

Upper Green River Area Rangeland Project

Fisheries Report

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A. Introduction

Forest management activities that may alter the aquatic habitat or affect individuals or populations of Proposed, Endangered, Threatened, and Sensitive fish and aquatic species require a Biological Evaluation to be completed (FSM 2671.44 and FSM 2670.32) as part of the National Environmental Policy Act process and Endangered Species Act to determine their potential effects on sensitive, threatened or endangered species. The Biological Evaluation process (FSM 2672.43) is intended to conduct and document analyses necessary to ensure proposed management actions will not likely jeopardize the continued existence or cause adverse modification of habitat for:

- A. Species listed or proposed to be listed as endangered (E) or threatened (T) by the USDI-Fish and Wildlife Service or USDC-NOAA Fisheries, and their listed or proposed listed critical habitat.

The Biological Evaluation process (FSM 2672.41) is also intended to conduct and document analyses to ensure that Forest Service actions do not contribute to loss of viability of any native or desired non-native plant or contribute to animal species or trends toward Federal listing of any species for:

- B. Species listed as sensitive (S) by USDA-Forest Service Region 4.

Management Indicator Species (MIS) are species used to indicate the effects of habitat changes associated with forest management activities. The Bridger-Teton Land and Resource Management Plan (LRMP) has identified Colorado River cutthroat trout (CRCT), Yellowstone cutthroat trout (YCT), rainbow trout (RT), and Bonneville cutthroat trout (BCT) as aquatic indicator species for the forest. MIS in the Upper Green River Area Rangeland Project area include CRCT, YCT, and RT.

This Biological Evaluation addresses all alternatives presented in the Upper Green River Area Rangeland Project Environmental Impact Statement.

Overview of Issues Addressed

The Forest Service first identified all potential issues and then separated them into two groups: significant and non-significant issues.

Significant issues were defined as those: 1) within the scope of the proposed action; 2) not already decided by law, regulation, Forest Plan, or other higher level decision; 3) relevant to the decision to be made; or 4) not conjectural, but supported by scientific or factual evidence.

Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision;

3) not relevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence.

The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "...identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)..."

Significant issues related to authorizing grazing on six allotments on the Pinedale Ranger District were identified through public and internal scoping. Similar or closely related issues were combined into one statement where appropriate. Four issues were determined to be significant and within the scope of the project decision, two of which were pertinent to the fisheries resources and will be addressed in this specialist report.

Issue 1: Effects on Threatened, Endangered, and Sensitive Species (TES), as well as Other Species of Concern

The concern is that livestock grazing may affect the recovery of Threatened, Endangered, Proposed, Candidate and Sensitive Species, in addition to viability and habitat objectives for other species in the project area. The Forest Plan provides direction for TES and Management Indicator Species. Species conservation is directed by laws, regulations, and policies.

Indicators: Compliance with federal law and policy and condition of habitat for Threatened and Endangered Species, Management Indicator Species and Sensitive Species that are affected by livestock grazing. Specific indicators are provided below by wildlife species.

Colorado River cutthroat trout – Riparian condition, bank stability, and stream temperature

Yellowstone cutthroat trout – Riparian condition, bank stability, and stream temperature

Issue 2: Riparian and Aquatic Conditions

The concern is that livestock grazing may affect riparian areas, riparian vegetation, fisheries and overall stream function and health.

Indicators: Streambank stability (percent), stream temperature (degrees Fahrenheit), and riparian function.

B. Existing Conditions

The 169,000-acre project area is located in the Pinedale Ranger District of the Bridger-Teton National Forest, approximately 30 miles northwest of Pinedale, Wyoming. The project area occurs primarily in the headwaters of the Green River and also extends into the headwaters of the Gros Ventre River. The project area is comprised of the following

six allotments: Badger Creek, Beaver-Twin Creeks, Noble Pastures, Roaring Fork, Upper Green River, and Wagon Creek. In addition, the River Bottom Pasture is grazed during the drift as herds move up to the appropriate allotments in the spring and leave the forest in the fall. Approximately 46,148 AUMs are currently permitted to 21 different term grazing permit holders, permittees, in the 169,000- acre project area. This is the maximum permitted use; actual use is almost always less than this ceiling level. These permits authorize grazing for a total of approximately 9,100 head of cattle and 50 horses in the six allotments.

The affected environment, also known as the action area, is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action [50 CFR §402.02]. For the purposes of this analysis, the affected environment is defined as all areas that could be authorized for grazing or trailing of livestock, as well as aquatic habitat areas downstream where potential effects could occur. The affected environment from the aquatics perspective lies within 13 different watersheds in the Upper Green River sub-basin and 3 watersheds in the Gros Ventre sub-basin. These watershed boundaries will be used to define the analysis area. Within these 16 watersheds, there are 1,054 total miles of stream channels, with 408 miles of perennial stream.

Water quality is generally good within the analysis area. The Green River is glacially fed in part, which leads to elevated natural turbidity, but most of the glacial sediment settles out in the Upper Green River Lakes. Other streams in the area are all spring fed and thus generally run clear and cold. None of the streams within the analysis area are listed on the Wyoming 303d list of water quality impaired streams (Wyoming Dept. of Environmental Quality 2012).

The existing condition discussion is divided into two main sections: aquatic species distribution and existing habitat conditions, particularly as they relate to the identified issues associated with livestock grazing. Only those species and associated habitat that are found within the affected environment are discussed and analyzed since there would be no effect/impact to species or habitat outside the affected environment. Table 1 describes the species that were considered for further analysis for this project.

Table 1. Threatened, Endangered, Sensitive & MIS Species Considered and Evaluated

Species	Species or habitat present in project area		Species Type	Rational for Further Analysis
	Species	Habitat		
<i>Fish</i>				
Kendall Warm Springs Dace <i>Rhinichthys osculus thermalis</i>	Yes	Yes	Endangered	The only known distribution of Kendall Warm Springs dace is in Kendall Warm Springs, which is located within the project area; therefore, this species is carried

Species	Species or habitat present in project area		Species Type	Rational for Further Analysis
	Species	Habitat		
				forward in analysis. Consultation with the Fish and Wildlife Service has been completed.
Bonytail <i>Gila elegans</i>	No	No	Endangered	This species does not occur within the project area and no new water depletion is expected under any alternative; therefore the species is not carried forward in analysis.
Colorado pikeminnow <i>Ptychocheilus lucius</i>	No	No	Endangered	This species does not occur within the project area and no new water depletion is expected under any alternative; therefore the species is not carried forward in analysis.
Humpback chub <i>Gila cypha</i>	No	No	Endangered	This species does not occur within the project area and no new water depletion is expected under any alternative; therefore the species is not carried forward in analysis.
Razorback sucker <i>Xyrauchen texanus</i>	No	No	Endangered	This species does not occur within the project area and no new water depletion is expected under any alternative; therefore the species is not carried forward in analysis.
Bonneville cutthroat trout <i>Oncorhynchus clarki utah</i>	No	No	Ecological MIS (riparian) and Sensitive	This species does not occur within the project area; therefore, the species is not carried forward in the analysis.
Colorado River cutthroat trout <i>Oncorhynchus clarki pleuriticus</i>	Yes	Yes	Ecological MIS (riparian) and Sensitive	The Colorado River cutthroat trout is native to Wyoming in the Green River and are found in the project area; therefore, this species is carried forward in analysis.

