of the potential decisions to be made about managing visitor use. Such is the case for the majority of designated river segments on the Bridger-Teton National Forest. For these segments, visitor capacity numbers will not be precise. However, monitoring will still occur and more precise numbers will be developed if trends suggest river values could be threatened. The one exception on the Bridger-Teton is the main stem of the Snake River below Hoback Junction where use levels are much higher and consequently the amount of analysis devoted to determining visitor capacity is greater.

For all river segments, capacity numbers are expressed on a "per day" basis and focus on the specific aspect or aspects of visitor use likely to first impact river values. Rather than expressing capacity as a single number incorporating all possible use within the river corridor, this approach is more meaningful for effective visitor management.

For designated river segments on the BTNF, desired conditions, outstandingly remarkable values, and existing visitor use are discussed in detail elsewhere in this document. The CRMP also identifies monitoring requirements and thresholds for potential impacts, as well

as suggested management strategies and tools to achieve or maintain desired conditions. Thus, this section briefly summarizes pertinent information necessary to address the visitor capacity requirement. To meet this specific requirement, visitor capacity is discussed for each segment by describing:

- Identified river values that could be affected by visitor use
- Current visitor use
- Applicable thresholds
- Estimate of visitor capacity and rationale

B. Capacity Estimates for Designated River Segments

DFC 3B, Snake River recreation segment

River values affected by visitor use

River values for the Snake River include scenic, recreational, ecological/wildlife, fish, and geologic. Recreational and ecological/wildlife values are the ones most sensitive to impact from increasing amounts of visitor use. Recreational values are most likely to be threatened by perceptions of crowding, specifically associated with competition for limited space at boat ramps, parking areas, observation points, and popular on-river play spots. Ecological/wildlife values most at risk include Bald Eagles, American White Pelicans, Osprey and waterfowl that depend on access to the river for nesting and foraging habitat.

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Current visitor use

The lower Snake River corridor is one of the most visited locations in the Jackson Hole area and indeed is one of the most densely used rivers in the West. River use is estimated at 170,000 people per season. Other major activities in the corridor include observing boaters at highway pullouts, photography, bank fishing, climbing, picnicking and fall big game hunting. Overnight recreation use occurs at three single-family campgrounds, three developed group campgrounds, and five assigned outfitter sites (including two river sites and three hunting camps). Camping is permitted only in developed campgrounds from May 1 until Labor Day annually. A small amount of camping use occurs at undeveloped sites during the fall season.

Very limited winter use occurs since most highway pullouts and parking areas are not plowed. Some winter use (primarily snowmobiling) originates in the river corridor, but because it primarily occurs along Wolf Creek, it is discussed in association with Wolf Creek, rather than here.

U.S. 89/26 runs through the river corridor. It is a major travel corridor for commerce between Jackson Hole and Utah or Southeast Idaho as well as an important commuter route for Star Valley and Swan Valley residents. The Wyoming Department of Transportation estimates average daily traffic at 5,410 vehicles near Pritchard boat ramp (2010 data, WYDOT). While the highway clearly provides critical access for recreation in the river corridor, recreation use of the highway cannot be differentiated, thus highway vehicle numbers will not be included in the capacity estimate. To protect river values, it is more meaningful to focus capacity estimates on direct measures of recreation use occurring at day use sites, boat ramps, and campgrounds. Table 3.2 summarizes available current recreation use numbers.

Table 3.2. Current Recreation Use, Snake River

Recreation Activity	Current Use	Boats or sites	Trends / Remarks	Data source
Guided Rafting *	84,389 people	9,893 boats	Guided rafting peaked in 1995 with 121,200 people. Since that time, use has stabilized in the 80,000 range for the number of people served from May – Sept. annually.	Actual use reports 2012
Guided Float	4,427 people	2,222 boats	Guided float fishing fluctuates with yearly water	Actual use reports

Recreation Activity	Current Use	Boats or sites	Trends / Remarks	Data source
Fishing *			levels, however trends indicate an overall increase in use.	2012
Instructional Boating *	458 people	349 boats		Actual use reports 2011
Canoeing *	446 people	223 boats		Actual use reports 2012
Commercial Photography	825 people @ 3 people/ day	273 days (On-Forest use)		Snake River use report 2010
Non-commercial River Use	26,700 people (at West Table only)	4,600 boats (at West Table only)	Non-outfitted use recorded in 1994 was 39,300 people. Accurate numbers for 2012 non-commercial river use are not available.	Snake River use report 2010
Camping	15,780 people (campgrounds) 546 people (hunting camps)	53 single-family sites, 5 group sites, 3 hunting camps, 2 river camps	Use numbers for outfitted river camps are included in guided rafting total.	2010 actual use reports Group sites are 2012 data

** Numbers do not include guides*

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Applicable Thresholds (from Forest Plan amendment):

- Total number of watercraft passing by a selected location per day
- Number of days existing vehicle access areas at selected locations are full (based on design capacity)

The Snake River Recreation Plan (decisions signed in 1997, 1998, 2002) divided the river corridor into an upper section (Astoria to East Table) and a lower section (East Table to Sheep Gulch). Current analysis suggests that existing facilities are not adversely affecting river values; rather they contribute to enhancing the recreational value of the river and the Headwaters system. Beyond the existing facilities, the Snake River corridor offers no acceptable terrain to build new developed facilities. If recreation use were to increase beyond what existing facilities can absorb, adverse effects on the on-river recreational experience would likely occur. Examples of possible adverse effects from a large increase in visitor use include the inability to access a popular wave feature due to a steady stream of downriver boat traffic, inability to fly-cast at a favorite fishing hole due to interference from other boats, long wait times for available parking spaces, and increasing conflict between groups over competition for available ramp space.

Current management actions implemented over the past decade have generally been effective at maintaining desired conditions and identified river values. Monitoring has revealed a decline in commercial whitewater rafting along with a decline in kayaking and non-commercial use. Group use has increased but is more evenly distributed over time due to permit requirements. Guided fishing has also increased but is now plateaued due to existing limits on use.

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Capacity Estimate

Visitor capacity for the Snake River focuses on locations where the amount of visitor use is likely to affect river values first. This approach is more meaningful for effective visitor management rather than expressing capacity as a single number incorporating all possible uses within the river corridor.

Overnight Use in Developed Campgrounds (May 20 – September 10)

Visitor Capacity = 58 groups per night at developed campground sites. A group is defined as up to 8 people in a single family site and up to 30 people in a group site.

Rationale: As visitor use increases in the Snake River corridor, the number of people who can stay overnight is limited by the physical capacity of sites in the developed campgrounds during the primary summer use season. Camping in the corridor is only permitted in developed sites from May 1 – Labor Day annually; no camping in undeveloped sites is permitted. Additional campground locations are not possible in the river corridor due to terrain limitations, floodplain restrictions, and the desire to avoid impacts to crucial Bald Eagle habitat. To prevent campsite expansion and associated impacts on vegetation, single-family campsites are limited to 8 people and 2 vehicles per site. Group sites are designed for 30 people per site. The capacity number is derived from 53 single-family sites + 5 group sites = 58 groups per night. July is currently the busiest month for camping in the Snake River corridor. Campground site occupancy was 78% in July 2009 but overall site occupancy for the primary use season was 45%.

River Use at Ramps

Visitor capacity for upper portion of river segment (Hoback to East Table) = 50 vehicles per day at Pritchard boat ramp. For the purpose of this capacity estimate, a vehicle is defined as a standard full-size truck (or smaller vehicle), potentially towing a drift boat or raft trailer.

Visitor capacity for lower portion of river segment (East Table to Sheep Gulch) = 145 boats per day at non-commercial ramp (Sheep Gulch); 170 boats per day at commercial ramp (Sheep Gulch). For the purpose of this capacity estimate, a boat is defined as: 1 raft (16-21 feet), 1 kataraft, 1 dory = 1 boat; 1 small raft (less than 16 feet) = .75 boat; 1 kayak (hardshell or inflatable), 1 canoe = .25 boat

Rationale for Estimate in Upper Portion of River Segment:

The most popular access point in this section for river recreation is Pritchard boat ramp. This ramp is also located within important Bald Eagle habitat in a cottonwood gallery. Thus, as river use increases, the physical capacity of the Pritchard boat ramp combined with the need to retain foraging access to the river for Bald Eagles is most likely to limit use in this section of river. Monitoring at this boat ramp has indicated that the parking area is full with 25

vehicles. Since most river trips in this section are half-day, 50 vehicles per day is estimated to be the capacity of this site. This capacity estimate is not considered precise. To improve precision, additional monitoring is needed to ensure that, as the number of vehicles and boats increase, there is not a large increase in boats launched prior to 10 am so that Bald Eagle foraging access is maintained. Monitoring conducted in 1998 recorded 38 boats per day at Pritchard with 12 of those launched prior to 10 am.

Rationale for Estimate in Lower Portion of River Segment (Whitewater section):

Extensive environmental analysis and public input from 1995-2000 indicated that the physical capacity of existing boat ramps was the factor that contributed most to congestion and competition for space and thus, most limited recreation use. On-river congestion and wildlife habitat needs are not as limiting. In particular, the Sheep Gulch boat ramp was identified as the bottleneck since it serves as the single primary take-out. Launch access is not as limiting since there are multiple locations upstream. Additional take-out ramp capacity is not realistic given steep canyon slopes and lack of additional suitable river eddies. The Sheep Gulch boat ramp consists of two paved ramps, one for outfitted public use and one for non-outfitted public use. The capacity calculation is based on the following:

Outfitted Public Ramp: 4 ramp slots; 8.5 hours per float day; average ramp occupancy of 12 minutes to take out a large raft (based on observations by ramp personnel)

8.5 hours per day x 60 minutes per hour / 12 minutes per boat per ramp slot = 170 boats per day*

Non-outfitted Public Ramp: 4 ramp slots; 8.5 hours per float day; average ramp occupancy of 14 minutes to take out a large raft (based on observations by ramp personnel)

8.5 hours per day x 60 minutes per hour / 14 minutes per boat per ramp slot = 145 boats per day*

The capacity estimate for the lower portion of the Snake River is considered valid for protecting identified river values into the future. Management actions implemented in 1998 and 2000 changed how outfitted rafting use was managed, required permits for non-outfitted groups over 15 people, and re-designed launch facilities to better balance launch and take-out capacity. These changes, along with intensive on-the-ground river ranger presence, resulted in use being more evenly distributed throughout the week and throughout the day, easing congestion particularly at the non-outfitted ramp. Since 2000, river use has not increased as rapidly as it was in the late 1990s and is being managed within ramp capacity.

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DFC 3C Rivers

River values affected by visitor use

River values common to DFC 3C segments include recreational, ecological/wildlife, fisheries, and geologic. Scenic values are identified for all segments except Pacific Creek. Cultural values are present on Blackrock Creek, the Gros Ventre River, and the Hoback River. Recreational and ecological/wildlife values are the ones most likely to be threatened by increasing amounts of visitor use. Recreational values are most likely to be threatened by perceptions of crowding, specifically associated with competition for limited developed and undeveloped campsites and fishing spots. Ecological/wildlife values most at risk include grizzly bear habitat particularly for river segments located within the primary conservation area, and bighorn sheep habitat in the Gros Ventre River and Hoback River corridors.

Current visitor use

In general, these river segments receive low to moderate use. The vast majority of recreation use is associated with driving for pleasure, camping, bank fishing, and fall big-game hunting, and for each of these activities, the presence of the river is a critical part of the recreation experience. Seasonal boating currently occurs on the Hoback River, Buffalo Fork, Gros Ventre River and Granite Creek. Snowmobiling is a popular activity in many of these corridors, with dog sledding also occurring in Granite Creek. Table 3.3 summarizes current recreation use information available for DFC 3C rivers. Visitation to private resorts and non-commercial use numbers are not available.

Table 3.3. Current Recreation Use, DFC 3C Rivers

River segment	Current Use	Data Source
Hoback River	Campground = 2,918 people/season (13 sites) Instructional boating = 312 people, 105 boats Highway = 1,779 average daily vehicle count	Campground actual use data 2009; Actual use report from river outfitters 2011 Highway data 2010 (WYDOT)
Blackrock Creek	Highway = 955 average daily vehicle	Highway data 2010
Buffalo Fork	Campgrounds = 2,066 people/season (28 sites) Outfitted river use = 75 service days	Campground actual use data 2009 (Angles, Box Creek

River segment	Current Use	Data Source
	canoeing; 651 service days bank fishing Resorts = 125 people at one time	and Turpin) Actual use reports 2009 from resorts
Granite Creek	Campground = 7,155 people/season (51 sites) Hot Springs = 24,121 people/year Patrol contacts average 15 people/day with median of 12 people/day (summer) Road = approx. 200 vehicles per month Outfitted winter use = 3,344 service days/year	Campground and Hot Springs actual use data 2010 Daily field monitoring reports 2010 Engineering traffic counts 2006-2009 Winter outfitter actual use data 2008
Gros Ventre River	Campground = 1,705 people/season (11 sites) Patrol contacts average 12 people/day with median of 10 people/day (summer) Road = approximately 340 vehicles per month in lower portion, upper road average of 48 vehicles/month Outfitted winter use = 1,552 service days/year	Campground actual use data 2009 (Red Hills, Crystal Creek) Daily field monitoring reports 2010 Engineering traffic counts 2009 Winter outfitter actual use data 2008
Crystal Creek	Outfitted day rides = 1,200 service days/year	Actual use report 2009
Pacific Creek	Campground = 254 people/season (8 sites) Patrol contacts average 7 people/day (summer) Outfitted camp use = 2300 service days/year	Campground actual use data 2010 Daily field reports for NW Buffalo Ranger District 2010 Outfitter actual use report 2009

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Applicable Thresholds

- Total number of watercraft passing by a selected location per day
- Number of people at one time at selected locations
- Number of days per season that existing vehicle access areas at selected locations are full
- Number of days per month, more than 80% of available dispersed campsites are occupied

Capacity Estimate

To protect identified river values for most of these river segments, the limiting factor is overnight campsite availability. This is because the number of potential campsites is limited by terrain. Increased visitor use would create more competition for space, degrading the quality of the experience, or pushing campers toward more sensitive sites that could be more easily impacted. Additionally, improper food storage associated with camping use, especially if campers are pushed to new areas without bear poles or available trees, can lead to bear mortality, adversely affecting ecological/wildlife values. Thus, visitor capacity is primarily based on the number of acceptable campsites (considering requirements for site distance from water and sustainability of developed infrastructure such as access roads, parking areas, water availability). Monitoring will occur for all established indicators however, and if day use or on-river use appears to be increasing rapidly, more precise day use capacity numbers will be developed for these segments.

Hoback River

Estimate for overnight use = 25 groups per night at developed campground sites. A group is defined as up to 8 people in a single family site.

Rationale: As visitor use increases in the Hoback River corridor, the number of people who can stay overnight is limited by the physical capacity of sites in the developed campgrounds during the primary summer use season. Camping is only permitted in developed sites from May 1 – Labor Day annually; no camping in undeveloped sites is permitted. Unlike the Snake River segment, there is some opportunity to expand camping opportunities in the Hoback River corridor. The Hoback Campground contains 13 sites. Eight sites located on the south side of the river are no longer accessible by vehicle since the bridge washed out in 1986. If these sites were replaced in a more accessible and acceptable location (i.e. along the

highway and outside of the 100 year floodplain), it may be possible to add up to 12 sites somewhere in the corridor while still protecting river values. Thus the total overnight capacity in developed sites = 25 groups per night. This number is not considered precise. Topographic surveys of potential campsite locations and associated environmental analysis would be needed to increase precision.

Blackrock Creek

Estimate for day use = 78 vehicles at one time in established parking areas. A vehicle is defined as a standard full-size truck or smaller.

Rationale: There are approximately five pullouts and one constructed parking area located on the Togwotee Highway that can provide access to Blackrock Creek. Four of the pullouts along the highway can comfortably accommodate four vehicles per pullout. A large parking area was constructed to accommodate snowmobile traffic and can accommodate 50 vehicles with trailers at one time. At the Buffalo Ranger District office, a visitor pullout can accommodate another 12 vehicles.

Buffalo Fork

Estimate for overnight use = 28 groups per night at developed campground sites. A group is defined as up to 8 people in a single family site.

Rationale: This is based on the site capacity for Angles, Box Creek and Turpin Campgrounds. Campground expansion is unlikely to occur due to grizzly bear habitat requirements. These campgrounds contain 28 sites, thus overnight capacity = 28 groups per night.

Estimate for river use = 100 service days of priority use* + 100 days of temporary** use.

Rationale: Outfitted river use is likely to increase more than non-outfitted use due to the presence of two guest resorts in this corridor; thus river capacity is based on outfitted use. Eighty service days are currently authorized for outfitted river use on the Buffalo Fork. A large increase in priority use is not advised due to the lack of facilities to handle concentrated human use and associated impacts. Temporary use is issued in blocks of 50 service days. Given facility restrictions, no more than 100 days of temporary use is advised. Allowing 100 service days for both priority and temporary use provides equity for these two types of outfitted river use.

* Priority Use—commercial outfitter-guide services; up to 10-year authorizations.

** Temporary Use—institutional outfitters, including non-profit entities, offering programs that are part of an accredited school or specialized services program; 1-year authorizations

Granite Creek

Estimate for overnight use = 80 groups per night in developed and undeveloped sites. A group is defined as up to 8 people occupying a single site.

Rationale: The Granite Creek corridor contains limited terrain for road access and campsites. The popularity of this corridor as a destination combined with limited terrain suggests that campsite capacity is the most limiting factor regarding overall public visitor use increases. Overnight use at private residences and lodges, the Girl Scout Camp and summer homes would not impact river values as much as campsites. The Granite Creek campground contains 51 sites, each of which is limited to 8 people per site. An inventory of undeveloped/dispersed campsites found approximately 29 acceptable campsites. Thus, total capacity is estimated at 80 groups per night in developed and undeveloped campsites.

Estimate for day use = 55 vehicles at one time at attraction or river access sites. A vehicle is defined as a standard full-size truck or smaller.

Rationale: The primary attractions in the Granite Creek corridor are the Hot Springs and Granite Falls. In addition, river access for kayaking or bank fishing is also important. The parking area for the Hot Springs can accommodate approximately 35 vehicles at one time; Granite Falls pull-out can accommodate 15 vehicles at one time and two river access points can accommodate a total of 5 vehicles.

Estimate for winter day use = 35 vehicles at one time at the winter trailhead. A vehicle is defined as a standard full-size truck or smaller, potentially pulling a trailer.

Rationale: Parking capacity for winter use is currently extremely limited in Granite Creek. Re-design of the existing parking area is needed but terrain limitations suggest that no more than 35 vehicles at one time should be accommodated. Allowing additional vehicles beyond this capacity would likely result in unacceptable visual impacts associated with a larger disturbed area or alternately, safety conflicts among visitors seeking different kinds of recreational experiences (eg. motorized and non-motorized winter uses) which travel at different speeds on the same corridor.

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Gros Ventre River

Estimate for overnight use = 33 groups per night in developed and undeveloped sites. A group is defined as up to 8 people occupying a single site; a group site may accommodate up to 30.

Rationale: Given the desire to limit impacts associated with camping and associated vehicle routes along the river, campsite capacity is considered one of the limiting factors for this corridor. The Red Hills and Crystal Creek campgrounds currently contain 11 sites, each of which is limited to 8 people per site. However, re-design of these campgrounds is needed to reduce existing riverbank impacts. Ten developed sites plus a group site could be provided with improved design. An inventory of undeveloped/dispersed campsites found approximately 22 acceptable sites. Given the emphasis in this corridor to provide a semi-primitive experience, these acceptable sites should be retained. Thus, total capacity is estimated at 33 groups per night in developed and undeveloped campsites.

Estimate for winter day use = 20 vehicles at one time at the winter trailhead. A vehicle is defined as a standard full-size truck or smaller, potentially pulling a trailer.

Rationale: Parking capacity for winter use is very limited in the Gros Ventre corridor. Terrain limitations and the potential for impacts to wildlife winter habitat suggest that no more than 20 vehicles at one time would be able to be accommodated into the future. Allowing additional vehicles beyond this capacity would likely result in conflicts among visitors due to competition for parking space and would increase the likelihood of creating negative impacts for wintering moose, especially, as well as for predators such as gray wolf.

Crystal Creek

Estimate for day use = 10 vehicles at one time. A vehicle is defined as a standard full-size truck or smaller.

Rationale: Little camping use occurs in this short segment, thus day use activities are the focus for visitor capacity. Day use (primarily associated with bank fishing, with some hiking and boating also occurring) is limited by the amount of vehicle parking space more than the amount of river available to fish. The most popular location for fishing access can reasonably accommodate 2 vehicles without impacting the streambank. Another fishing access mid-way between the Gros Ventre road and Crystal Creek trailhead can accommodate another 3 vehicles. The Crystal Creek trailhead can accommodate an additional five vehicles without interfering with parking for Wilderness trips.

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Pacific Creek

Estimate for overnight use – 14 groups per night in developed, undeveloped, and outfitted assigned campsites. A group is defined as up to 8 people occupying a single family site or undeveloped site. For the outfitted assigned site, the group size is larger.

Rationale: The Pacific Creek campground contains 8 sites, each of which is limited to 8 people per site. An inventory of undeveloped/dispersed campsites found five acceptable undeveloped campsites available to the general public. Additionally, there is one large outfitted assigned site. Thus, total capacity is estimated at 14 groups per night in developed, undeveloped and outfitted campsites.

DFC 3D Rivers

River values affected by visitor use

Outstandingly remarkable values for Bailey Creek and Willow Creek include scenic, recreational, ecological/wildlife, and fish. Geologic values are present on Bailey Creek but not Willow Creek. Recreational values are most likely to be first threatened by increasing amounts of visitor use, particularly competition for limited campsites and fishing spots. As Wild Rivers accessed only by trail, river values emphasize a more "primitive" experience in these corridors with more opportunity for solitude and few encounters with other recreation users.

Current visitor use

In general, these river segments receive relatively low use. Recreation use is primarily associated with trail hiking, horse riding, dispersed camping, bank fishing, and big game hunting. Since these segments are accessed only by trails, limited boating use occurs, however pack-raft use is beginning to occur, particularly in Willow Creek.

Backcountry travel by foot, horse, mountain bike, and skis or snowmobiles occurs in the Willow Creek corridor; an extensive trail system provides access from the trailhead at Bryan Flat. Fall hunting is the peak season for recreational use in the corridor. Use is more concentrated in the trail system north of Shepard and Mumford creeks; the remote southern part of the corridor sees a lower level of recreation use.

Recreation use is largely land-based in Bailey Creek, with hiking, fishing and horseback riding popular summer pursuits and hunting a primary use during the fall. A trailhead in the Little Greys River drainage provides access to Bailey Creek. Access to lower Bailey Creek is generally restricted to low water at the end of the season since it requires floating or fording the Snake River from the Elbow boat ramp. The confluence of Bailey Creek with the Snake

River was once a popular camping area. However, an outfitted camp was removed in the 1980s and overnight camping was prohibited to aid recovery of the bald eagle population.

Table 3.4 summarizes current recreation use information available for DFC 3D rivers.

Table 3.4. Current Recreation Use, DFC 3D Rivers

River segment	Current Use	Data Source
Willow Creek	Outfitted summer stock use = 3,281 service days Outfitted fall hunting = 947 service days Outfitted hiking and educational use = 182 service days Trailhead vehicles at one time = 1 in summer; 4-24 in fall Trail encounters = 3 people per day; one incident of encountering 12 people per day	Outfitter actual use reports 2008 Daily field monitoring reports 2010, 2012 (limited data)
Bailey Creek	Trailhead vehicles at one time = 4	Field monitoring 2011

Applicable Thresholds

- Number of days per month, more than 80% of available dispersed campsites are occupied
- Number of encounters between groups average no more than 12 per day (per Forest Plan)

Capacity Estimate

To protect outstandingly remarkable values for Bailey Creek and Willow Creek, the limiting factor is the lack of easy access and overnight campsite availability. The Bryan Flat trailhead provides the primary access to Willow Creek; other accesses off the highway cross private land. Access to Bailey Creek involves crossing the Snake River by boat or driving long distances on gravel roads to the Little Greys Trailhead. The number of desirable campsites is limited by terrain which would create competition (perceptions of crowding) if use were to increase by a large amount. However, it is possible that day use of these corridors may

increase more quickly than camping use, thus estimates for both overnight and day use are provided. On-river use is extremely low and would not create adverse impacts before other capacity limits were reached. Winter use, primarily snowmobiling, is also low, with no groomed routes, and is not a limiting factor for protection of river values.

Willow Creek

Estimate for overnight use = 27 groups per night

Estimate for day use = 50 groups per day

Rationale: The estimate for overnight capacity is based on the number of acceptable campsites in the designated river corridor. The estimate for day use is intended to keep use within trail encounter thresholds but is considered very imprecise. The Willow Creek designated river is 16.2 miles long. Given the large number of side trails, length of this corridor, and differential timing of overnight versus day use, fifty groups could potentially be in the corridor without exceeding the 12 parties per day encounter threshold for any individual group, although close monitoring would be needed. This number of people is typical only during fall hunting season, when groups also tend to disperse off-trail and are less likely to encounter each other.

Bailey Creek

Estimate for overnight use = 3 groups per night

Estimate for day use = 12 groups per day

Rationale: The estimate for overnight capacity is based on the number of acceptable campsites (near Bailey Lake). An inventory recorded two small sites and one large site. No camping is permitted in Bailey Creek within ¼ mile of the Snake River. The estimate for day use is based on the threshold for encounters between groups. This corridor is only seven miles long, without associated side trails, so it is likely that any group recreating within the corridor would encounter the other parties. Thus, to ensure the desired opportunities for solitude are sustained, the estimated capacity is 12 groups per day. Monitoring of actual encounters among groups could be used to adjust this estimate.

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DFC 6 Rivers

River values affected by visitor use

Outstandingly remarkable values for these river segments include recreational and ecological/wildlife. Scenic values are present for all segments except Pacific Creek. Fisheries values are present for all segments except Granite Creek. Geologic values are present for all segments except Wolf Creek and the Snake River. Cultural values are present for the Buffalo Fork, Granite Creek, and Gros Ventre River. Recreational and ecological/wildlife values are most likely to be threatened by increasing amounts of visitor use. Recreational values are most likely to be threatened by increasing trail and camping use that compromises the areas' opportunities for solitude or primitive and unconfined recreation. Ecological/wildlife values most at risk include grizzly bear habitat needs, particularly for river segments located within the primary conservation area.

Current visitor use

In general, these river segments receive relatively low use. All are located within Wilderness or Wilderness Study Areas. Recreation use is primarily associated with hiking and backpacking, horse riding and pack trips, bank fishing, and big game hunting. Since these segments are accessed only by non-motorized trails located in remote areas and are generally smaller volume waters, boating use rarely occurs, although pack-rafting is possible. Winter use is light, due to remoteness and terrain.

Shoal Creek is remote and access is difficult, with a short use season running from July 1 (when the Riling Draw gate opens) to mid-October, by which time weather usually prevents vehicle travel to the trailhead, although one can park at the Riling Draw information board and hike or ride along the road. Access through the Dell Creek Feedground is closed to public entry from December 1 through April 30. Fishing, hunting, day hiking and horseback riding are the primary recreation pursuits in the drainage.

Table 3.5 summarizes current recreation use information available for DFC 6 rivers.

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Table 3.5. Current Recreation Use, DFC 6 Rivers

River segment	Current Use	Remarks	Data Source
Buffalo Forks **(Teton Wilderness)**	No data available	Historically use was higher than exists today	
Crystal Creek **(Gros Ventre Wilderness)**	Trail encounters = 1 to 6 groups with up to 27 people per day Trailhead vehicles = up to 6 vehicles at one time	3-4 fisherman often observed in meadow about 1 mile inside Wilderness	Daily field monitoring reports 2010
Granite Creek **(Gros Ventre Wilderness)**	Trail encounters = 1 to 3 groups with up to 15 people per day Trailhead vehicles = up to 5 vehicles at one time		Daily field monitoring reports 2010, 2012 (limited data)
Gros Ventre River **(Gros Ventre Wilderness)**	Trail encounters = 1 to 3 groups with up to 18 people per day	Historically use was higher than exists today	Daily field monitoring reports 2010, 2012 (limited data)
Pacific Creek **(Teton Wilderness)**	Outfitted day use horse rides = 3,500 service days/season Overnight use = 8 groups/night	Historically use was higher than exists today	Actual use reports Field monitoring
Shoal Creek **(Gros Ventre Wilderness and Shoal WSA)**	Trail encounters = 0 to 2 parties per day; party size 2-4 typically	July 1 – Sept.	Field monitoring
Snake River **(Teton Wilderness)**	No data available		

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Wolf Creek **(Palisades WSA)**	Trail encounters = typically 2-4 people per day but one encounter with 15 people in one group Trailhead vehicles = up to 3 vehicles at one time (summer) Trailhead vehicles = up to 4 vehicles at one time (winter)		Daily field monitoring reports 2010, 2012

Applicable Thresholds

- Campsite condition rating including stock impact rating
- Number of encounters between groups (DFC 6A-D Wilderness Plan direction and DFC 6S direction)

Capacity Estimate

Monitoring trends suggest that recreation use is declining in the Teton Wilderness and remote portions of the Gros Ventre Wilderness. Therefore, river values are unlikely to be threatened in the near future and capacity estimates are considered imprecise. On-going monitoring of campsite conditions and encounters between groups should be sufficient to detect changing conditions before unacceptable impacts occur. To protect outstandingly remarkable river values into the future for most of these river segments, the limiting factor is overnight campsite availability. Visitation to remote areas requires camping overnight and available forage for pack-stock limits the number of campsites. Increased visitation could also increase the chance for improper food storage associated with camping use, which is most likely to adversely affect ecological/wildlife values. Wolf Creek and the first few miles of Granite and Crystal Creeks are the only segments where increasing day use could limit use before campsite capacity is reached. On-river use would not create adverse impacts before camping or trail limits were reached. Winter day use capacity is estimated where it is occurring.