Species	Species or habitat present in project area		Species Type	Rational for Further Analysis
	Species	Habitat		
Northern Leatherside <i>Lepidomeda copei</i>	No	No	Sensitive	The Northern Leatherside is native to Wyoming in the Bear and Upper Snake River systems. This species is not found in the project area; therefore, this species is not carried forward for analysis.
Rainbow trout <i>Oncorhynchus mykiss</i>	Yes	Yes	Harvest MIS	This non-native trout was historically stocked in many lakes and streams on the BTNF and is found in five of the six allotments. Although not native, the species has been identified as a Management Indicator Species and has populations and habitat within the project and will be carried forward in the analysis.
Yellowstone/ Snake River fine-spotted cutthroat <i>Oncorhynchus clarki spp.</i>	Yes	Yes	Ecological MIS (riparian) and Sensitive	The Yellowstone cutthroat trout is native to the Yellowstone and Snake River systems. This trout is native within one of the six allotments; therefore, this species is carried forward in the analysis.

Aquatic Species Distribution

Management Indicator Species and Sensitive Species

The National Forest Management Act of 1976 provides direction for selecting MIS. These species are selected “because their population changes are believed to indicate the effects of management activities” (36 CFR 219.19). Management indicators are “any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity” (FSM 2605). MIS are identified in the BTNF LRMP (USDA-FS 1990), and these MIS represent threatened and endangered species, important harvest species, ecological indicator species, and sensitive species. Twenty-three MIS occur on the BTNF: seven mammals, four birds, three fish, two amphibians, and seven plant species. CFR 219.14(f) allows for those plans under the 1982 Planning Rule to use habitat as an indicator instead of population trends unless the plan specifically talks to population trends.

Threatened and Endangered Species

Threatened and Endangered species possibly occurring in the project area or potentially affected by project actions include Kendall Warm Springs dace (*Rhinichthys osculus thermalis*), bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), razorback sucker (*Xyrauchen texanus*) (Table 1).

Kendall Warm Springs Dace

The only known location of Kendall Warm Springs dace (*Rhinichthys osculus thermalis*) is within Kendall Warm Springs located approximately 32 miles north of Pinedale, Wyoming. The springs are tributary to the Green River and are within the project area. The entire population resides in a 328 yard reach of springs. Kendall Warm Springs originates at the base of a bluff, flows 328 yard through a braided channel, and cascades over a waterfall into the Green River. The springs maintain a constant flow of approximately 8 cubic feet per second and a constant temperature of 85 °F. The temperature of the stream channel fluctuates seasonally with winter temperatures cooler downstream and near the channel margin (US Fish and Wildlife Service 2010).

The Kendall Warm Springs dace utilize various habitats within the channel. Adult dace primarily utilize shallow pool habitat in the main channel, while juvenile dace are found mostly in slower channel margin habitat. The dace are believed to spawn through the year. Juvenile dace utilize habitat near the channel margins or stay in benthic habitats in the littoral zone. Aquatic vegetation provides important hiding cover for the dace (US Fish and Wildlife Service 1982). Small pools created by large ungulates are believed to provide valuable habitat for the dace (US Fish and Wildlife Service 2010).

The Forest Service has monitored Kendall Warm Springs dace utilizing a Catch-Per-Unit-Effort (CPUE) protocol (Gryzka 1996). Surveys were conducted in seven years between 1995 and 2013 (see Figure 1). The monitoring indicated a sharp decline in the dace population density between 2005 and 2007, but it appears that the population trend may have stabilized since that time.

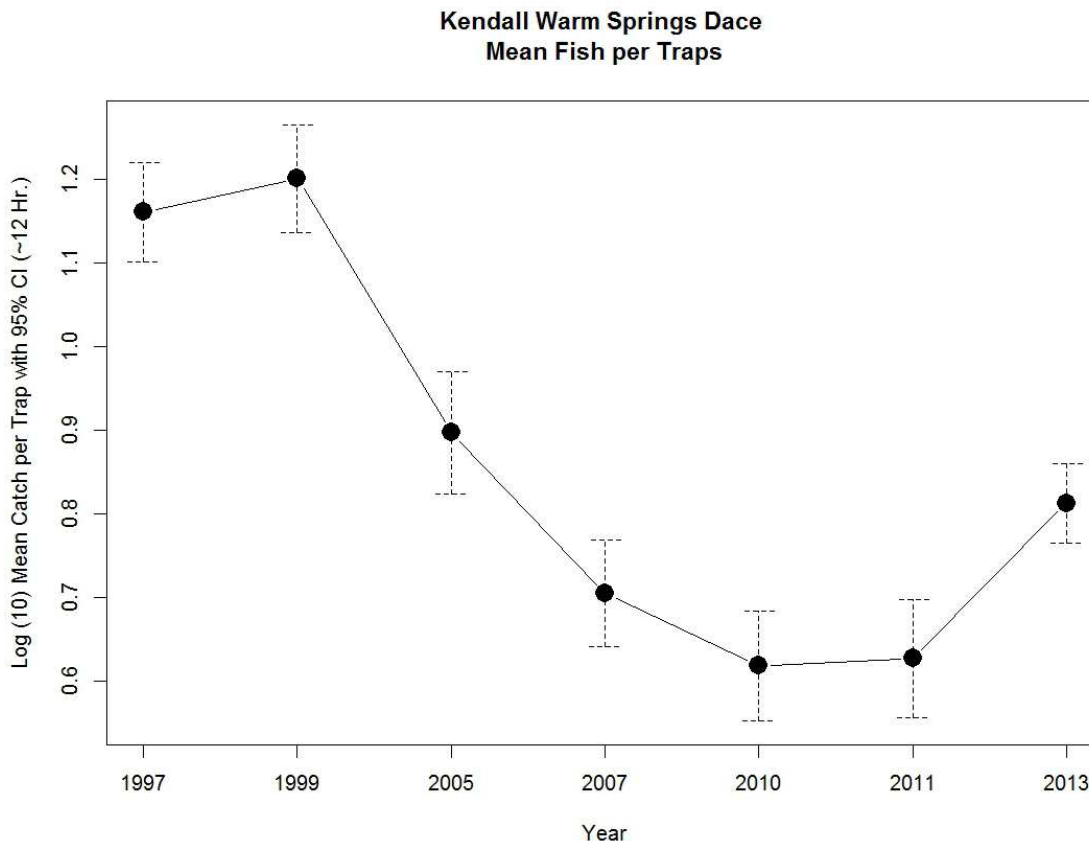


Figure 1. Relative population trend of the Kendall Warm Springs Dace based on mean catch per trap set following protocol 1 described in Gryzka (1997).

Colorado Pikeminnow, Humpback Chub, Bonytail, and Razorback Sucker

All four endangered species are restricted to the Upper Colorado River system including the Green River below Flaming Gorge Reservoir, where distribution and abundance are far below historic levels due to the effects of dams and exotic fishes. Although these four species do not occur within project area, any water depletion from the Colorado River basis is considered to jeopardize the continued existence or adversely modify the critical habitat of these four Colorado River endangered fish species (50 CFR 17.95 (e)).

Colorado River Cutthroat Trout (*Oncorhynchus clarki pleuriticus*)

The Colorado River cutthroat trout (CRCT) is a Bridger-Teton National Forest Management Indicator Species (MIS) and R4 Regional Forester's Sensitive Species. CRCT have been petitioned in 1996 and in 2006 to be protected under the Endangered Species Act of 1973. In 2007, the US Fish and Wildlife Service determined that listing CRCT was not warranted.

CRCT require relatively cool, well-oxygenated water and the presence of clean, well-sorted gravel with minimal fine sediment for successful spawning. They generally spawn in clear, cold, shallow riffles of small streams soon after ice is off in the spring. The initiation of spawning is influenced by water temperature, increased water discharge from runoff, elevation and latitude. The distance cutthroat trout travel to spawn is generally short and eggs hatch within 28-40 days depending on water temperature. Optimal stream habitat is characterized by clear, cold, relatively silt-free water with rocky substrate.