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Buffalo Forks

Estimate for overnight use = 9 groups per night in the South Fork from Wilderness boundary to Upper Pendergraft Meadow. 8 groups per night in the North Fork from the Wilderness boundary to North Fork Falls.

Rationale: There are eleven acceptable campsites located within the South Fork river corridor. There are nine acceptable campsites located within the North Fork river corridor including one assigned outfitted camp. To ensure opportunities for solitude are preserved while camping, the capacity estimate is based on 80% occupancy.

Crystal Creek

Estimate for overnight use = 20 groups per night

Rationale: There are 24 acceptable campsites located within this river corridor. To ensure opportunities for solitude are preserved while camping, the capacity estimate is based on 80% occupancy.

Estimate for day use = 20 groups per day

Rationale: The Gros Ventre Wilderness Action Plan recommended a threshold of no more than ten groups encountered per day for this area. Given that the wild segment of Crystal Creek is 14 miles long and there is a mix of overnight and day use, twenty groups could likely be travelling somewhere in the corridor and still meet the threshold of no group encountering more than ten other parties. Encountering no more than ten other parties is particularly important in the lower meadow located about one mile inside the Wilderness. Current monitoring observations show up to three or four people fishing at one time in this popular meadow. Fishing groups tend to be small (1-2 people per group) but given the small size of this meadow, more than ten groups would likely result in unacceptable resource impacts (user-created trails) and impair the quality of the wilderness fishing experience.

Granite Creek

Estimate for overnight use = 20 groups per night

Rationale: There are 25 acceptable campsites located within this river corridor. To ensure opportunities for solitude are preserved while camping, the capacity estimate is based on 80% occupancy.

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Gros Ventre River

Estimate for overnight use = 40 groups per night

Rationale: There are about 50 acceptable campsites located within the river corridor. To ensure opportunities for solitude are preserved while camping, the capacity estimate is based on 80% occupancy.

Pacific Creek

Estimate for overnight use = 8 groups per night

Rationale: There are about 10 acceptable campsites in this river corridor. To ensure opportunities for solitude are preserved while camping, the capacity estimate is based on 80% occupancy.

Shoal Creek

Estimate for overnight use = 10 groups per night

Rationale: There are about 13 acceptable campsites located within the river corridor. To ensure opportunities for solitude are preserved while camping, the capacity estimate is based on 80% occupancy.

Winter day use is largely precluded in this corridor due to lack of plowed trailhead parking areas and closure of the Dell Creek Feedground to public entry.

Snake River, wild segment

Trail encounters should be no more than 5 other groups per day (based on DFC 6B)

Rationale: This segment within the Bridger-Teton National Forest is only 7 miles long, but it is accessed from several different trail routes by a long (20+ miles) trek from the nearest road. The maximum backcountry group size is 20 people and 35 pack and saddle stock. Because of its remoteness and the number of access options, this segment would seldom approach encounter threshold at present.

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Wolf Creek

Estimate for summer day use = 15 groups per day

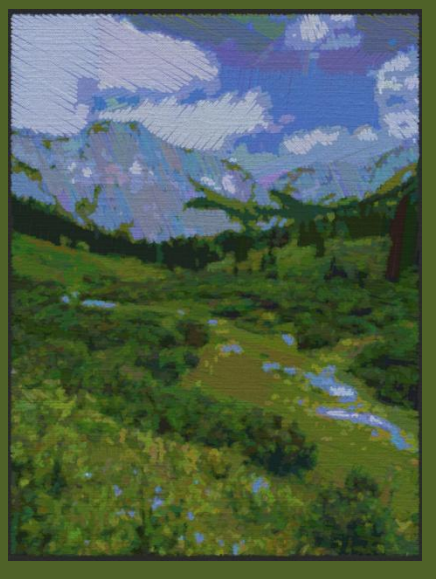
Rationale: The trailhead parking is the most limiting factor for this area. During the summer, the parking area can acceptably accommodate up to six vehicles with some of these vehicles pulling horse trailers. (This does not include river vehicles temporarily using the trailhead). Given that this segment is only seven miles long, much of the use will be day use, thus encounters among groups are more likely. The parking area limitation combined with desire to keep encounters between groups to no more than 12 per day suggest that maximum capacity should be around 15 groups per day.

Estimate for winter day use = 5 groups per day

Rationale: The trailhead parking area is more limiting in the winter than in the summer due to the reduced amount of area plowed as a highway pullout. Given the shorter day length in winter, there is likely to be less turn-over in vehicles, thus the capacity estimate for trailhead vehicles is roughly equivalent to the estimate for the number of groups that can be acceptably accommodated per day.

Willow Creek and beaver dam

Management Direction 4



Chapter 4. Management Direction

--DRAFT Direction from proposed Forest Plan Amendment—

The Management Direction presented below is Alternative 2 in the Forest Plan Amendment Environmental Assessment released at the same time as this document. This chapter will be revised following the public comment period to reflect the final decision on that amendment.

Elements Covered by Wild and Scenic Rivers Act

Under the Wild and Scenic Rivers Act, several aspects of existing direction have been superseded in designated corridors. These legal requirements apply whether or not a Forest Plan Amendment is signed and are therefore not included in the proposed action.

- FERC-licensed hydropower projects are prohibited.
- Any federally-assisted or -permitted development and activities within bed and banks of designated stretches, or directly affecting those stretches, regardless of ownership, are subject to WSRA Section 7 analysis.
- Areas within the mapped corridors along wild classified river segments are withdrawn from mineral entry, subject to valid existing rights.
- Subject to valid existing rights, new mining claims in available areas can be patented only as to the mineral estate and not the surface estate.
- Classifications of river segments as described in the Snake River Headwaters Legacy Act must be retained, limiting development and roaded access on National Forest System lands to that which would not exceed the following descriptions:

  * **Wild River Areas –** Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

  * **Scenic River Areas –** Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

* **Recreational River Areas –** Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Forest-wide Plan Elements

- **Goal 4.11:** Waterways designated by Congress as part of the National Wild and Scenic Rivers System will be managed to protect and enhance their outstandingly remarkable values, free-flow condition, and water quality for future generations.
- **Objective 4.11(a):** Implement applicable Comprehensive River Management Plan(s) and monitor the resource and social indicators identified.

Management Emphasis

All designated river segments will be managed to protect and enhance their outstandingly remarkable values (described in detail in the required Comprehensive River Management Plan), free-flowing condition, and water quality for future generations. This protection, defined as a non-degradation standard, derives from a baseline of developments, conditions and ecosystem functions present at the time of designation.

Management will:

1. Promote the rivers' natural hydrological processes, channel form and function, and ability to shape the landscape, reduce impediments to free flow, ensure sufficient flows to protect and enhance outstandingly remarkable values, and ensure the maintenance of water quality.
2. Protect and enhance the natural biodiversity, complexity, and resiliency of riparian areas, wetlands, floodplains and adjacent uplands.
3. Protect and enhance cultural resources as important links to the human history of the river corridors, including historical and archeological sites, cultural landscapes, and ethnographic resources.
4. Provide a diversity of settings for visitors of varying abilities to experience, learn about, and have a direct connection with the rivers and their special values. Such opportunities must be consistent with the values which caused the rivers to be designated.
5. Allow for legal and permitted multiple uses and associated developments, consistent with each river segment's classification, while supporting the protection and enhancement of river values.

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Desired Future Conditions

Desired Future Condition (DFC) 3: Wild and Scenic Rivers

DFC 3A
Eligible, but non-designated rivers outside Wilderness and Wilderness Study Areas

Re-categorized from DFC 3 to DFC 3A; managed in accordance with existing DFC 3 and Forest Plan Amendment Two direction.

DFC 3B

Snake River, recreational segment (Confluence with the Hoback River to one mile east of Alpine Junction):

This is the most heavily developed recreational corridor within the Bridger-Teton National Forest, with frequent, ready access from U.S. 26/89 and developed boating and camping facilities. With its unique level of development and high use, including large groups, this river segment would be managed to accommodate that visitation style. It would continue to be managed under the existing Snake River Recreation Plan, which contains specific direction to manage high numbers of visitors, including commercial outfitted publics, to protect the desired recreational experience and other identified values of the corridor.

Season-long water flows sufficient to support river rafting and fishing experiences would be maintained. Visitor opportunities would be accessible and relevant to diverse populations, promoting understanding and enjoyment of the environment, preservation of natural settings, and encouragement of healthy river-related activities to invigorate the human spirit and create lasting memories, especially among the large groups that frequent this corridor.

DFC 3C

Hoback River, recreational segment; Blackrock Creek, scenic class; scenic river segments of Pacific, Crystal, and Granite Creeks; Buffalo Fork River and the Gros Ventre River scenic sections:

These segments are accessible via paved roads and highways, some of which are scenic byways, and/or high-standard Forest roads. However, the level of development is lower, and the use is primarily by small groups and individuals. Boat launches are primitive, campgrounds are few, and there are many opportunities for dispersed camping and day use. The corridors would continue to provide for day-use and overnight camping in developed or dispersed settings. A wide range of recreational and educational experiences, including fishing, hunting and wildlife viewing, would be encouraged. Information would describe opportunities to explore the full Headwaters system. Interpretation of both natural and cultural resources would educate the public about river

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values and how activities in the Headwaters system help protect and enhance these values. Resource adaptation and resilience would be promoted through retention of management flexibility, especially regarding fish and wildlife habitat projects.

DFC 3D

Bailey and Willow Creeks, wild segments:

These segments are classified as wild rivers, yet are located outside of designated Wilderness or Wilderness Study Areas (WSA). They are accessed by non-motorized trail and have no facilities other than trails and trail bridges, food storage poles, and undeveloped campsites. Fishing, hunting and wildlife viewing continue to be key activities. Visitors would adapt to changing natural conditions, with new recreation activities allowed only if they are consistent with the protection and enhancement of river values. Activities that might result in a more developed classification would not be allowed, but management to restore natural conditions or functions would be supported. Interpretation and education would primarily occur off-site.

Note: Approximately two miles each of Shoal Creek and Buffalo Fork wild segments are also outside Wilderness/Wilderness Study Area boundaries and will be managed under DFC 3D, as will any WSA portions of this designation that may be released from Wilderness management in the future.

DFC 6

Wilderness and Wilderness Study Areas (WSA): Designated Rivers located within Wilderness or Wilderness Study Areas continue to be managed under Desired Future Condition 6. New Standards and Guidelines are added, but no existing guidance is removed.

Applicable wild river segments include the upper portions of Crystal, Granite, Pacific, and Shoal Creeks, all of Wolf Creek and the upper portions of Snake, Gros Ventre, and Buffalo Fork Rivers, generally from the source to Wilderness or Wilderness Study Area boundary (or as mapped). Additional standards will apply only to these river corridors, which exist in all five Wilderness/WSA subcategories (DFC 6A-D and DFC 6S). The Forest Geographic Information System data will depict these corridors as an overlay within DFC 6.

Subcategories of DFC 3, including 3A (Eligible Rivers defined prior to Amendment 2) and the Amendment 2 Eligible rivers overlay, along with the DFC 6 designated Wild and Scenic Rivers overlay corridors are shown below in Figure 4.1.

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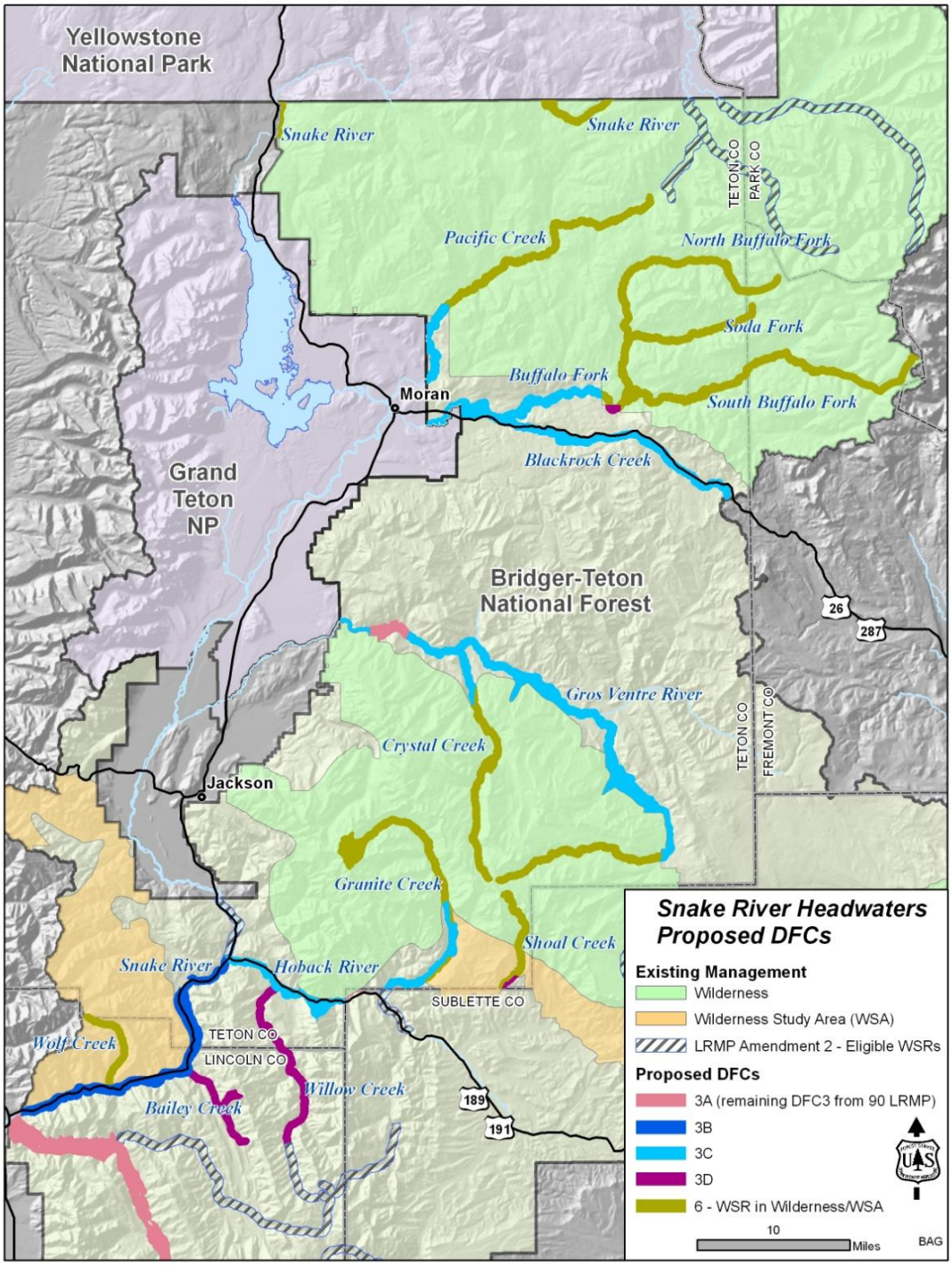
Figure 4.1: Desired Future Conditions by River Segment



Resource Standards and Guidelines

Standards and guidelines provide direction to ensure that the proposed desired conditions and Management Emphasis for designated rivers is achieved. Standards are constraints upon project and activity decision-making and are explicitly identified in a plan as 'standards.' (36 CFR 219.7(a)(3)) A standard differs from a guideline in that a standard is a strict design criteria, allowing no variation, whereas a guideline allows variation if the result would be equally effective. Guidelines are stated as flexible limits on project proposals, while standards are stated as requirements. These overall standards and guidelines applicable to all segments (described below) better protect the resources identified as outstanding in the *Snake River Headwaters Act*.