CRCT historically occupied portions of the Colorado River drainage in Wyoming, Colorado, Utah, Arizona, and New Mexico. CRCT are now estimated to occupy 11% of their historic range, which is up from an estimate of 8% in 2005 due to both increased survey efforts that have discovered existing populations and reintroduction efforts that have caused reoccupation of historic habitats (Hirsch *et al.* 2013). Current distribution on the BTNF occurs primarily in the headwaters of the Green River and down the western slope of the Wyoming Range. CRCT occupy approximately 217 miles of stream habitat on the BTNF. CRCT occupy approximately 27 miles of habitat within the project analysis area (see Figure 2). Based on this, the project area contains approximately 12% of the occupied cutthroat trout habitat across the Forest. However, CRCT strongholds on the forest are those populations with little or no invasion pressure from non-native trout, particularly brook trout, and the populations within the project area are all extensively invaded with the exception of Klondike Creek.

Population trend data is in development. The best monitoring information available indicates that populations that are being invaded by competing non-native salmonids, particularly brook trout, are experiencing population declines. Streams that have extensive brook trout invasions have very low CRCT populations, such as Rock Creek, Jim Creek, and Gypsum Creek.

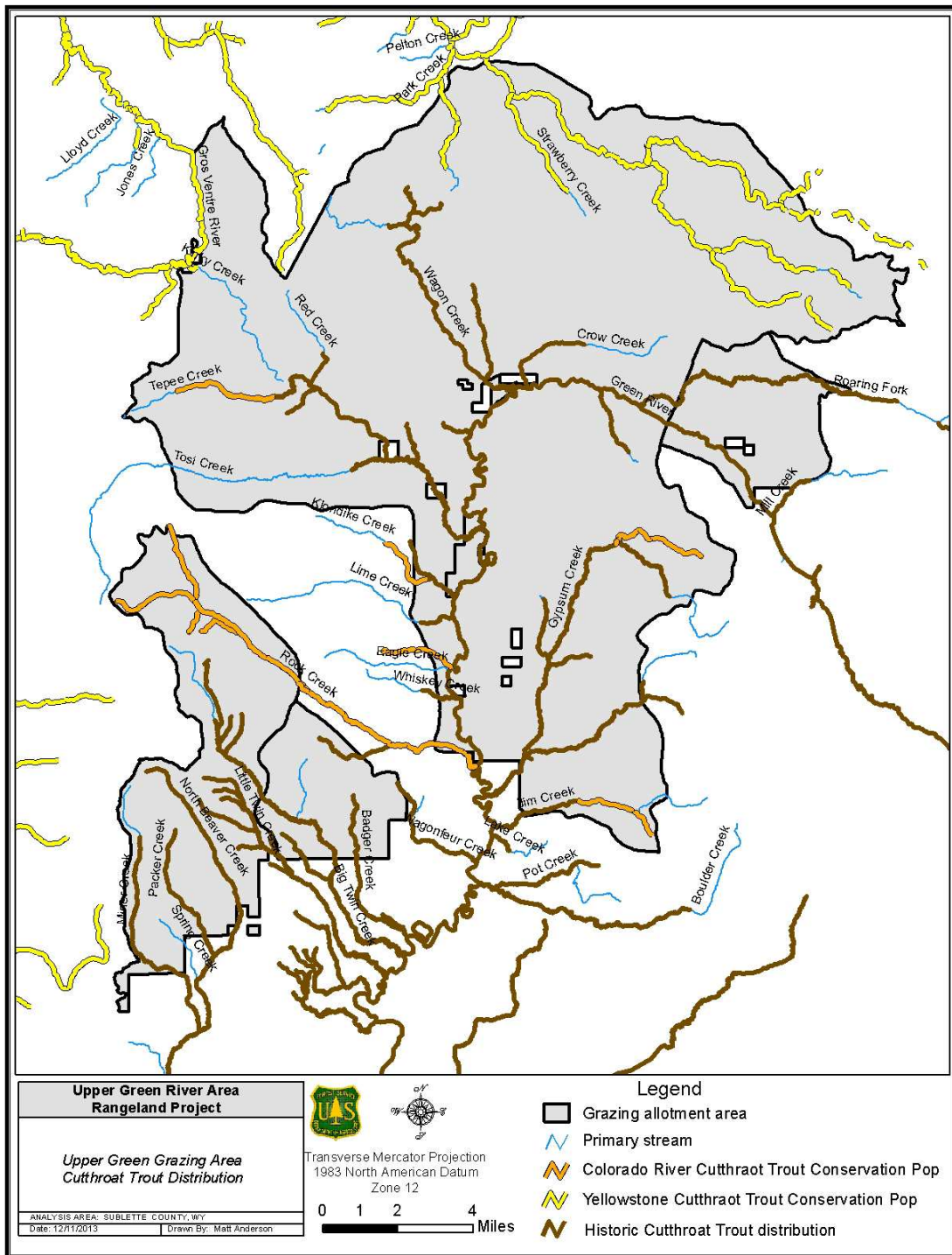


Figure 2. Map of the distribution of Conservation Populations and historical occurrence of Colorado River Cutthroat (CRCT) and Yellowstone Cutthroat Trout (YCT) and historical distribution within the project analysis area.

Yellowstone Cutthroat Trout (*Oncorhynchus clarki ssp.*)

The Yellowstone Cutthroat Trout (YCT) is a Bridger-Teton National Forest Management Indicator Species (MIS) and R4 Regional Forester's Sensitive Species. The YCT has been petitioned in the past to be protected under the Endangered Species Act of 1973. In 2001, the US Fish and Wildlife Service determined that listing YCT was not warranted.

YCT are widely distributed within their historic range in the states of Utah, Nevada, Idaho, Montana and Wyoming (May *et al.* 2003). On the Bridger-Teton National Forest YCT are found throughout their original range in the upper Snake River above Palisades Dam (Van Kirk and Benjamin 2001). There are approximately 1,537 miles of river and streams and 3,116 acres of lake on the Bridger-Teton National Forest that support YCT. These populations contain both historical and currently occupied habitat and encompass the headwaters of the Snake River, Gros Ventre, Greys-Hoback, and Salt River watersheds.

Typical of other cutthroat trout sub-species, YCT require relatively cool, well-oxygenated water and the presence of clean, well-sorted gravel with minimal fine sediment for successful spawning. They generally spawn in clear, cold, shallow riffles of small streams soon after ice is off in the spring. The initiation of spawning is influenced by water temperature, increased water discharge from runoff, elevation and latitude. Sexual maturity varies from 2-3 years for males and 5-11 years for females with a high post-spawning mortality rate. The distance cutthroat trout travel to spawn is generally short and eggs hatch within 28-40 days depending on water temperature. Optimal stream habitat is characterized by clear, cold and relatively silt-free water with rocky substrate.

Gros Ventre River population historically occupied 317 miles of rivers and streams and 13 lakes. Currently YCT occupy 306 miles of river and stream and 16 lakes (May *et al.* 2003). As shown in Figure 2, current YCT occupy most of their historical habitat within the project area. They occur throughout Fish Creek and tributaries, Raspberry Creek, and the Gros Ventre River. On the Forest, YCT occupy 1,527 miles of habitat and within the project they occupy 37 miles of habitat (2.4% of the total habitat Forest-wide). YCT have a much smaller fraction of their habitat that has been invaded by non-native trout, and available data indicates that the populations are relatively stable. Within the project area, non-native brook trout have invaded each of the major YCT streams: SF Fish Creek, Raspberry Creek, and Strawberry Creek. Raspberry Creek had no brook trout in 1999, and although cutthroat were dominant at three monitoring locations in 2014, brook trout were present at all three sites. Strawberry Creek has cutthroat present, but brook trout dominate the assemblage.