Within DFCs 3B, 3C and 3D, additional standards and guidelines that vary across the categories better protect the current variety of management options, landscape settings and visitor opportunities available across the Snake River Headwaters.

The standards and guidelines in Table 4.1 replace previous DFC direction for all subcategories of designated river segments outside Wilderness/WSAs.

Table 4.1: Overall Standards/Guidelines DFC 3B, 3C, 3D
Designated Rivers outside Wilderness and Wilderness Study Areas

ECOLOGICAL AND WILDLIFE RESOURCES
Wildlife and Vegetative Habitat Guideline: The composition, structure and function of native plant and animal habitats should be maintained or restored by promoting natural ecological processes to the extent practical throughout mapped corridors (riverine, riparian and upland habitats).
Forest Health Guideline: Insects and disease should be managed only as necessary to protect human life and critical infrastructure.
Fencing and Safe Road Crossings Guideline: Fences should be modified to meet Wyoming Game and Fish Department wildlife-friendly guidelines or removed. Wildlife-impermeable fences, overpasses and underpasses may be used to facilitate safe passage for wildlife across roads.
Biodiversity Guideline: To the fullest practical extent, management should maintain genetic integrity of native plant and animal species, and maintain native populations at all trophic levels. **
Migration Corridors Guideline: Management actions should be designed so that timing, location and duration of activities allow for successful use of historic and new fish and wildlife migration routes.

AQUATIC RESOURCES
Fisheries Habitat Guideline: Fisheries habitat management should give preference to maintenance of self-sustaining native fish populations in their native range.
Aquatic Habitat Guidelines: Managers should maintain and/or restore self-perpetuating floodplain and riparian conditions. Natural stream habitat conditions as reflected by channel dimensions, shape, gradient, and presence of hydric vegetation and large woody debris should be sustained. Direct restoration of spawning, rearing, and adult fish habitats in designated corridors may also occur. Landscapes affected by restoration projects should be natural-appearing and compatible with other identified river values.
ROADS AND FACILITIES
Road Maintenance Guideline: Existing roads should be managed to protect or enhance water quality, conditions of free-flow and the outstandingly remarkable values of each river segment. Best Management Practices should be utilized to improve drainage and reduce erosion and sedimentation.
Road Density Guideline: A transportation system should be provided that is the minimum necessary for adequate access to popular recreation sites, private lands, and to meet resource management needs. Where appropriate to protect or enhance river values within the corridor, roads should be decommissioned, which includes restoring natural contours, drainage, and vegetation.
Administrative Structures and Facilities Guideline: New facilities should be located within existing developed areas. Facilities and structures should be designed or redesigned, located and maintained to protect identified values.
Stream Crossings Standard: Wherever occurring on designated segments and adjacent tributaries, crossing structures must be designed to safely pass water flows, sediment, and debris associated with the bank-full flows. Existing non-compliant structures will be modified as funding permits. Temporary crossings must be removed and rehabilitated upon completion of use.
Road Improvement and New Road Building Standard: Service level of permanent new or reconstructed roads must be consistent with the Recreation Opportunity Spectrum for the project area.
SCENERY
Scenery Management Guideline: Management practices should maintain a high level of scenic integrity for identified foreground features and middle-ground or background scenic vistas. Changes in visual character resulting from natural processes such as fire (including smoke), flooding, wind events, insects and disease,

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landslides and naturally-impounded ponds should only be modified where necessary to provide for public safety or to the degree necessary to maintain critical infrastructure.
Scenery Perspective Guideline: River facilities and management activities should be designed to be compatible with the river scenery as viewed, in priority order, first from the waterways and second from travel routes within corridors.

**Biodiversity guideline is not intended to limit planting disease-resistant whitebark pine seedlings

Desired Future Condition DFC 6 Wilderness and Wilderness Study Areas

Without removing existing guidance, the following requirements shown in Table 4.2 are added within designated corridors across all DFC 6 subcategories, including 6S.

Table 4.2: Additional DFC 6 Standards and Guidelines for Designated Rivers inside Wilderness and Wilderness Study Areas

ECOLOGICAL AND WILDLIFE RESOURCES
Biodiversity Guideline: Genetic integrity of native plant and animal species and native populations at all trophic levels should be maintained, within the context of Wilderness character. **
Forest Health Projects Standard: Only hazard tree removal at designated facilities allowed.
RECREATION RESOURCES
Recreation Permits Standards: Proposed outfitter-guide special uses must help enhance identified river values. No recreation events allowed.

**Biodiversity guideline is not intended to limit planting disease-resistant whitebark pine seedlings

Standards that vary by Desired Future Condition Subcategory

DFC 3 Subcategories

In addition to the overall standards and guidelines listed in Tables 4.1 and 4.2, the standards in Table 4.3 apply to specific DFC sub-categories in the designated river segments, replacing previous Amendment Two direction. In DFC 3A, Eligible but not Designated rivers, standards from Amendment Two still apply.

Table 4.3: DFC-specific Standards (Replaces Amendment Two Direction)

Resource Area	DFC 3B	DFC 3C	DFC 3D	DFC 6/6S
Water Resource Projects	Subject to valid existing rights, existing diversions and impoundments may be maintained, utilizing methods that are protective of current free-flow and identified river values. All proposed federally-assisted or –permitted (non-FERC hydropower) water resources projects within or adjacent to designated segments are subject to Section 7 evaluation for potential effects on the values for which the river was added to the National System. New (non-FERC hydropower) water resources projects may be permitted only if river values are protected.		All flood control or irrigation structures, impoundments and diversions are prohibited, subject to valid existing rights.	
Forest Health Projects	Only selective hazard removal or facility enhancements allowed.	Silvicultural activities are allowed only to enhance ecological function or visual quality, or if necessary for selective hazard removal or reduction of fuels risks in WUI, must maintain ecological function and visual quality.	Only WUI fuels treatments, habitat restoration, or hazard tree removal allowed.	Only hazard tree removal at designated facilities allowed.

Resource Area	DFC 3B	DFC 3C	DFC 3D	DFC 6/6S
Dispersed Camping	None allowed in corridor during the high use season, between May 1 and Labor Day.	Allowed except where seasonally (May 1-Labor Day) prohibited. All vehicles at dispersed campsites shall remain outside a 100' setback from waterways; Hitching, tethering or picketing pack and saddle stock shall remain outside 200' lake and 100' stream setbacks	Hitching, tethering or picketing pack and saddle stock shall remain outside 200' lake and 100' stream setbacks.	
Recreation Facilities	No new campgrounds; other facilities may be approved, appropriate to setting; enhancements of existing facilities are allowed.	New and existing developed sites, river access, trailhead facilities, interpretive sites are allowed appropriate to setting. Facilities that might result in a more developed classification would not be allowed.	No facilities allowed, although minimal structures such as bear poles may be installed to protect identified values.	

Resource Area	DFC 3B	DFC 3C	DFC 3D	DFC 6/6S
River-related Recreation Permits	Current limits on commercial permits are incorporated. Group (>15) permit required. Recreation events allowed. *Same as No Action Alternative here.*	Proposed outfitter-guide or recreation event permits must enhance identified river values and river stewardship.	No events allowed; New outfitter-guide permits must enhance wild river character, identified river values and stewardship.	
Visual Quality	The Visual Quality Objectives are Retention in the foreground or Partial Retention beyond the foreground.		The Visual Quality Objectives are Preservation in the foreground or Retention beyond the foreground.	The Visual Quality Objective is Preservation.
Non-recreation Developments	New structures on NFS lands may not have exterior lights, signals or illumination, except for specific safety needs. Height of any new structures should be consistent with county Land Development Regulations. New structures must be evaluated as to appropriateness for character of immediate vicinity, river classification, and according to Visual Quality Standards.		New structures are not allowed in river corridors.	

Resource Area	DFC 3B	DFC 3C	DFC 3D	DFC 6/6S
Bank Stabilization	Stabilization projects are allowed, subject to approval through the Section 7 review process, for safety or protection of river values. Materials used must be natural or natural-appearing, consistent with site characteristics.		Stabilization projects are allowed only to correct human-caused resource damage. Materials used must be natural, consistent with site characteristics.	
Road and Trail Fords	No developed or improved road or trail stream fords are allowed.	No new developed or improved road or trail stream fords shall be allowed, unless an existing crossing must be re-located or re-designed to minimize impacts on river values or water quality.		
Common Variety Minerals	Visual screening from waterway and roadway of new or existing in-use pits is required. Pits must be outside the bed or banks of designated segments and must apply established Best Management Practices to protect river values. Unused pits will be rehabilitated.		*Withdrawn by law from mining entry, subject to valid existing rights.*	
Leasable Minerals	Available (except where subject to other No Lease or withdrawal decisions) with No Surface Occupancy stipulation on any new oil and gas leases. All leasing operations shall minimize surface disturbance and visual impairment, and avoid impacts to water quality.		*Withdrawn by law from mineral leasing, subject to valid existing rights.* Existing valid claims in wild corridors will be managed to minimize surface disturbance and visual impairment, and avoid impacts to water quality.	

Resource Area	DFC 3B	DFC 3C	DFC 3D	DFC 6/6S
Locatable Minerals	Areas available except where subject to other withdrawals. All operations shall minimize surface disturbance and visual impairment, and avoid impacts to water quality.		*Withdrawn by law from mining entry, subject to valid existing rights.* Existing valid claims in wild corridors will be managed to minimize surface disturbance and visual impairment, and avoid impacts to water quality.	

Definitions of Terms Used in Standards and Guidelines

Critical Infrastructure: This includes administrative and visitor facilities such as buildings and trails and resource features such as whitebark pine 'plus' trees that can serve as vital resilient seed stock.

Designated Facilities: In wilderness, this includes defined outfitter-guide or livestock camps and cabins under permit, as well as administrative facilities such as cabins, fences and trails.

Dispersed Camping: Campsites chosen by visitors, without Forest Service developments such as picnic tables and rest rooms. Bear poles and bear boxes may be provided in high use dispersed campsite locations.

Non-Recreation Facilities and Structures: This includes but is not limited to cell towers, grazing structures, wildlife management structures, administrative sites, communications sites, transmission lines and pipelines.

Recreation Facilities and Structures: Facilities include developments and areas associated with campgrounds, picnic areas and major boat launches; structures include bear boxes or poles, hitch rails, corrals, etc. associated with recreation sites. Designated facilities in wilderness include Forest System trailways, outfitter-guide camp locations, and guard stations.

Recreation Opportunity Spectrum (ROS): A conceptual tool for managing recreation and integrating recreation with other land uses by assessing physical, social and managerial attributes of various settings and how settings combine with activities to create a variety of recreation opportunities.

Road Decommissioning: Closing a road and restoring the natural contours, drainage, and vegetation to the area impacted by the road or trail (see p. 104-5 Forest Plan—Road Elimination Condition 4—Restoration)

Visual Quality Objectives: Defined protocol for determining the allowable amount of visual alterations to the natural landscape. *Retention/Partial Retention*: natural-appearing scenic quality with few alterations evident to the viewer beyond recreational facilities, roads and bridges. Alterations beyond the corridor are subordinate and compatible with the natural setting. *Preservation*: preserve natural scenery in the corridor and retain a natural-appearing backdrop with no evident alterations in the foreground relative to the river. Few structures other than trail bridges or primitive camps are evident.

Wildland Urban Interface (WUI): The zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. On the Bridger-Teton National Forest, these zones are spatially identified by local community wildfire protection plans (CWPP's).

Monitoring

In order to evaluate whether the proposed standards are effectively protecting the identified resources and river values, a new monitoring program is added for designated Wild and Scenic Rivers. (See Table 4.4) These indicators have been selected as the minimum necessary to ascertain the earliest likely changes across the system that could lead to negative impacts. Other additions to the monitoring plan may take place as the opportunity arises and when funding allows. For example, new reference reaches using all of the applicable Multiple Indicator Monitoring indices have also been collected on streams within the designation and will provide comparison data for the future if necessary. Permanent photo points will also be established on each segment, with more outside wilderness where greater pressure may be expected, that can provide a quick look at conditions for relatively little expense. The intent underlying all of these measures is to provide long-term trend analysis rather than simply offering snapshots of conditions.

Indicators are the resource or experience element to be measured; thresholds for specific locations across the Headwaters are **the point at which managers need to assess and potentially implement other strategies to protect the resources of the designation.**

None of these thresholds are limits, except in the recreational segment of the Snake River, where limits on commercial use were established through a prior Recreation Plan decision document (2002).

Definitions of Terms Used in Proposed Indicators:

Watercraft: any contrivance used or designed primarily for navigation on the water that is designed to be propelled by hands, arms, paddles, oars, sails or motors; to include devices considered water sport toys—any aid to swimming or fishing on the water.

Campsite Condition Class: Frissel rating system that classifies the degree of human-caused change that a campsite has undergone.

Stock Impact Rating (SIR): Evaluates the combined impacts of all recreation stock use areas associated with an individual recreation site. The SIR is a numerical score based on the sum of the numerical rating of three categories of stock related impacts: **Size, Vegetation Impact, and Tree Damage.**

Multiple Indicator Monitoring (MIM):

Statistically-significant protocols developed to evaluate short- and long-term indicators of riparian and stream channel conditions are used to determine if resource objectives are being met for these areas**. Selected indicators are:**

- Streambank stability

- Cumulative Bankfull Width distribution
- Greenline composition: Foliar cover, percent by species
- Woody species age class

Live/Dead (L/D) Index:

Protocol developed by Keigley et al (2002) that assesses regeneration potential in browsed shrub habitats.

The above ecological indicators are to be monitored every five years, except Greenline composition, which will be monitored every ten years. No 2009 baseline exists for Greenline composition, but the agency commits to establishing a baseline for the selected sections at a minimum (see Chapter 5).

Ecological thresholds are considered to be any statistically significant downward trend, not attributed to natural causes. Downward trends in the ecological indicators or exceedances of criteria are determined considering a confidence interval around the measurement or metric's mean. This helps address variability due to site complexity, observer variation, and other variables.

If new monitoring methods are deemed more scientifically accurate or would likely provide better answers to the questions listed in the introduction to this section, those may be substituted for the ones listed here.

Table 4.4: Additions to Forest Monitoring Program

	Indicator	Thresholds: point at which managers need to assess new strategies for protection			
		DFC 3B	DFC 3C	DFC 3D	DFC 6
Recreation	Total number of watercraft passing by a selected location per day.	145 noncommercial craft daily @ Sheep Gulch; 170 commercial craft daily	Hoback: 40 craft per day, more than 10% of times sampled; Buffalo, Gros Ventre, Granite: 30 craft per day more than 10% of times sampled	Willow: 20 craft per day more than 10% of times sampled	Presence of watercraft in collective corridors more than 60% of monitoring days
	Occupancy of total mapped dispersed campsites in defined areas	*Not monitoring this indicator in DFC 3B*	Buffalo: Exceeding 80% more than 5 days per month ; Exceeding 80% more than 10 days per month per segment (Granite, Gros Ventre, Pacific)	*Not monitoring this indicator in DFC 3D*	*Not monitoring this indicator in DFC 6*
	Number of days existing vehicle access areas at selected locations reach facility design capacity (are full) per season	Boat Ramps: 10 days per season	Hoback fishing pullout: 10 days; Crystal fishing pullout: 10	*Not monitoring this indicator in DFC 3D*	Wolf Creek Trailhead: 10 monitored both winter and summer

	Indicator	Thresholds: point at which managers need to assess new strategies for protection			
		DFC 3B	DFC 3C	DFC 3D	DFC 6
	Number of campsite and stock holding areas per specified reach exceeding listed Class & Impact Ratings	*Not monitoring this indicator in DFC 3B*	8 areas with Condition Class Ratings ≥3 or 8 areas with Stock Impact Rating ≥ 10; *Not monitoring this indicator in the Hoback segment*	5 areas with Condition Class Ratings ≥3 or 3 areas with Stock Impact Rating ≥ 10	4 areas with Condition Class Ratings ≥3 or 2 areas with Stock Impact Rating ≥ 10
Ecological & Water Quality	% Stream bank Stability; Greenline Composition (% Foliar Cover by species); Cumulative Bankfull Width; Live/Dead Index; Woody Species Age Class	*Not monitoring these indicators in DFC 3B*	Gros Ventre River @ Fish Creek, and reference stretch upstream of Fish Creek; Monitor every 5 years except Greenline Composition, every 10 years. Threshold is any statistically significant downward trend.	*Not monitoring these indicators in DFC 3D*	*Not monitoring these indicators in DFC 6*

Corridor Boundaries

The 1968 *Wild and Scenic Rivers Act* states that a river corridor cannot exceed an average of 320 acres/mile, or an average of ¼-mile from the ordinary high water mark on each side of the river. Land below the ordinary high water (banks and streambeds during low water, including islands) does not count against the acreage limitation. The default boundary for all segments other than those in the 1990 Forest Plan is ¼ mile from normal high water on both banks.

As a practical matter in delineating the boundary, some form of on-the-ground identification—either physical features (canyon rims, roads) or legally identifiable lines (survey or property lines)—are used so that the boundary can be more easily identified on the landscape or accurately described legally. These adjustments from the ¼ mile default conform closely to the identified river values for each river segment.

The river corridor boundaries for the Snake River Headwaters are mapped using GIS technology, delineating the active river channel based on 2009 aerial imagery. Most of the designated river corridors begin at normal high water mark on both banks of the stream and extend for ¼ mile. Corridor boundaries for the designation also include some minor adjustments for management efficiencies, such as to match other special area or administrative boundaries.

The additional adjustments described below in Table 4.5 incorporate features that exemplify river values and improve management practicality. Despite the additions, the Bridger-Teton National Forest overall average is 314 acres/mile due to the sinuosity of the rivers, well within the 320 acres/mile maximum established in the 1968 WSRA.

Table 4.5: Boundary Adjustments to River Segments

River Segment	Rationale	Quad Map(s)	Change in Acreage
Bailey Creek (wild)	Expanded to include the landslide that created Bailey Lake (geological value). Recreational classification of the Snake River applied within ¼-mile of the confluence; old placer mine and developments influence this setting.	Bailey Lake, Pine Creek	+ 2,643
Buffalo Fork (scenic)	Expanded to include river movement floodplain and important amphibian habitat (geological and ecological values).	Rosie's Ridge	+ 65
Crystal Creek (wild)	Expanded to include the Crystal Peak landslide that created Crystal Lake (geological value).	Grizzly Lake	+ 209
Granite Creek (wild)	Included Turquoise Lake (recreation value) and multiple headwaters.	Granite Falls	+ 1,300
Gros Ventre River (scenic)	Included Upper Slide that created Upper Slide Lake (geological value). Adjusted the corridor to follow the Gros Ventre Wilderness boundary (already legally described) from Big Cow Creek valley to the wild segment of the river to avoid isolated DFCs and make more manageable.	Upper Slide Lake Ouzel Falls	+ 2,100

River Segment	Rationale	Quad Map(s)	Change in Acreage
Hoback River	Extended to include the Beaver Mountain landslide and exposed bedrock (geological value). Narrowed the corridor to follow the Gros Ventre Wilderness boundary on north side of corridor from upper end of designated segment to Stinking Springs because the *Wild and Scenic Rivers Act* A requires the more limited management of Wilderness to take precedence.	Bull Creek Camp Davis	+ 648 (cumulative)
Pacific Creek (wild)	Included the Two Ocean Creek alluvial fan that occurs on the Continental Divide (geological value).	Buffalo Headwaters	+ 58
Willow	Recreational classification of the Hoback River applied within ¼-mile of the confluence; private land and developments influence this setting.	Camp Davis	n/a

Detailed maps are provided online at www.fs.usda.gov/btnf under the Wild and Scenic Rivers Management link. *Once finalized, each quad map will be included in CRMP*.

Strategies for Changed Management

The monitoring plan includes a number of indicators and thresholds to determine when specific impacts might be trending toward unacceptable levels of change. Should those thresholds be reached during the life of this CRMP, managers might investigate a number of potential actions to change those trends. The discussion below offers a starting point for those future actions, although it is recognized that ongoing research may yield additional solutions that are not yet listed here. Many of these actions, including any visitor limitation proposals, would require a separate analysis under the National Environmental Policy Act.

The following list of potential strategies provides suggestions for future managers should they be faced with a situation of demonstrated impacts requiring a change in

management in order to protect identified resource or experience values. It is expected that the least-restrictive and least-costly measures would be attempted initially, with continued (and probably more frequent) monitoring to determine if that action was sufficient to reverse any downward trend.

Recreation Experience Indicators

Indicator: Total number of watercraft passing by a selected location per day.

This indicator provides information regarding the recreational experience on-water, and for people recreating alongside waterways, especially the perception of crowding and the maintenance of desired character, or desired portion of the Recreation Opportunity Spectrum, for each segment.

- Assess primary causes: why are people concentrating in these areas?
- Redirect: provide visitors information about appropriate alternative locations for their desired activities, using trailhead information, website information, social media, and partnership opportunities.
- Redesign facilities: may include either expansion or contraction options for parking areas and put-ins/take-outs, and include facilities development in areas to which managers plan to redirect some of the visitor volume or type of use.
- Establish—by signing or hardening or off-site information—specific put-in/take-out points for pack-rafts
- Change group size limits or maximums
- New permit requirements: consider permits limited to certain group types or permits instituted at various levels of intensity; begin with free permits and progress only if necessary to assessing fees for permits.
- Consider spatial and temporal segregation options: certain use types or group types in specific stretches of a popular segment or limiting at certain times of day or days of week.

Indicator: Exceeding 80% occupancy of total mapped dispersed campsites in defined areas.

This indicator provides information regarding the recreational experience primarily for people recreating alongside waterways. Again, the perception of crowding and the sense of location choice are important to Headwaters recreationists. This indicator also serves as a proxy for total volume of visitor use that may be leading to natural resource impacts such as soil compaction and vegetation loss from user-trails.

- Redirect: provide visitors information about appropriate alternative locations for their desired activities, using trailhead information, website information, social media, and partnership opportunities.
- Redesign facilities: may include both expansion and contraction options for parking areas and put-ins/take-outs, the use of boulders or structures to contain the footprint, and facilities development in areas to which managers plan to redirect some of the visitor volume or type of use.
- Reduce stay limits: stay limits presently include both occupied camps and unoccupied camps where visitors may leave vehicles or tents while they are elsewhere but intend to return after several days. Regulations could also be changed to specify that camps must be occupied for a portion of any day they are left on-site.
- Harden sites: some popular sites may be hardened or better delineated to avoid resource impacts.
- Rest/rotation for dispersed sites, where a certain proportion of sites are rested from use on a rotating schedule to allow vegetation and sites time to recover from recreational use.
- Reservation system: Use of a permit system to apportion designated sites may be a future strategy to limit the amount of camping that occurs within specified time slots in order to retain desired settings.
- Develop fee campgrounds: this could be considered as a tool in appropriate locations.
- Develop fee areas for popular roads, using that income stream to keep impacts at a minimum through behavior modification (ranger presence) and road/site improvements.

Indicator: Days per season exceeding capacity at selected parking areas.

This measures the effects of crowding on the opportunity to access a desired riverside or on-water recreational experience. By choosing different locations than previous indicators managers will assess day-use capacity as well as overnight capacity. Consistently large volumes of visitors would indicate a need to assess other resource impacts as well, especially loss of streamside vegetation from user-created trails.

- Redirect: provide visitors information about appropriate alternative locations for their desired activities, using trailhead information, website information, social media, and partnership opportunities.
- Redesign facilities: may include both expansion and contraction options for parking areas and put-ins/take-outs, and include facilities development in areas to which managers plan to redirect some of the visitor volume or type of use.
- Increase on-site ranger presence to ensure vehicles do not overflow site capacity onto unsafe roadways.
- Institute parking time limits which would also require ranger monitoring and compliance action.
- Institute fees for parking during busy times.
- Assess nearby resource impacts.

Indicator: Number of campsite or stock holding areas per specified reach exceeding Condition Class 3 or Impact Ratings of 10.

This provides an assessment of visual quality impacts and recreational desirability of camping areas, as well as proxy information for when impacts may be occurring that could affect water quality.

- Redirect stock users to upland sites and to smaller tributary areas outside the designated corridor where less use might retain more vegetation for filtering water.
- Increase ranger presence to educate about potential impacts and low-impact behaviors, as well as to achieve compliance with existing (or potentially new) regulations.

- Require stock to be picketed, hobbled, contained by temporary (electric) fences or highlined rather than tied directly to trees.
- Decrease allowable group sizes or number of stock permitted per party.
- Require stock users in specific corridors to carry feed.
- Restore/rehabilitate sites, including temporary site closures; include partners for funding/labor.
- Institute a closed season for springtime camping until sites have achieved some vegetation growth and soils dry out.
- Permanently close specific sites, or designate stock-free sites.

Ecological and Water Quality Indicators

Indicators: Percent stream bank stability; Greenline composition (percent foliar cover by species); cumulative bankfull width; Live/Dead index; woody species age class.

These measure upland erosion, stream sedimentation and coverage of woody species and non-woody species at streamside to allow an assessment of a stream's ability to carry out its natural functions in the landscape, including its ability to maintain water quality, and of native vegetation to continue its landscape functions for wildlife habitat needs and creation of system resilience through diversity. Because all of the MIMS indicators provide proxy information, the first step after monitoring reveals a negative trend would be to assess causes. If caused by natural events (fire, flood, landslides, etc.), then management actions need not change.

Recreation-caused:

- Increase signage and/or ranger presence to encourage compliance with streamside camping and stock setbacks and designated motor vehicle use maps.
- Decrease monitoring interval when impacts are noted.
- Use various information channels to direct launch and boat access to designated areas.
- Education/signage on-site at dispersed site locations.

- Institute seasonal closures.
- Review permit terms for special use outfitter-guides, recreation events, institutional permits and filming.
- Consider trail and/or spur road relocations.
- Harden sites, including river access trails and launch sites.
- Temporary or permanent site closure and rehabilitation.

Unnatural road restrictions:

- Clean out identified sediment traps (culverts, etc.)
- Relocate roads when possible.
- Seasonal road closures.
- Permanent road closures.

Livestock-related:

- Increase herding to move livestock out of riparian zones.
- Develop upland stock-water facilities to improve livestock distribution.
- Adjust livestock forage allocation in areas where repeated overutilization of preferred forage species is apparent and other management strategies have failed to adequately address the issue.
- Fence out livestock along impacted waterway segments where other management strategies have failed to adequately address resource issues (see also fencing standards).

Wildlife-related (this pertains primarily to human-caused concentrations of wildlife at feedgrounds):

- Work cooperatively and frequently with state agencies, based on annual WGFD MOU, on potential solutions.

Additional Guidance

This CRMP is intended to be a living document that will set guidance for addressing specific river management issues as they arise. When those specific issues come up, guidance will be developed and included in this section of the CRMP. Large Woody Debris management in the rivers, and highway staging, storage and borrow areas are examples discussed below.

The plan will be reviewed on an annual basis (discussed in further detail in Chapter 6). That annual review will be conducted with other river managing agencies.

A. Large Woody Debris (LWD)

Large woody debris (LWD) is typically defined as logs that are at least 10cm in diameter and 1m in length. Wood pieces must be at least partially contained in the obvious high water channel to be considered stream LWD. For the purpose of this CRMP and the diversity of stream sizes within the designation, large woody debris is considered native plant matter of any dimension that could provide:

Bank stabilization; sediment filtration and nutrients, decrease stream velocity, modified microclimate, wildlife habitat and connectivity, and an aquatic habitat condition for fish supporting a diverse, productive, and stable aquatic community typical of that found in these rivers.

Any removal of large woody debris as discussed below should be the minimum tool necessary.

Large woody debris occurring in the Snake River Headwaters will remain in place in all cases, but removal may be considered under the following conditions:

1. Human-Induced Source of Debris – Debris may be removed if from a human-induced source such as previous stream alterations, past agricultural practices, bridgework, or that directly results from ramping water levels at dams or diversions.

2. Recreation Considerations –

    a. **Percentage of Channel Blockage –** Debris may be removed if managed for downstream travel outside of designated Wilderness whenmore than two-thirds of the stream is impounded, with main flow pulling water through debris, with little or no option for safe passage or portage.

b. **Obscured Hazards** – Debris may be removed if hidden, unavoidable, in a roaded area, highly difficult to portage, likely to entrap a human, on a frequently paddled stretch of a class II-IV section.

3. Other Considerations

a. **Critical Infrastructure -** Debris removal may be allowed if threatening to impact exiting critical infrastructure.