Rainbow Trout (*Oncorhynchus mykiss*)**Status, Distribution, and Habitat:**

The rainbow trout (RBT) is a Bridger-Teton National Forest Management Indicator Species (MIS). The rainbow trout is native to coastal streams flowing into the Pacific Ocean along the west coast of North America and is an introduced species on the BTNF.

This trout has been introduced into many streams and rivers as a game fish. Rainbow trout are generally considered stream-dwelling species, but they also thrive in lakes. Rainbow trout are a popular species for sport fisheries and due to historical introductions they now occur throughout the BTNF. Wyoming Game and Fish Department (WGFD) has largely discontinued stocking of rainbow trout in streams and rivers in order to reduce impacts to the native cutthroat trout. Within the project area, rainbow trout are found in the Green River and in the lowest segments of some of the tributaries. Recent monitoring data indicate that the population of rainbow trout has been declining. This is likely due to a combination of factors that include reduced stocking and increase in the brown trout population (Wyoming Game and Fish Department 2011).

Other Fish Species

Native fish species known to inhabit the upper Green River include bluehead sucker, Colorado River cutthroat trout, Kendall Warm Springs dace (KWD), mountain sucker, mottled sculpin, mountain whitefish, and speckled dace. Nonnative fish introduced to the upper Green River include brook trout, brown trout, lake trout, and rainbow trout, Redside shiner, longnose dace, and white sucker. Harvest Species include brook trout, brown trout, cutthroat trout, rainbow trout, and mountain whitefish. Brook trout have been introduced widely throughout much of the upper green and have severely limited the distribution and density of native cutthroat trout.

The WGFD has a goal of 1500 trout per mile in the Kendall reach of the upper Green River. Population monitoring in 2011 estimated 757 trout per mile in that segment (SE = 204), which indicated that the goal is not currently being achieved (Wyoming Game and Fish Department 2011). The WGFD annual report noted one possible reason for the decline as sediment deposition in the habitat enhancement structures along the river.

Existing Habitat Conditions

Riparian Condition

Riparian vegetation plays an important role in maintaining habitat for fisheries. Riparian vegetation provides root strength, which resists erosion and helps maintain channel form, particularly in low-gradient alluvial valleys. Riparian vegetation provides roughness, thereby reducing flow velocities during high flow conditions and encourages sediment deposition on the banks. Shade provided by streamside vegetation buffers streams from solar heating and effects levels of primary production, which can affect macroinvertebrate community composition.

Riparian areas were evaluated at a broad-scale based using data collected under the Wyoming Habitat Assessment Methodology (WHAM) level I survey (Quist and Hubert 2004). Habitat surveys were conducted on 188.5 miles of 408 miles of perennial stream in the analysis area, including 148.4 miles of 253 total perennial miles of stream within the allotments. The Level I assessment is a rapid process that provides a characterization

of upland, riparian, and aquatic habitat conditions. The protocol is designed to identify potential problems and management opportunities in a watershed. This is an ocular survey that involves walking a perennial stream from the mouth of the stream, or the Forest boundary, to its headwaters. Stream condition class was assigned based on surveyor’s evaluation of the following criteria: 1) Riparian functioning – riparian area is functioning to capture sediment and maintain high water table, riparian area has a diversity of vegetation that is capable of slowing high flows and protecting and stabilizing the banks; 2) Hydric soils present – soils saturated with water are present indicating that the stream is not incised; 3) Riparian vegetation recruitment – saplings and young woody plants are present in the reach; and 4) Bank erosion – the fraction of the length of the bank that shows evidence of recent erosion and that would be susceptible to further erosion under high-flow conditions. Riparian condition class was assigned at the reach level using the WHAM data set (See Table 2).

Table 2. Criteria for determining riparian conditions class based on WHAM data

Class I	Class II	Class III
< 25% bank erosion and;	< 50% bank erosion and;	≥ 50% bank erosion or;
At least three of: <ul style="list-style-type: none"> • <10% bank erosion • Riparian functioning • Hydric soils present • Riparian vegetation recruitment 	At least two of: <ul style="list-style-type: none"> • <25% bank erosion • Riparian functioning • Hydric soils present • Riparian vegetation recruitment 	Fails to meet two of: <ul style="list-style-type: none"> • <25% bank erosion • Riparian functioning • Hydric soils present • Riparian vegetation recruitment

The results of the reach-scale riparian condition class are illustrated in Figure 3 below. Based on these criteria, out of 148.4 miles of stream surveyed on the allotments, 130.3 miles (84%) were Class I, 15.4 miles (12%) were Class II, and 2.7 miles (4%) were Class III condition. Streams with Class III condition class include one reach of Tepee Creek, an area referred to as Tepee flats in the Tepee-Tosi rotation, a tributary of Lime Creek outside the cattle grazing allotments, and a reach of Fish Creek outside of the cattle grazing allotments. Streams with Class II reaches include Jim Creek, Gypsum Creek, Roaring Fork, Tepee Creek, Packer Creek, Miner Creek, and North Beaver Creek. The condition of specific streams and reaches is discussed in more detail under the specific allotments below.

In addition to the WHAM surveys, Multiple Indicator Monitoring (MIM) sites were established as key sites, which are used to monitor conditions in stream reaches that are sensitive to management impacts and representative of broader conditions, and focus areas, which are areas of special concern or areas that are known to not be meeting desired conditions (Burton *et al.* 2011). The MIM riparian assessment is described in detail in the Water Quality Specialist’s Report and focus areas are discussed by allotment below.