4. Critical Infrastructure –

a. **Pre or post designation? –**Natural appearing structures may be allowed to be placed and anchored in designated streams (post-Section 7 analyses) in order to restore near-natural stream function that has been previously altered. Impoundments occurring from pre or post-designation failure of streamside or instream construction activities, approved or illegal may be removed post-failure at the discretion of the managing agency. Pre-designation streambank stabilization projects may remain in place if removal or replacement would put costly, irreplaceable and/or critical public infrastructure in jeopardy of failure (roads, buildings, pipelines, or other utilities), or continued water events in a failure area are putting approved/legal private property structures in continued annual jeopardy.

b. **Emergency Actions Not Likely Considered –** Problems occurring at places where the landowner or agency has worked outside of legal processes/procedures required to build or locate roads, fences, diversions, buildings, bridges, streambank or other structures, roads awaiting or needing decommissioning, and flooding due to blockage will not exceed ordinary high-water mark will not be considered for emergency temporary stabilization measures.

c. **Temporary Management Actions Considered: -**

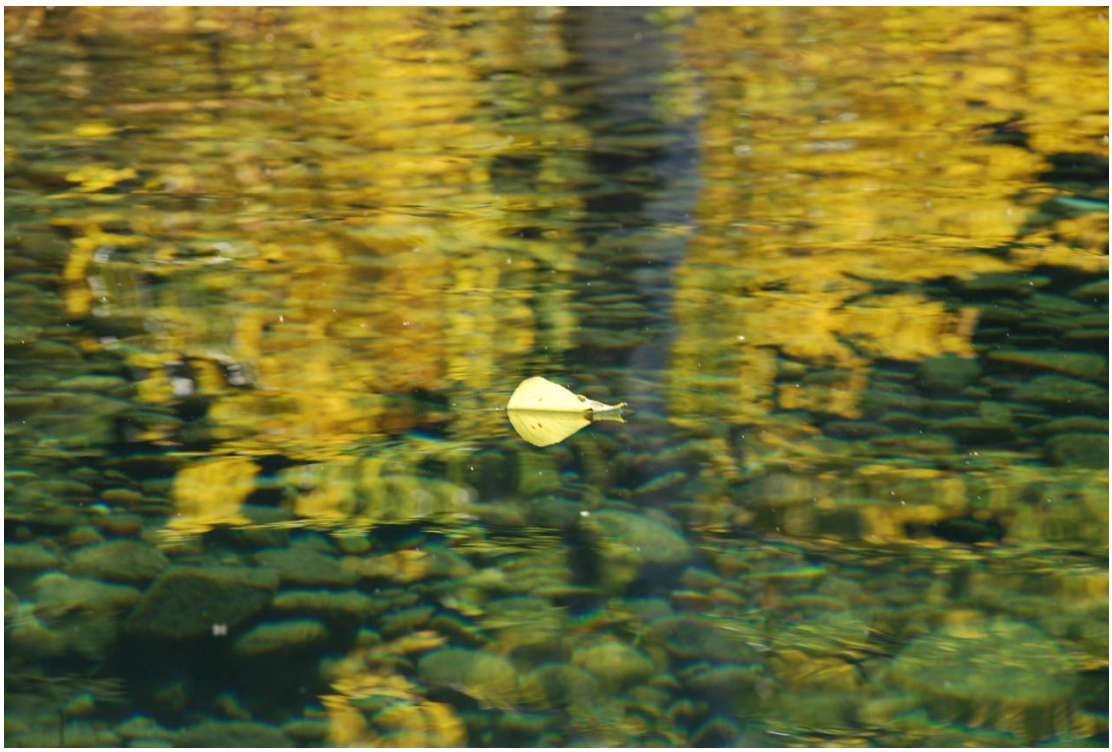
i. if critical/irreplaceable public infrastructure and access will be lost or undermined and/or

ii. Substantial irreplaceable loss to uninvolved landowners will occur if not acted upon in a timely manner, and

iii. needed work can be completed without substantial risk of injury or death to those working in or near the area, or

iv. if further failure would exacerbate downstream jeopardy of life and life-safety infrastructure (ex. the only bridge, the sewer plant or water treatment facility, mine tailing piles, utility lines/pipes, etc.), and

v. a viable plan is proposed and agreed to by the managing agency for the temporary fix, its removal, and a permanent solution (per Section 7 determination) for installation in a reasonable timeline.



B. Highway Staging, Storage and Borrow Areas

The Wyoming Department of Transportation (WYDOT) has easements on the Bridger-Teton National Forest that allow for staging and storage areas, and for borrow material for the ongoing maintenance and construction activities on the state highways. There is a long term need for these sites due to the dynamic nature of the geology in which these established roadways are located.

Activities at these sites are managed cooperatively to ensure while in use, river values are protected, and that when no longer necessary, the sites are reclaimed.

The Bridger-Teton National Forest has a full-time liaison with WYDOT and Federal Highways who works in concert with those agencies to ensure river values are protected and enhanced.

- Guiding Principles: Areas should be screened where possible to protect the scenic ORV.
- Site design should ensure stormwater control measures are in place to prevent erosion and delivery of sediment.
- Hazardous material and spill prevention plans should be implemented as necessary.
- Reclamation plans and implementation should be in place for when areas are no longer needed.

C. Strategies for Addressing Climate Change

Climate change has the potential to adversely affect the future resource conditions of Snake River Headwaters. As global and regional climates continue to change, a management approach that enhances the protection and resilience of climate-sensitive resources is becoming increasingly important. The following outlines such a strategy that adapts to our growing understanding of climate change influences and the effectiveness of management to contend with them.

Climate change science is a rapidly advancing field and new information is continually being collected and released, yet the full extent of climate change impacts on resource conditions is unknown. As such, public lands managers and policymakers have not determined the most effective response mechanisms for minimizing impacts and adapting to change. Because of this, the following proposed management strategies do not provide definitive solutions or directions; rather they provide science-based and scholarship-based management principles to consider when implementing the broader management direction of this Comprehensive River Management Plan.

Climate change is one of the major challenges to the Forest Service mission to sustain the health, diversity, and productivity of the Nation's forests and grasslands for present and future generations. The future vitality of the public's lands is at risk from climate change, which drives fire, insects, diseases, invasive species, drought, and other forces. The agency must manage forests and grasslands to adapt – that is, to accommodate the changes and new conditions imposed by climate shifts. But adaptation cannot be the single focus of our response to climate change. The agency-wide Climate Change Roadmap and Performance Scorecard direct staff in creating a balanced approach that also includes mitigating climate change, building partnerships across boundaries, and preparing employees to respond to climate-related issues by understanding and applying emerging science.

The Greater Yellowstone Coordinating Committee (GYCC) was formed to allow representatives from the National Park Service, U.S. Forest Service, the U.S. Fish and Wildlife Service and the Bureau of Land Management to pursue opportunities of mutual cooperation and coordination in the management of core federal lands in the Greater Yellowstone area. All three agencies created Response strategy papers in 2010, and the GYCC includes climate change as one of its 5 priority areas. Much of the monitoring and research being conducted in the area is supported by and shared through this coordinated effort. More citations and links can be found online at http://fedgycc.org/ClimateChange.htm.

The Bridger-Teton National Forest is a leading example of the Forest Service's work on Climate Change. The forest is identifying mitigation and adaptation opportunities in its 5-year vegetation management planning efforts. At least a dozen projects have been identified that will produce measurable results for increased carbon sequestration, emissions reductions, and/or increased ecosystem resiliency. The Bridger-Teton and Caribou-Targhee National Forests are also participating in the Greater Yellowstone Ecosystem Greenhouse Gas Emissions Inventory Project. This effort involves other national forests in Regions 1, 2 and 4, the National Park Service, and U.S. Fish and Wildlife Service across the Greater Yellowstone Ecosystem. Together, these units are developing a strategy to reduce carbon emissions from administrative activities across the Greater Yellowstone Area.

The strategies below have been adapted for use by the Bridger-Teton National Forest in managing the Snake River Headwaters.

Science:

- Conduct scientific research and vulnerability assessments necessary to support the Forest Service adaptation, mitigation, and communication efforts.
- Collaborate with scientific agencies and institutions to meet the specific needs of management as it confronts the challenges of climate change.
- Learn from and apply the best available climate change science.

Mitigation:

- Reduce carbon footprint of the Bridger-Teton National Forest.
- Promote energy efficient practices, such as alternative transportation.
- Enhance carbon sequestration as one of many ecosystem services.
- Integrate mitigation into all business practices, planning, and the Forest Service culture.

Adaptation:

- Develop the adaptive capacity for managing natural and cultural resources and infrastructure under a changing climate.
- Inventory resources at risk and conduct vulnerability assessments.
- Prioritize and implement actions, and monitor the results.

- Explore scenarios, associated risks, and possible management options.
- Integrate climate change impacts into facilities management.

Communication:

- Provide effective communication about climate change and impacts to the public.
- Train staff and managers in the science of climate change and decision tools for coping with change.
- Lead by example.

Management Approaches:

Wild and Scenic Rivers under this CRMP will be managed to focus on properly functioning floodplains and riparian areas that filter and store water and sediments. By maintaining channel integrity and retaining cool water, this management will have predictable, consistent value under any climate change scenario. Allowing fire to play its natural ecological role within any scenario will also be important, as is the retention of critical migration corridors, typically in or along waterways. The new Forest Plan standards provide enhanced protections for all of these ecological processes.

With the overarching guidance of the above strategies, additional approaches to address climate change could be used throughout the implementation of this CRMP (examples listed below). The examples below are among the management approaches suggested in the article titled, *Some Guidelines for Helping Natural Resources Adapt to Climate Change* (Baron et al., 2008).

- Use best management practices to reduce human-caused stresses (e.g., infrastructure and visitor- or management-related disturbances) that hinder the ability of species or ecosystems to withstand climatic events and rapid trends.
- Form partnerships with other resource management entities to maintain regional habitat connectivity and refugia that allow species dependent on public lands resources to better adapt to changing conditions.

Climate Impacts Group Data on Historic and Projected Climatic and Hydrologic Trends for Portions of Western U.S

The Climate Impacts Group has released a comprehensive dataset of downscaled climate data for five major basins in the Western U.S. that is designed to help natural resources managers incorporate climate change impacts into resource management planning and analysis.

The "Regional Climate and Hydrologic Change in the Northern U.S. Rockies and PNW" dataset provides an internally consistent set of historical (1916-2006) and future (2040s, 2080s) downscaled climate and hydrologic data and projections that can be tailored to management units in the Columbia, upper Missouri, Colorado, and Great Basins.

Some products developed for the project include the following:

- Historical trend maps (graphics) and station tables for Historical Climate Network climate trends for maximum/minimum temperature and precipitation
- Data, graphics, and future projections summarized by Bailey ecosections, 8 digit HUCs, and Omernik ecoregions and
- Maps showing results for the historical and 2040s over the whole project domain

More information on the "Regional Climate and Hydrologic Change" project and data access is available online at http://cses.washington.edu/cig/. Jeremy Littell is the project lead.

Opportunities, Concerns & Future Actions 5

Chapter 5: Opportunities, Concerns & Future Actions

Developing short- and long-term goals and projects that would promote the mandate of the Wild and Scenic Rivers Act is a major emphasis for this Comprehensive River Management Plan.

Implementation of the CRMP

The team that developed the Forest Plan monitoring and management requirements attempted to ensure that the measures are meaningful, feasible, and reasonable with current and anticipated resources. The implementation of the approved CRMP depends on future funding and staffing, and could be affected by factors such as changing visitor use patterns, and unanticipated environmental changes. Current priority workloads already overwhelm Forest staff operating under regular program appropriations. Because leading the required WSRA Section 7 evaluation teams and analyzing project proposals within the designated river corridors already constitutes an additional workload, establishing a new position for implementation of the CRMP would provide a distinct advantage in moving forward any of the additional projects listed below.

Implementation of this CRMP will be ongoing. Additional feasibility studies and more detailed planning, environmental documentation, and consultations will be completed, as appropriate, especially if ground-disturbing activities are involved.

It is intended that this be a living document that can respond to changing conditions and new research. To that end, a review of accomplishments and monitoring results will occur annually, along with the development of a new yearly work plan. This assessment will be coordinated with our partner agencies in the Snake River Headwaters. Please refer to Appendix G for a summary of projects completed in 2012.

Headwaters-wide Initiatives

In-stream Flows:

The Omnibus Public Lands Management Act, which designated waterways of the Snake River Headwaters as a wild and scenic river, sets the priority date (March 19, 2009) for the quantification of water rights. Valid, existing water rights within the

Snake River Headwaters; all interstate water compacts in existence as of March 19, 2009; water rights in Idaho and Wyoming; other rights held by the United States; and existing private water rights are not affected by this Act. A federal reserved water right will be established, following finalization of the CRMP, to protect and enhance the free-flowing condition, water quality and Outstandingly Remarkable Values (ORVs) that allowed these rivers to be designated. Flow data continues to be collected at this time that will be the basis for a future filing of water rights under Wyoming state law, as required in the Act.

Water Quality:

The Bridger-Teton National Forest should petition the State Water Quality Division for Class I waters classification across the designation. This would create consistency across state and federal agencies regarding the beneficial uses of these waterways. It will also create consistency in that all waters in the national parks are Class I, as well as all Wilderness waters in the Bridger-Teton, and Granite Creek throughout its entire length.

Aquatic Conditions:

Diversions posing entrainment problems for native fish need to be identified across the DFC 3B and 3C corridors. Public/private partnerships are needed to implement solutions, based on best available science as current processes are evaluated and adjusted. Human-created fish migration barriers need to be identified, and then removed or modified wherever appropriate. Historic flows supportive of native aquatic species and their critical habitat requirements need to be retained, and should be part of the ongoing process to determine any appropriate applications for federal water rights to the state.

Minerals:

As funding becomes available, the Forest should assess the need to apply for mineral withdrawal in any of the scenic or recreation class designated corridors. If through that further study, it is determined to proceed, a comprehensive process including public involvement and environmental compliance would be required through the Wyoming Bureau of Land Management State Office.

Baseline Conditions:

Wherever baseline data for the monitoring plan is lacking, the Bridger-Teton commits to prioritizing the collection of that information. Where intensive monitoring is not yet necessary or feasible, regular visual monitoring through established permanent

photo points will be collected annually, which can help determine if/when more thorough efforts might become necessary.

Sign Planning:

Public recognition of the wild and scenic Snake River Headwaters will be provided through signing efforts. The Forest Recreation Staff Officer will explore opportunities to create a multi-jurisdictional effort. A single unified visual representation of the many values identified for this designation would be desirable. A single partnership message regarding aquatic invasive species and the visitor behaviors that would protect against infestations is critical. Managers must also strive for consistency in avoiding signs unrelated to the values of the designation which could decrease scenic values.

Interpretive Planning and Public Outreach:

Increased awareness of the special nature of the Wild and Scenic Snake River Headwaters will greatly enhance the overall stewardship opportunities for these interconnected waterways. A Wild and Scenic Rivers implementation leader position on the Bridger-Teton would substantially improve the ability of the Forest to move forward on these important concepts.

A clear focus should be on potential climate change influences on water quantity, quality, and demand. A proposal will be developed which includes strategies for developing a vulnerability assessment.

Given the resources and existing initiatives of the Bridger-Teton and its partners, the Snake River Headwaters may be uniquely situated to help the public understand causes and effects between climate change and water resources.

Another water-related initiative, the USFS Forests to Faucets project uses GIS to model and map the continental United States land areas most important to surface drinking water. It highlights the role forests play in protecting these areas, and the extent to which these forests are threatened by development, insects and disease, and wildland fire. In perhaps its most important role, this work can serve as an education tool to illustrate the link between forests and the provision of surface drinking water, a key watershed-based ecosystem service.

Interpretive messages need to integrate these broader perspectives of the underlying value of river protection as intended by the drafters of the Wild and Scenic Rivers Act. Specific efforts at public outreach to promote these messages will achieve multiple benefits for these rivers, including heightened interest in stewardship through both individual actions and group efforts. A biennial Headwaters Festival

should become an ongoing community celebration to retain the awareness of and positive stewardship energy for these rivers among the greater public. A commitment to this outreach would allow the ripples of those many benefits to reach out to other rivers, other water projects and other ongoing initiatives in the Greater Yellowstone, the Intermountain Region and across the Forest Service.

Three of the corridors in the designation have received recognition as Scenic By-ways, and these should provide primary locations for on-site interpretive messages. Blackrock Creek and lower Buffalo Fork, as well as the Hoback River, already attract interest for their cultural and natural resource messages. A current public initiative has also proposed the Snake River recreation segment as part of a scenic byway. With the many developed recreation sites along that highway, this corridor too offers logical places for the public to learn about this superlative area and to deepen the Sense of Place that will inspire people's interest in both exploring and protecting it.

Off-site, less-intrusive interpretive options are also increasing with new technologies. Not only can people be inspired, engaged and educated through print brochures, but also with online offerings and digital audio tours and applications for their phones. The Bridger-Teton has just begun to investigate these types of media, both through the award-winning partnerships of the Children's Forest and through recent explorations on the Scenic Byways. For more rustic or primitive areas of the Snake River Headwaters, off-site options are most suitable.

Prioritized Corridor Plans:

Corridor planning would be the process of consolidating a number of proposals in priority areas to use as protections and enhancements where conditions may be most vulnerable under current trends. These corridor plans would provide a chance to pilot management actions where they can then be evaluated over time. As trends change, or visitor or other public activities shift locations, more information about these management actions would then be available for future proposals.

For example, a corridor plan for Granite Creek could be prioritized, to include actions such as (but not limited to) the following:

- Evaluate dispersed camping site access roads for inclusion in Travel Plan or rehabilitation;
- Implement engineering efforts, such as boulder barriers, to delineate 100-foot vehicle setbacks;
- Evaluate addition of accessible fire rings at high use sites;

- Determine if and where delimited or hardened water access or viewpoint routes should be proposed;
- Design, create and install new interpretive and stewardship signage;
- Analyze potential road re-route above Little Granite confluence;
- Develop alternatives to current winter parking congestion.

Wildlife Crossing Enhancements:

In all roaded areas across the Headwaters (DFC 3B and 3C), potential opportunities for adding safer wildlife crossings should be sought whenever possible. These can include large culvert-type underpasses, fencing that funnel wildlife to safer crossing locations, or even overpasses. Wyoming Department of Transportation and Game and Fish Department have been extremely proactive with these types of projects and will be evaluating results in the years to come. In some cases, slower speed limits may also be appropriate at certain times of year or times of day. Information already gathered by the above agencies can be monitored to determine if certain locations are in need of changed management in order to better protect wildlife or to enhance safety for traveling visitors.

Eligible Rivers Management within the Snake River watershed:

Remaining rivers and streams within the upper Snake River watershed that were not designated (or perhaps not yet studied for eligibility) contribute in various ways to many of the identified river values in the Snake River Headwaters system. A Wild and Scenic Rivers implementation leader should review existing management direction for these rivers to determine where inconsistencies exist and develop a proposal for Forest leadership evaluation.

Collaborative Public/Private Process for Projects; Establish Stewardship Team:

Develop process to effectively outreach for organizational and individual participants in a stewardship team with specific ongoing projects such as monitoring work, and/or periodic efforts such as events, sign installations, grant proposals, volunteer days, etc.

Opportunities, Concerns & Actions by River Segment

As federal agencies seek to conserve financial resources by working smarter, more integration of projects across traditional divisions is expected. This wild and scenic designation will fit that trend exceptionally well, as potential enhancement projects need to be protective of water quality, free-flow and all six identified outstanding values. For example, a recreation enhancement such as trail stabilization will also need to protect the free-flowing condition of a stream without interrupting the (long-term) water quality and can have no negative impacts to identified wildlife values.

As potential projects are proposed for analysis by the public or by resource agency specialists, river managers should also review the list below to determine if any of the opportunities included could be integrated with the goals or work activities suggested.

Bailey Creek

- The main access is by trail. The trail condition (as of 2012) is contributing erosion of soil into the creek and compaction/denuding of the stream bank in a few places. Unarmored creek and bog crossings also contribute sediment into the creek and lake. Strategies to address these impacts should be developed.
- Few weeds are observed but could increase without monitoring and control.
- Presence of non-native brook trout may be suppressing the native fisheries. In order to enhance the fisheries value, some management action may be necessary.
- Increased education at trailhead (outside corridor) and with backcountry patrols regarding voluntary recommendations for food storage will keep bears and humans safer.
- Permit administrators will emphasize food storage recommendations in working with both outfitter-guide and grazing permittees.

Blackrock Creek

- The presence of non-native brook trout could jeopardize the health of native fish species; Fisheries specialists could create a plan for reducing or eliminating this species that would benefit the fisheries value.

- During highway reconstruction, the Wyoming Department of Transportation installed underpasses designed to accommodate safe travel of wildlife, and retaining walls that greatly reduced roadway effects on the corridor's extensive riparian zones. Continued monitoring of construction and site restoration is needed as the project concludes.

- Eroding culverts and weed infestations in the lower reaches of the creek may be corrected as the highway reconstruction project continues but in the meantime, the WYDOT liaison will watch these and suggest control measures where possible.

Buffalo Fork

- There are no built facilities for river access to accommodate increasing recreation activities. With increases in angling and boating and no facilities for access, there could be potential stream bank erosion and human waste issues along the river. Recreation specialist should seek potential interested stakeholders for monitoring this activity as a logical first step to determine if a problem is developing. The district could conduct an analysis to determine need and potential location for facilities.

- Impacts to the Buffalo Fork from roads are restricted to the portion of the river that is downstream from Clear Creek (i.e., the non-Wilderness portion of the designated reach). Crossings and sections of road near the stream have the potential to impact the channel, but because of its dynamic nature few roads are close to the channel for long distances. In addition to roads, trails and trail crossings may also impact the Buffalo Fork and its designated tributaries. Where trails are within riparian areas or where portions of trails intersect channel features, and where crossings lie within bankfull channel boundaries, channel function may be altered in the immediate vicinity of the impacts. Trail patrols should add these locations to their patrol records for photo point monitoring.

- Wildlife specialists should seek opportunities for riparian habitat restoration and enhancements that can benefit the declining Jackson moose herd and other riparian species.

Crystal Creek

- A bridge crosses the creek on Forest Road 30400 and is expected to be replaced in the near future. Engineering must coordinate with Wild and Scenic lead to ensure that management requirements, including scenery protections are met.
- Clean-up of trash would be an appropriate and valued volunteer activity and should be included on list of stewardship team opportunities.
- District should explore partnering with private landowners to reduce the potential for effluent and channel impacts from corrals on private land should be explored.

Granite Creek

- High snowpack during winter 2010/2011 exposed (and exacerbated) existing drainage problems along the road and also re-activated a number of landslides that caused cutslope and fillslope failures along the route, blocking access through early summer 2011 and delivering additional sediment to Granite Creek from the road. Delivery of road-derived sediment to Granite Creek is greatest within the 0.8 mile stretch upstream from the Little Granite Creek confluence where the road is closest to the channel. In 2012, a large amount of road surfacing and drainage improvement addressed many of the existing issues. The district and Forest engineering should create a long-term plan to for a sustainable road in this area.
- District recreation manager should investigate improvements to winter trailhead parking and capacity, including potential relocation; improve stream protection and safety by eliminating blind corner by highway junction.
- Campground concessionaire must monitor water quality relative to hot springs management.
- Consider partnerships to investigate water quality influences from Little Granite Creek.
- Recreation crews should perform deferred maintenance tasks at campgrounds and day-use areas.
- Recreation and trail crews should rehabilitate user-created trails and educate visitors regarding river impacts of proliferating trails.

- Recreation manager should develop corridor plan for camping/ interpretation/access, including better separation between launch sites and camping areas.
- Recreation manager should work with landscape architect to improve parking at Falls and investigate including a universally-accessible overlook there.

Gros Ventre River

- The gravel pit between the confluences of Slate and Crystal Creeks with the main stem is a seed source for musk thistle, cheatgrass, and other non-native plants. Metal debris was removed in 2012. The stewardship team should develop a river enhancement project here to reduce the footprint and visual impacts while retaining options for use.
- District should develop a plan for which gravel pits to retain, how to manage those, and schedule restoration of the others.
- Weeds are of concern throughout the corridor, especially in the lower stretch where knapweed is increasing. Vegetation managers should develop a weed management plan, and work to continue and expand annual Gros Ventre Spray Days partnership.
- The Forest and Wyoming Game and Fish should develop monitoring partnerships that can fund invertebrate studies for water quality assessment.
- The stewardship team should investigate beaver and willow restoration, wetland and floodplain improvements above the confluence with Fish Creek that could enhance river functions interrupted by early settlement manipulations.
- The district and engineering should explore options related to the road elevation at Goose Lake due to beaver dam activities that would allow additional opportunities for the beaver to increase the extent of the wetland.
- The Forest should pursue ‘willing seller’ land easements or acquisitions agreements within this corridor as funding becomes available.
- Forest Recreation Staff should work to develop a multi-jurisdictional plan to improve parking/partnership/interpretation at Jumping Rock corner.

Hoback River

- District recreation manager should develop corridor plan for camping/interpretation/access.
- Engineering should rehabilitate old road prism, including removal of old culverts that present safety hazards and visual detractions, to create additional non-motorized access.
- Non-recreation permit administrator should require Lower Valley Energy to consult with landscape architect on scenery protections for housing pump stations or valves. Permit administrator should work with rivers manager to determine if any new LVE access points could and should be public.
- District should rehabilitate gravel pit and access road within wilderness.
- District and engineering should rehabilitate 0.8 miles of road off cattle guard at 4th crossing.
- District and engineering should rehabilitate power line/pit road across from Hoback Campground.
- River manager should investigate new launch location near Snake River confluence.
- Vegetation manager should develop a noxious weed management strategy, and initiate weed removal partnership activities with emphasis on engaging local homeowners.

Pacific Creek

- If the pre-existing placer gold mines become active; minerals manager will need to work with operator to effect positive river protections as per new stipulations.
- District recreation specialist should develop corridor plan to address dispersed camping. Dispersed camps along the scenic segment are quite large and could be improved with better delineation for protection of the stream banks.

Shoal Creek

- The main ford below Shoal Falls is widening the creek and is being trampled by both recreational stock and cattle. Fords crossing tributary creeks are not in good condition and all appear to be sources of sedimentation into Shoal Creek. Where the trail is too close to the creek and side-stream crossings cannot be repaired, trail crew should relocate it onto higher, more stable ground or replace with turnpike.
- Grazing in the lowest two miles of the designated stretch has created braided trails and some impacts at stream crossings. Range administrator should investigate permittee partnerships such as Low-Stress Livestock Handling trainings to assist with keeping cattle off sensitive areas.
- Trails specialist should explore trail maintenance partnerships to restore crossings.

Snake River – Wild Segment

- Wilderness patrollers should continue monitoring former salting sites and resultant barren areas.
- Recreation specialist should explore trail maintenance partnerships to prevent problems at fords and along wet trails.

Snake River – Recreation Segment

- District should designate staging areas that can be used for highway maintenance or emergency operations.
- Lower Valley Energy will continue work to revegetate power line and remove the powerline tower cement footings that were never used on the north end of the Snake River Sporting Club.
- River and trails crews should rehabilitate user-created trails and educate visitors regarding river impacts of proliferating trails.
- Vegetation specialist should manage invasive species, such as knapweed and thistle, to restore ecological integrity and maintain native fauna and flora (terrestrial and aquatic).

- River manager should continue wash stations at launch areas.
- Recreation or trails specialists should investigate accessible trail along lower segment to include views of mountain goat cliffs, and if implemented, provide printed material for Alpine businesses to promote.

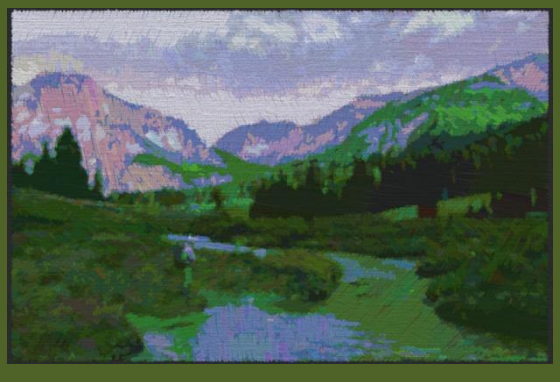
Willow Creek

- Recreation specialist will provide increased education at trailhead (outside corridor) and with backcountry patrols regarding voluntary recommendations for food storage that will keep both humans and bears safer.
- Permit administrators will emphasize food storage recommendations in working with both outfitter-guide and grazing permittees.
- Stewardship team should pursue habitat restoration and enhancement in areas altered by past livestock grazing.

Wolf Creek

- Stewardship team should address the presence of noxious weeds, particularly knapweed, at the confluence with the Snake River and the trailhead area.
- A culvert with active spawning for Snake River cutthroat trout runs under U.S. Highway 89 at Wolf Creek. WYDOT liaison should seek opportunities to enhance spawning habitat with a wider culvert allowing reduced water velocity.
- WYDOT should identify strategy to keep alluvium from plugging crossing.
- WYDOT liaison should seek opportunity to address a road drainage culvert across from Roos Creek to stop erosional gullying.

Partnerships & Stewardship 6



Chapter 6: Partnerships and Stewardship

The CRMP has been developed in consideration of the goals of all Federal, state and local agencies with jurisdiction over the resources of the designated rivers. Tribes continue to have traditional cultural-use ties and off-reservation interests in lands and waters of the area. Additionally, private landowners have an ongoing role to play as well. Only by working together can the full intent of the Wild and Scenic Rivers Act be accomplished. The responsibilities of relevant stakeholders, and the WSRA's direction regarding Easement Acquisition on private property, are described below.

Federal Agencies:

USDA Forest Service: The Bridger-Teton National Forest has management responsibility for National Forest System lands within the designated Wild and Scenic River corridors, which constitutes the majority of lands within the corridors. Forest Service management of lands is accomplished through a two-level planning process. The first level of planning is programmatic and is represented by the Forest Plan and its amending documents. The Forest Plan provides direction for management programs, practices, uses and protection measures on National Forest System lands.