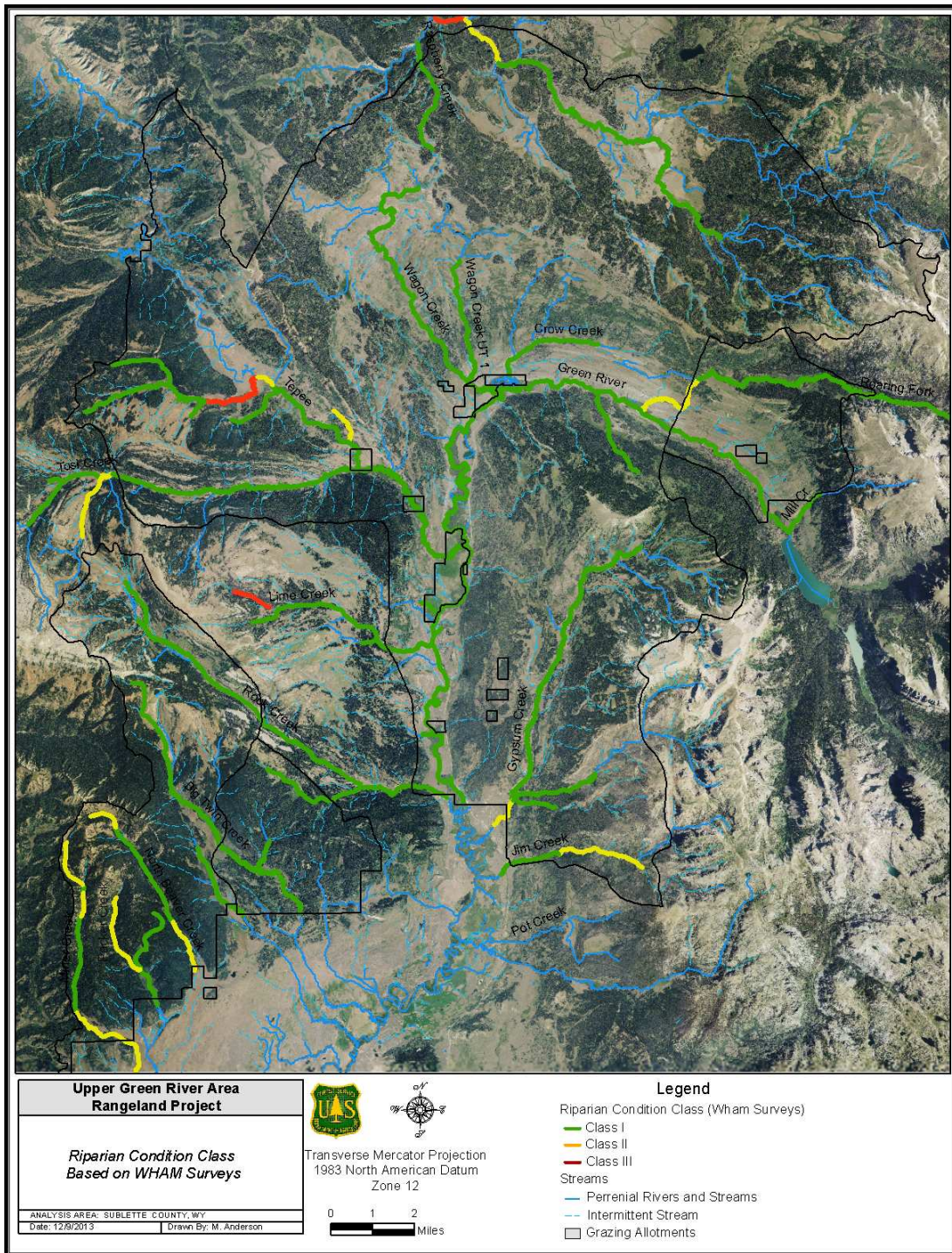


Figure 3 – Riparian condition class assessment of the Upper Green River Rangeland analysis area.

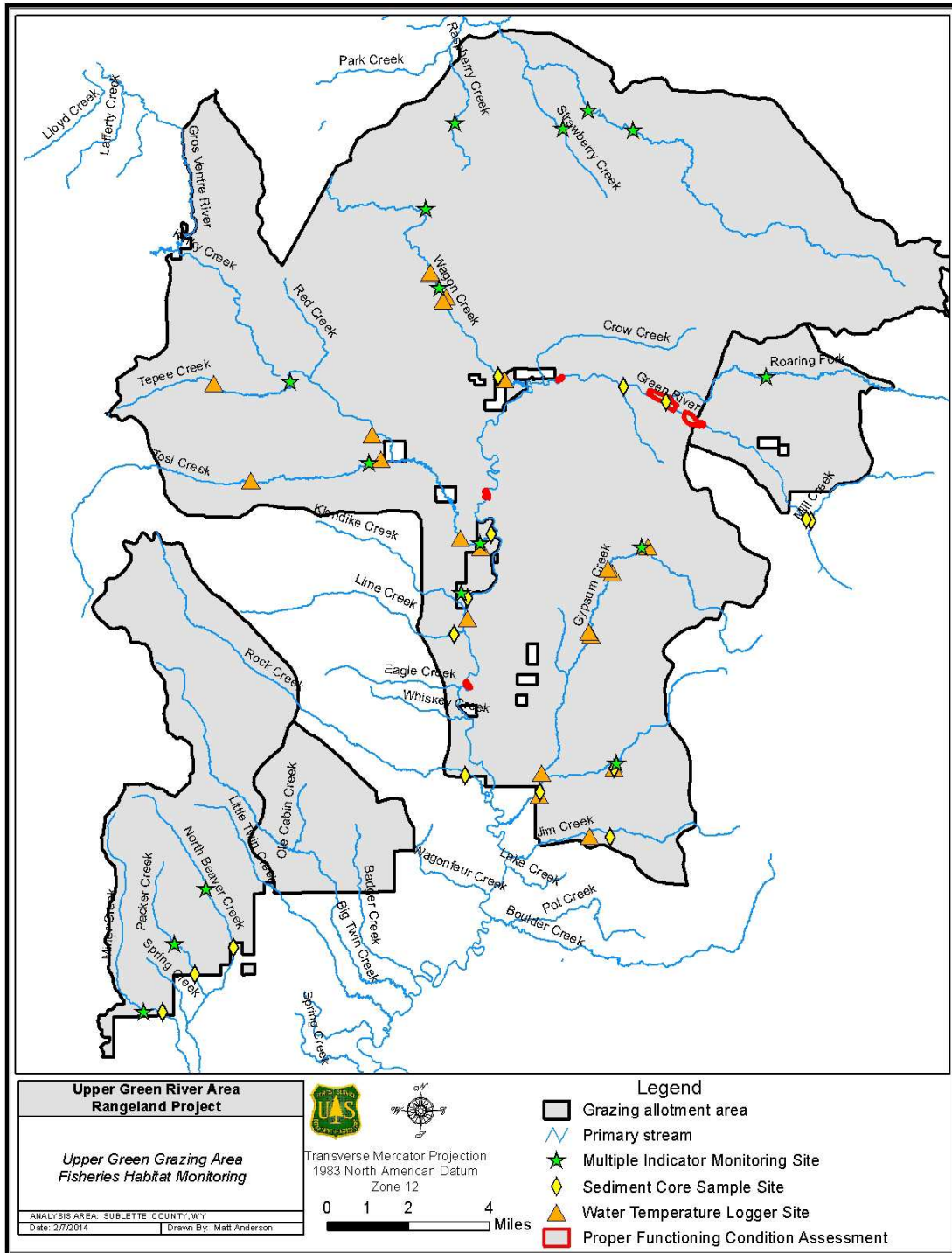


Figure 4 – Fisheries habitat monitoring locations for MIM sites, sediment core sample sites, water temperature logger sites, and proper functioning conditions assessment locations.

Bank Stability

Streambank condition is a good indicator of the health of a stream channel and fish habitat and can be affected by overgrazing or grazing during seasons in which banks are more susceptible to damage. Streambank instability can be initiated by natural events (extreme floods, wildfires, mass wasting) or human disturbances (improper livestock grazing, logging, roads, urban developments, etc.) that change discharge, sediment load, and channel stability. Bank material and vegetation type and density also affect the stability of streambanks (Platts 1989). Unstable streambanks can lead to accelerated bank erosion and subsequent channel widening, increased sediment supply, and decreased sediment transport capability, which has the effect of reducing stream depths, interstitial gravel spaces, and pool volumes (Platts 1991). Eroding streambanks support little or no riparian vegetation, resulting in a reduction of stream shading, bank undercut, and terrestrial insect drop in to the stream. Such degraded riparian and channel conditions can affect fish by increasing summer stream temperatures, reducing winter temperatures resulting in anchor ice, reducing cover through lack of undercut banks or overhead vegetation, and decreasing terrestrial and aquatic fish food items (Platts 1991).

Bank stability is high throughout most of the project area (WHAM surveys, MIM key sites); however, there are areas within the project area that bank stability is not meeting objectives. Many of the streams in the project area are steep gradient (>4%) with forested or well-developed willow riparian communities and are not highly susceptible to bank erosion. As a result, more intensive survey efforts were focused on lower gradient streams in open valleys that were more susceptible to grazing impacts. Bank stability was monitored at 16 sites across the project area (see Figure 4). The sites were selected by the IDT either because the site was an area of known concern (focus area) or as an area that would be sensitive to management that was representative of other sensitive stream and riparian areas in the allotment (key area).

Lower than desired bank stability were observed at the South Gypsum Creek and Tosi Creek in 2009 and Raspberry Creek in 2012. Bank stability on South Gypsum Creek and Raspberry Creek were within the reported confidence interval (see Burton et al. 2011) of the desired condition (desired bank stability conditions by stream type is shown in the monitoring recommendations of this report).

Table 3 – Bank alteration and stability at MIM sites in key areas.

Site #	Site Name	Alteration		Stability	
		2009	2012	2009	2012
3	Gypsum Cr	15	No Data	85	No Data
4	South Gypsum Cr	7	14	59	73
6	Miner Cr	5	0	91	99
7	North Beaver Cr	4	7	89	93
8	Packer Cr	6	0	85	81
9	Raspberry Cr	22	8	86	71

11	Roaring Fork	3	0	79	98
14	Tosi Cr (2)	11	7	65	85
16	Wagon Cr (2)	20	0	76	100

Table 4 – Bank alteration and stability at MIM sites in focus areas.

Site #	Site Name	Alteration		Stability	
		2009	2012	2009	2012
1	Fish Cr (1)	14	41	70	46
2	Fish Cr (2)	26	5	59	76
5	Klondike Cr	13	26	71	48
10	Strawberry Cr	12	10	80	48
12	Tepee Cr	25	37	40	40
13	Tosi Cr (1)*	34	20	34	71
15	Wagon Cr (1)	9	32	80	75

* A different reach of Tosi Creek was monitored in 2009 and 2012.

Fine Sediment

Fine sediment deposition in streams can adversely affect fish and fish habitat, particularly for salmonids, by reducing the quantity and/or quality of spawning habitat, reducing food supply by impacting invertebrate habitat, reducing interstitial habitat, thereby decreasing egg-to-fry survival, and reducing pool quality and quantity (Irving and Bjornn 1984). Livestock grazing can influence fine sediment in streams by reducing vegetation cover in the upland or riparian areas and reducing bank stability through altering riparian vegetation or physical bank trampling (Clary and Webster 1989).

Sediment samples were collected from riffles near the mouth of the stream or near the Forest boundary on sixteen streams in the Upper Green (see Figure 4). Samples were collected using the barrel sampler method. However, because the samples are not connected to known spawning habitats for salmonids, no inference from these samples to the quality of the actual utilized spawning habitat is possible. For more information on collecting representative sediment sample information see Bunte and Abt (2001). At this point the data from each stream are a single measurement in time, so no trend information is available.

Table 5. Estimated percent fine sediment (<6.3mm) in stream sediment core samples. Streams with cutthroat trout present are in bold.

Stream	Sample Year	Est. Percent fine <6.3 mm
Gypsum Cr	2009	38
Wagon Cr	2009	23
Mill Cr	2009	20
South Gypsum Cr	2009	54
Jim Cr	2009	31

Lime Cr	2009	22
Rock Cr	2009	17
Klondike Cr	2009	19
Tosi Cr	2009	50
Green R	2009	17
Moose Cr	2009	52
Roaring Fork	2009	30
Packer Cr	2008	6
Miner Cr	2008	15
Rock Cr	2009	17
North Beaver Cr	2008	19

Stream Temperature

Summer water temperatures are critical to cutthroat trout, which prefer water temperatures of 55°F (13°C) and do best when water remains continuously below 68°F (20°C) (Bear *et al.* 2007, Johnston and Rahel 2004). High water temperatures can negatively affect cutthroat trout growth and fitness and alter inter-specific competitive interactions. Cutthroat can suffer mortality when continuously exposed to high stream temperatures. Experimental studies have found that Bonneville cutthroat suffered 50% mortality under 7-day continuous exposure to 24.2°C (Johnston and Rahel 2004), and westslope cutthroat had 50% mortality following a 60-day exposure of 19.2°C (Bear *et al.* 2007). Stream temperatures have been found to be a major factor limiting the distribution of cutthroat trout populations in the intermountain west (Sloat *et al.* 2005, Hirsch 2005). Cutthroat trout have lower optimal growth temperatures and temperature tolerance limits than brook trout, brown trout, and rainbow trout and have been observed to have a competitive disadvantage at warm temperatures (Bear 2007, Staso and Rahel 1994). Survival of cutthroat trout through the winter season is related to the thermal conditions in the summer season. Juvenile cutthroat must have adequate thermal conditions during the summer to build sufficient energy reserves to survive cold (<4°C) winter conditions (Coleman and Fausch 2007).

Continuous temperature monitoring units were deployed on Gypsum, South Fork Gypsum, and Jim creeks in 2002, on Gypsum, Clear, Tosi, and Wagon creeks in 2003, and on Tosi, Tepee, Gypsum, and Wagon creeks in 2013 (Table 2, Figure 4). Gypsum, South Fork Gypsum, Jim, and Clear Creeks had peak mean weekly maximum temperatures (MWMT) near or below the desired maximum temperature of 68°F and exhibited few to no days of a 3 hour period over 68°F. The two sites on Wagon Creek, however, had numerous days over 68°F, and both sites had warmer than desired MWMT. In 2003, Tosi Creek also a MWMT exceeding 68°F and had 10 days over the course of the summer with a 3 hour period over 68°F. In 2013, Tosi Creek temperatures were generally cool, although the lowest site was not revisited.

Table 6. Stream temperatures recorded on streams in the analysis area using continuous temperature loggers.

Stream	Elevation (ft)	2002		2003		2013		2014	
		MWMT	Days 3hrs >68°F	MWMT	Days 3hrs >68°F	MWMT	Days 3hrs >68°F	MWMT	Days 3hrs >68°F
Tosi Cr	8439	-	-	-	-	60.8	0	57.3	0
Tosi Cr	8023	-	-	-	-	64.5	0	60.3	0
Tosi Cr	7869	-	-	-	-	66.5	0	61.3	0
Tosi Cr	7783	-	-	70.7	10	-	-	-	-
Tepee Cr	8964	-	-	-	-	70.0*	10*	63.1	0
Tepee Cr	8699	-	-	-	-	-	-	70.2	6
Tepee Cr	8151	-	-	-	-	60.1	0	-	-
Gypsum Cr	8905	-	-	67.8	4	-	-	-	-
Gypsum Cr	8718	62.2	0	67.5	1	62.8	0	-	-
Gypsum Cr	8492	68.4	2	-	-	67.8	2	-	-
Gypsum Cr	7875	-	-	-	-	67.2	0	-	-
Gypsum Cr	7741	66.6	0	69.3	0	-	-	-	-
Wagon Cr	7849	-	-	-	-	71.8	15	-	-
Wagon Cr	8633	-	-	73.2	34	73.9	22	-	-
Wagon Cr	8692	-	-	72.3	14	71	11	-	-
SF Gypsum Cr	8646	58.5	0	58.8	1	-	-	-	-
Jim Cr	8384	59.7	0	-	-	-	-	-	-
Klondike Cr	7964	-	-	-	-	-	-	53.1	0
Rock Cr	8223	-	-	-	-	-	-	53.9	0
Strawberry Cr	8558	-	-	-	-	-	-	61.2	0
SF Fish Cr	8558	-	-	-	-	-	-	66.4	0

*Unit was inundated by a beaver pond, which caused poor mixing conditions, and likely poorly represented the stream temperature.

Fisheries Existing Condition for each Allotment

Badger Creek Allotment

Streams within Badger Creek Allotment include the lower reaches of Big Twin Creek, Ole Cabin Creek (a tributary to Big Twin), 200 feet of lower Little Twin Creek, and an un-named tributary to Rock Creek in Sawmill Park. Big Twin Creek is the major stream within the allotment (See Appendix A Photo 1).