The second level of planning is at the project level. Individual project plans implemented within the designated river corridors will be analyzed for potential site-specific environmental impacts and for compliance with desired conditions and management standards and guidelines set in the amended Forest Plan.

In addition, the BTNF has the responsibility for evaluating federally-assisted water resources projects (defined as being a project within the bed and banks of the river) to ensure existing conditions of identified river values (free-flowing condition, water quality, and outstandingly remarkable values) are not diminished. This is required in the designated rivers, regardless of land ownership.

Bureau of Land Management: The BLM has jurisdiction over federally owned minerals in the Scenic and Recreational river corridors. Federal minerals in the Wild segments are withdrawn by the Wild and Scenic Rivers Act.

U.S. Environmental Protection Agency: The Environmental Protection Agency (EPA) develops and enforces regulations that implement environmental laws enacted by Congress, including those associated with the Federal Water Pollution Control Act, commonly called the Clean Water Act (CWA). The EPA has the authority to implement pollution control programs. The CWA governs the discharge of dredged or

fill material into "waters of the United States." EPA has the lead for establishing the environmental guidelines/criteria that must be met to receive a permit under CWA.

U. S. Army Corps of Engineers: The Army Corps of Engineers (ACOE) is the permitting authority for water resource projects and is responsible for mitigation of projects that impact wetlands. Army Corp permits for projects on private lands within the bed and banks of designated river segments must be accompanied by a letter of certification from the River Administering Agency.

U.S. Fish and Wildlife Service: The U.S. Fish and Wildlife Service (USFWS) enforces federal wildlife laws, protects threatened and endangered species, manages migratory birds, restores nationally significant fisheries, and conserves and restores wildlife habitat such as wetlands. The USFWS role and authority under the Endangered Species Act requires that the BTNF enter into informal or formal consultation with the USFWS to gain concurrence on anticipated effects to federally listed or proposed species and to designated critical habitat known to occur on the National Forest. In addition to this role, the USFWS manages a small segment of the Scenic Gros Ventre River where it flows into the National Elk Refuge.

National Park Service—Grand Teton National Park, Yellowstone National Park, and the John D. Rockefeller, Jr. Memorial Parkway: Each of these units of the National Park Service has management responsibilities for lands along designated river segments within their respective boundaries, along with administrative responsibilities for Section 7 evaluation of associated waterways.

Federal Energy Regulatory Commission: The Federal Energy Regulatory Commission (FERC) is an independent agency that regulates the interstate transmission of natural gas, oil, and electricity. FERC also regulates natural gas and hydropower projects.

U.S. Geological Survey: USGS maintains water flow gauges on several of the rivers and shares information gathered with managing agencies.

Tribal Relations:

The BTNF honors the U.S. Government trust responsibility and treaty obligations toward Native American tribes within a government to government relationship. This relationship is outlined in a Memorandum of Understanding (MOU) between sovereign and federally recognized tribes and the Forest Service. Nothing in this CRMP or in its implementation is intended to modify, abrogate, or otherwise adversely affect tribal reserved or treaty guaranteed rights applicable within the river

corridors. The two tribes on Wyoming's Wind River Reservation, the Northern Arapaho and the Eastern Shoshone, are recognized as having cultural ties to the Snake River Headwaters. At Fort Hall, Idaho, the Shoshone-Bannock Tribes are connected downstream along the Snake River and hold off-reservation interest in the lands and streams of the headwaters.

State of Wyoming:

Several state agencies play a role in managing Wild and Scenic Rivers.

The **State Historic Preservation Office** (SHPO) is a state office with a federal mandate. Under Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations at 36 CFR 800, federal agencies are required to consult with SHPO regarding the eligibility of historic and cultural properties for nomination to the National Register of Historic Places, and on determinations of effect from federal undertakings and management decisions.

The **Wyoming Department of Environmental Quality** (WDEQ) is responsible for protecting public health and the environment by administering the state's environmental quality laws and delegated federal programs (CWA) to prevent, control and abate pollution of air, water and land resources.

The **Wyoming Game and Fish Department** (WGFD) is responsible for managing and protecting the state's fish and wildlife resources. The agency sets game animal harvest levels, hunting and fishing seasons and limits on catch and possession of game animals. The WGFD manages populations of fish and wildlife while the Forest Service manages the habitat on National Forest lands. Both agencies are cooperating to prevent the introduction of aquatic invasive species into the waterways of the Snake River Headwaters. More broadly, cooperation is also key to the successful attainment of the separate missions of the Forest Service and the WGFD.

The **Wyoming Department of Agriculture** (WDA) assists the citizens of Wyoming to live safe and healthy lives, promote and preserve the agricultural community, be responsible stewards of our natural resources, and achieve integrity in the marketplace.

The **Wyoming Department of Transportation** (WYDOT) is responsible for maintaining a safe, efficient transportation system for the traveling public. A majority of WYDOT's budget and efforts go toward planning, building and maintaining the 6,800 miles of highway that connect Wyoming's communities and surrounding states. As a full-service transportation provider, the agency also has numerous other

responsibilities. In addition to coordinating improvements at 40 airports around the state, agency personnel also collect fuel taxes and user fees that are used to fund transportation projects; oversee production of license plates for distribution to the county governments; test drivers and issue drivers licenses; enforce traffic laws, and regulate commercial vehicle operations. The Forest Service has established MOUs with both WYDOT and Federal Highways Administration.

The **Wyoming State Engineer's Office** (WSEO) is charged with the regulation and administration of the water resources in Wyoming. Water rights can be issued to anyone who plans to make beneficial use of the water. The Board of Control is the regulatory division within the State Engineer's Office that adjudicates water right permits and ensures that they are being beneficially used as specified under their permit. The Bridger-Teton and the Wyoming State Engineer's Office have a current MOU which outlines the notification process between the two agencies, and the two have been collaborating on the process for quantifying the amount of water flow needed to protect identified river values.

County and Town Planning Departments:

The authority to regulate and control land use and development activities on private lands within the designated river corridors rests with local agencies, primarily Teton and Lincoln Counties. The Forest Service does not have the authority to zone or regulate uses on these private lands outside the bed and banks of designated rivers. Coordination between planning departments and the BTNF is essential whenever applications for projects within bed-and-banks of designated rivers are submitted.

Easements and Acquisitions

A number of federal legal authorities are available to affect partnerships for river protection through cooperative management approaches. An excellent resource, available through the Interagency Wild and Scenic Rivers Coordinating Council website (www.rivers.gov), is *The River Partnership Paradigm: Legal Authorities and Case Studies*, a paper prepared for the 2004 River Management Society Symposium by Jackie Diedrich of the U.S. Forest Service.

The Wild and Scenic Rivers Act does not give federal agencies authority to regulate private land outside of the bed and banks of designated rivers. Consequently, the only effect of designation is to authorize the purchase of easements within the river corridor, and to enable federal agency staff to provide technical assistance to private

landowners interested in reducing impacts on the river's water quality and riparian integrity. Generally, existing agricultural and grazing practices and related structures are not affected by designation.

Section 6(b) of the Wild and Scenic Rivers Act specifically prohibits the use of condemnation for fee title purchase of private lands if 50 percent or more of the acreage within the boundaries on both sides of the designated river is in public ownership (i.e., owned by the federal, state, or local government), and so is not an available tool in the Snake River Headwaters. In addition, Section 6(a)(1) of the Act prohibits acquiring more than 100 acres per river mile within the corridor, which equates to a strip of land about 400-feet wide along both sides of the river.

Section 13(g) of the Wild and Scenic Rivers Act allows the granting of easements and rights-of-way within the boundaries of designated components in accordance with applicable laws, provided that the conditions attached to the grant are consistent with the purposes of the Act. Easements on private lands acquired for the purposes of protecting wild and scenic rivers do not provide public access unless this right was specifically acquired from the private landowner. A trail or road easement by necessity would involve public use provisions. Any provisions for public use of private lands must be specifically purchased from the landowner.

Evaluation Guidelines for Water Resource Projects 7

Chapter 7: Evaluation Guidelines for Water Resource Projects

Section 7 of the Wild and Scenic Rivers Act is a key provision, directing federal agencies to protect designated rivers from negative impacts of water resource projects. It requires evaluation of federally assisted (or federally permitted) water resources projects by the river-administering agency, in this case, the U.S. Forest Service, to determine if a project will have adverse effects on outstandingly remarkable values, free flow, or water quality. The administering agency may also require modifications to a project in order to avoid any direct and adverse impacts. This analysis is required regardless whether a project is on public or private lands.

A water resources project under Section 7 of the act is defined as any dam, water conduit, reservoir, powerhouse, transmission line, or other project works under the Federal Power Act, or other construction of developments that would affect the free-flowing characteristics of a wild and scenic river (36 CFR 297). In addition to projects licensed by the Federal Power Commission, water resources projects may also include water diversion projects, fisheries habitat and watershed restoration or enhancement projects, bridges and other roadway construction or reconstruction projects, riverbank stabilization projects, channelization projects, levee construction; recreation facilities such as boat ramps and fishing piers, and activities that require a 404 permit from the U.S. Army Corps of Engineers.

The degree of analysis required under section 7 directly relates to the magnitude and complexity of a proposed project. Less complex projects may require a brief review to evaluate the effects and to support a determination. However, every determination must be based on the best available science, professional judgment, and be consistent with the Wild and Scenic Rivers Act and agency policies.

Before undertaking an evaluation of proposal's effects, project proponents whether internal or external should develop options that minimize the amount of impact and intervention, similar to a minimum tools analysis. This iterative process with various resource specialists can create a proposal that is most likely to receive a positive evaluation.

The following evaluation procedures have been adapted from the Interagency Wild and Scenic Rivers Council (2004) and would be used by the Bridger-Teton National Forest when evaluating proposed projects to make a Section 7 determination. The following steps also provide useful information for those interested in seeking approval of a proposed water resource project.

Step 1. Establish Need: Define the need for the proposed activity and make a preliminary determination whether the proposed activity is consistent with the management goals and objectives for the river. If management goals and objectives have not been formalized through a river planning process, utilize Forest Plan standards and guidelines and any applicable state fish

and wildlife, water quality, or other state agency management plans or policies consistent with identified values to develop objectives for each of the outstanding river values.

If the activity does not evidence a compelling need or is inconsistent with the management goals and objective or other applicable laws, the project need not be considered further. If there is a need for the activity and it appears consistent with management goals and objectives, proceed with Steps 2-10. In conducting and documenting the analysis, the scope of the evaluation is to be consistent with the magnitude and complexity of the proposed activity.

Step 2. Define the Proposed Activity: Objectively describe the proposed activity in terms of the:

- Project proponent(s);
- Purpose/need for the project(document results of Step 1);
- Geographic location of the project;
- Duration of the proposed activities;
- Magnitude/extent of the proposed activities; and,
- Relationship to past and future management activities.

Step 3. Describe How the Proposed Activity Will Directly Alter Within-Channel Conditions: Address the magnitude and spatial extent of the effects the proposed activity will have on in-channel attributes. Give special attention to changes in features that would affect the oustandingly remarkable and other significant resource values. Describe:

- The position of the proposed activity relative to the stream bed and stream banks.
- Any likely resulting changes in:
    - Active channel location;
    - Channel geometry (cross-sectional shape, width/depth characteristics);
    - Channel slope (rate or nature of vertical drop);
    - Channel form (straight, meandering, or braided); and,
    - Relevant water quality parameters (turbidity, temperature, nutrient availability).

Step 4. Describe How the Proposed Activity Will Directly Alter Riparian and/or Floodplain Conditions: Address the magnitude and spatial extent of the effects the proposed activity will have on riparian/floodplain attributes. Give special attention to changes in features that would affect the outstandingly remarkable and other significant resource values. Describe:

- The position of the proposed activity relative to the riparian area and floodplain.
- Any likely resulting changes in:
  - Vegetation composition, age structure, quantity, or vigor.
  - Relevant soil properties such as compaction or percent bare ground.
  - Relevant floodplain properties such as width, roughness, bank stability, or susceptibility to erosion.

Step 5. Describe How the Proposed Activity Will Directly Alter Upland Conditions: Address the magnitude and spatial extent of the effects the proposed activity will have on upland attributes. Give special attention to changes in features that would affect the outstandingly remarkable and other significant resource values. Describe:

- The position of the proposed activity relative to the uplands.
- Any likely resulting changes in:
  - Vegetation composition, age structure, quantity, or vigor.
  - Relevant soil properties such as compaction or percent bare ground.
  - (Relevant hydrologic properties such as drainage patterns or the character of surface and subsurface flows.
- Potential changes in upland conditions that would influence archeological, cultural, or other identified significant resource values.

Step 6. Evaluate and Describe How Changes in On-Site Conditions Can/Will Alter Existing Hydrologic or Biologic Processes: Evaluate potential changes in hydrologic and biological processes by quantifying, qualifying, and/or modeling the likely effects of the proposed activity on:

- The ability of the channel to change course, re-occupy former segments, or inundate its floodplain;

- Stream bank erosion potential, sediment routing and deposition, or debris loading;
- The amount or timing of flow in the channel;
- Existing flow patterns;
- Surface and subsurface flow characteristics;
- Flood storage (detention storage);
- Aggradation/degradation of the channel; and,
- Biological processes such as:
  - Reproduction, vigor, growth and/or succession of streamside vegetation;
  - Nutrient cycling;
  - Fish spawning and/or rearing success;
  - Riparian dependent avian species needs; and,
  - Amphibian/mollusk needs.

Step 7. Estimate the Magnitude and Spatial extent of Potential Off-Site Changes: Address potential off-site, or indirect effects of the proposed activity, acknowledging any uncertainties.

- Consider and document:
  - Changes that influence other parts of the river system;
  - The range of circumstances under which off-site changes might occur (for example, as may be related to flow frequency); and,
  - The probability or likelihood that predicted changes will be realized.
    - Specify processes involved, such as water and sediment, and the movement of nutrients.

Step 8. Define the Time Scale Over Which Steps 3-7 are Likely to Occur: Review steps 3-7 looking independently at the element of time. Define and document the time scale over which the effects will occur.

Step 9. Compare Project Analyses to Management Goals: Based on the analysis of steps 3-8, identify and document project effects on achievement, or timing of achievement, of management

goals and objectives relative to free-flow, water quality, riparian area and floodplain conditions, and the outstandingly remarkable and other significant resource values.

Step 10. Make Section 7 Determination: Make the Section 7 determination consistent with the policy outlined in Forest Service Manual 2354.73. Based on the analysis of steps 3-9, document:

- The effects of the proposed activity on conditions of free-flow, including identification of any proposed measures to minimize those effects;
- Any direct and adverse effects on the outstandingly remarkable and other significant resource values for which the river was designated or is being studied; and,
- Any unreasonable diminishing of scenic, recreational, fish and wildlife values associated with project activities above or below the area.

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