There are no current populations of native cutthroat trout in the streams in the Badger Creek allotment. Most of the streams in the allotment provide brook trout fishery, but there has not been recent monitoring to determine the fisheries population density in this area.

A 1989 stream survey of Big Twin Creek identified sensitive stream channel and high rate of bank failure from the confluence with Ole Cabin Creek downstream for ½ mile and from the allotment boundary downstream ½ mile. Although much of the bank failure was from natural causes (i.e. channel meander cutting through old beaver pond deposits), a management recommendation to minimize disturbance to stream banks was included in the survey report. All the streams within this allotment were resurveyed during the summer of 2009. During those surveys, beaver ponds were present where expected throughout the drainages, which contributed to the stability of the riparian area. Overall, the 2009 surveys indicated high stream and riparian function and good bank stability.

Beaver-Twin Creeks Allotment

The Beaver-Twin Creeks allotment includes portions of Rock, Miner, Packer, North Beaver, Little Twin, and Big Twin Creeks (See Appendix A Photos 2-4). The only stream within the allotment that contains Colorado River cutthroat trout (CRCT) is Rock Creek. This population is being invaded by Brook Trout, which has led to reduced cutthroat densities despite efforts to actively remove brook trout from the stream from 2011 through 2013. Colorado River cutthroat trout were introduced in Miner Creek in 1982 and observed during a 1989 stream inventory. Subsequent fish sampling in mid-1990's by WGFD resulted in no recaptures nor were any CRCT captured during a fish population estimate conducted by the USFS in 2008. Brook trout were the only fish species present. Brook trout fisheries are also found in Packer, North Beaver, Little Twin, and Big Twin creeks as well as in Waterdog Lake.

Habitat inventory (GAWS surveys) conducted on Rock Creek in 1989 indicated fish habitat was in good to excellent condition, but noted some bank slumping in reach 5, which is located at the lower end of the allotment. The WHAM surveys resulted in condition class I rating for the entire stream system. The prior survey's reach 5 area appeared to have stabilized due to increased beaver dams.

Miner Creek habitat was surveyed with the GAWS survey protocol in 1989 and the WHAM protocol in 2008. The upper section of Miner Creek was found to have high fine sediment composition and low fish habitat condition in 1989 and mostly ranked as riparian condition class II because of the undeveloped riparian area. This is an area that holds snow through much of the year, so riparian vegetation growing conditions are less than ideal. Grazing, of both livestock and wildlife, were indicated as potential contributors to the riparian condition. MIM surveys on Miner Creek in 2009 and 2012 indicated low bank alteration and high bank stability (see Table 3).

Packer Creek stream assessment report, from 1989, indicates two channel segments that were in poor condition with low bank stability and high percentage of fines in stream

bottom gravels. In both cases, there is evidence of breached beaver dams that can cause instability. Such low-gradient areas are susceptible to grazing impacts, particularly when beaver dams are washed out. WHAM surveys indicated condition class I in the lower reach and class II in the upper reach. The lack of riparian vegetation appears to be primarily due to narrow valley bottoms and rocky, well-drained soils. MIM surveys in 2009 and 2012 indicated that over 80% bank stability and low bank alteration (See Table 3).

The 1989 North Beaver Creek stream assessment report indicated that fish habitat condition was good, except for the first reach upstream of the Forest Boundary. However, this reach was described as having high bank stability. MIM surveys in 2009 and 2012 (see Table 4) recorded stable banks with less than low bank alteration.

The 1989 Little Twin Creek stream assessment report indicated that the majority of the habitat condition was in a good to excellent condition. However, there were two areas of concern, both were sensitive reaches that had high erosion potential, but were functioning near the expected natural condition. Recreation and livestock trail crossings were identified as areas of management concern. These locations were re-visited in 2013 and were determined to have very limited impact to the stream conditions.

In 1989, Big Twin Creek had sensitive stream channels and high rate of bank failure observed from the southern allotment boundary through Twin Creek Basin upstream to trail crossing (Figure 3). Although much of the bank failure was from natural causes (i.e. channel meander cutting through old beaver pond deposits), a management recommendation to minimize disturbance to stream banks was included in the survey report. WHAM surveys conducted on Big Twin Creek was surveyed during the summer of 2009 found beaver ponds present throughout the drainage within the allotment, which had increased stability of the riparian area. There are heavily used game and livestock trails crossing the larger streams; these were the primarily sediment contributors on Big Twin Creek.

Noble Pastures Allotment

The Noble Pastures contain about 1 mile of Tosi Creek and ½ mile of Klondike Creek just before they flow into the Green River. Both Tosi Creek and Klondike Creek within the allotment are low gradient, meandering channels that are sensitive to management impacts. In addition, the allotment is adjacent to the Green River. There is fencing in pastures 2 and 4 that prevent livestock access to the Green river and vegetation excludes most access to the river in pastures 1 and 3. Stream diversions are located on both streams just before they enter Noble Pastures, which are used to flood irrigate the pastures in the allotment.

Fish surveys found brook, brown, and rainbow trout all present in the lower reach of Tosi Creek. Colorado River cutthroat trout were found in Tepee Creek, which is a tributary to Tosi Creek, but were not found lower in the stream (Gardiner and Rhea 2010). Klondike

Creek was surveyed for fish populations, but no depletion estimates were conducted on the Noble Pastures allotment. CRCT were found upstream of the allotment, isolated from the downstream reaches by a large beaver complex, and brook and rainbow trout were found in the Noble Pastures stream reach. Additional electrofishing sampling was conducted in the irrigation ditches that come off both Tosi and Klondike Creeks, and brook trout and mottled sculpin were found in ditches connected to both streams.

A fenced enclosure was constructed on Klondike Creek in 1985, which resulted in improvements in the channel and riparian condition; however, the fence received little to no maintenance from 2004-2008, and the wire was removed in 2008. The stream channel currently meanders through a wet sedge dominated meadow without willows (see Appendix A Photo 7). The livestock crossing near the edge of the enclosure is overwidened and is a source of sediment (see Appendix A Photos 5-6). Bank stability measurements taken in 2009 and 2012 (see Table 4) indicate that the reach is still below the target bank stability for the stream type. MIM monitoring in 2012 indicated an increase in bank alteration and a decline in bank stability; which indicates that the stability of the banks in this reach may be sensitive to current year alteration. This stream reach currently lacks a willow component, which would be expected as a natural component of the riparian vegetation community.

The segment of Tosi Creek within the Noble Pastures allotment includes an alluvial fan and a low gradient reach that meanders through the Green River floodplain (see Appendix A Photo 8). The upstream end of the pasture tends to be an incised channel with long, eroding cutbanks. As you move downstream toward the Green River, the riparian area becomes more dominated by willow, beaver dams are more prevalent, and livestock impacts are less apparent. MIM surveys were conducted on one reach on Tosi Creek in 2009 but that reach could not be repeated in 2012 because of beaver dam inundation of the site; therefore a second reach just downstream was surveyed. On Tosi Creek, the 2009 survey found 34% bank stability and 34% banks alteration, and the site surveyed in 2012 had 71% bank stability and 20% bank alteration.

Roaring Fork Allotment

The Roaring Fork allotment contains the Roaring Fork River and approximately 3 miles of the Upper Green River (see Appendix A Photo 10). R1/R4 Habitat Surveys were conducted on the Roaring Fork in 2001. Brook and rainbow trout were observed in Roaring Fork during the habitat survey. The survey indicated overall good fish habitat and strong fish populations; however, some grazing impacts were also noted. Areas with cattle grazing impacts include the Roaring Fork Basin and Roaring Fork at the western allotment boundary. Both areas were reported to have trailing in the riparian area that had resulted in some bank sloughing.

The 2009 WHAM survey indicated the Roaring Fork was in good shape with good fish habitat. Permittees are no longer salting the cows in the Roaring Fork Basin. As a result, there has been less cattle impact on the stream compared to the 2001 survey. Fish were noted throughout the drainage with the species being primarily brook trout within the

allotment and cutthroat above a waterfall barrier above the allotment. In 2013, crews conducted presence surveys up to river mile 7 and confirmed that brook trout were the dominant species through the allotment. No cutthroat trout were observed. MIM surveys at a key site in 2009 found bank stability at 79% with less than 5% bank alteration and in 2012 determined 98% bank stability and 11% alteration.

Upper Green River Allotment

The Upper Green River Allotment is a combination of four units each with their own pasture rotation system and timing. These four units are named Gypsum Creek, Mud Lake-Fish Creek, Mosquito Lake, and Tosi-Tepee.

Gypsum Creek Unit

There are two pastures within the Gypsum Creek Unit, Gypsum Creek Upper Pasture and Gypsum Creek Lower Pasture. This unit is managed as a deferred rotation. Grazing order is alternated between the two pastures each year.

Gypsum Creek Upper Pasture

Streams within Gypsum Creek Upper Pasture include the east bank of the Green River, Moose Creek, and upper Gypsum Creek (see Appendix A Photo 11). Upper Gypsum Creek has a small population of Colorado River cutthroat trout; however, this population is supported by stocking efforts and is under heavy competition pressure from invading brook trout. Both of these streams are mostly comprised of higher gradient channels (>2%) that are dominated by cobble and boulder channels. There is little evidence of grazing along the Green River in this pasture. The existing condition of the Green River is discussed in detail under the River Bottom Pasture below.

WHAM surveys conducted in 2009 on Gypsum Creek and Moose Creek found generally high bank stability and functioning, well-vegetated riparian areas on both streams. A MIM survey site on Gypsum Creek in 2009 found bank stability at 85% and bank alteration at 15%. The site was inundated by a beaver pond in 2012, so the MIM survey was not repeated.

Three Proper Function Condition surveys conducted on the Green River within this allotment. Two of these sites were rated as Proper Functioning Condition and one was rated as functioning at risk. The site that rated Functioning at Risk is located adjacent to the elk feed ground near the confluence of the Green River and the Roaring Fork. This location had willows that were highly suppressed and had hummocked soils. Another site a short distance upstream had notably less grazing but some impacts were still apparent. These two upper sites had a combination of impacts from domestic livestock grazing and wildlife grazing.

Gypsum Creek Lower Pasture

Streams within the Lower Pasture include the lower section of Gypsum Creek, South Fork Gypsum Creek, Jim Creek, and about 1 mile along the east side of the Green River (see Appendix A Photos 12-14). The lower segment of Gypsum Creek was identified as a stream with a conservation population of CRCT in 2005 but the length of stream occupied by that population has been revised to a short reach in the upper pasture based on surveys (Rhea and Gardiner 2009). South Gypsum Creek is a brook trout dominated fishery. Jim Creek was also identified as having a CRCT conservation population, but this population was revised to a short reach in the headwaters based on 2012 fish surveys. Additional survey work in 2013 indicates that this CRCT population has effectively been eliminated and replaced by brook trout.

Fire has played a major role in the existing condition of South Gypsum and Jim creeks. Much of the upper South Gypsum Creek watershed burned in 2007, including segments of the riparian area (Figure 12). Post-fire effects include increased erosion and sedimentation of streams and increased peak flows. WHAM surveys conducted in 2008 found that the riparian was recovering well. MIM surveys on the South Fork of Gypsum Creek in 2009 recorded bank stability of 59% and 7% bank alteration. When the survey was repeated in 2012, bank stability had improved to 73% and bank alteration was 14%. This indicates that the stream is recovering from fire impacts.

The Jim Creek Fire of 2006 burned much of the headwaters of Jim Creek. Although much of the riparian area remained unburned, changes in the watershed vegetation caused altered stream hydrology and lead to some stream instability. The WHAM survey found the upper reach to be condition class II, primarily due to reduced bank stability. This is likely the result of post-fire effects. There is little capable cattle grazing in this segment, and little grazing impacts have been detected.

Mud Lake-Fish Creek Unit

The three pastures within this unit include Mud Lake East, Mud Lake West, and Fish Creek. The pasture is managed as a deferred rotation pasture.

Mud Lake West Pasture

The Mud Lake West pasture has a segment of Crow Creek, a major tributary to Wagon Creek, and a small segment of the mainstem of Wagon Creek. WHAM surveys conducted on this segment of Crow Creek and on the Wagon Creek tributary indicate that grazing impacts are present, but that the stream and riparian area are in relatively good shape in both cases. A segment of Wagon Creek in this pasture experiences heavy trailing and there are obvious, but localized, livestock impacts to the stream (see Appendix A Photo 15).

Mud Lake East Pasture

Streams within Mud Lake East include the north bank of the Green River, lower Roaring Fork, and Crow Creek. WHAM surveys conducted in 2009 found Crow Creek to have acceptable bank stability and riparian vegetation. At the lower end of Crow Creek, the

fence dividing Mud Lake East and Mud Lake West pastures runs right along the stream. There is an area, about 10 acres and 0.2 miles of stream, with heavy livestock impacts to the stream and riparian area, including low ground cover, pedestalled willows, and low bank stability (see Appendix A Photo 16). The lower segment of Roaring Fork was determined to have a riparian condition class II. This segment of stream has areas with unstable banks and trailing through the riparian area (see Appendix A Photo 9). The impacts to the stream in this area are both from summer livestock grazing and winter grazing of elk and moose. The mouth of Roaring Fork is very near the Upper Green River elk feedground, which supports approximately 500 elk for 118 days a year (USFS 2008).

Fish Creek Pasture

The Fish Creek pasture contains South Fork Fish, Raspberry, and Strawberry Creeks (see Appendix A Photos 17-19). These streams are tributaries to the Gros Ventre River, and the native trout are Yellowstone cutthroat trout. South Fork Fish Creek contains both native cutthroat trout and non-native brook trout. Raspberry Creek was found to have almost exclusively cutthroat trout. Strawberry Creek was almost exclusively cutthroat trout. Fish densities are high in each of these streams.

WHAM surveys were conducted on SF Fish Creek and Raspberry Creek in 2013 indicated broadly functioning riparian areas with light grazing impacts except with some localized areas of discernable cattle impacts. Generally, these streams had low bank erosion except the lower reaches of SF Fish Creek, which is out of the Upper Green Grazing Area. Where bank erosion was high, surveyors attributed the cause to be natural conditions.

MIM surveys were conducted in 2009 and 2012 at two locations on SF Fish Creek and one location on both Raspberry and Strawberry Creeks. The SF Fish Creek #1 site is a focus area, while each of the other three MIM sites were originally identified as key sites, believed to be representative of stream conditions across the grazing Unit. At the SF Fish Creek #1, the focus area, bank stability dropped with a corresponding increase in alteration from 2009 to 2012, which indicates that the site is sensitive to alteration. At the key sites, stability met objective at Strawberry and Raspberry creek sites in 2009, but was slightly below objective at the SF Fish Creek #2 site. In 2012, bank stability of both Strawberry and Raspberry Creek went down and SF Fish Creek #2 went up. The 2012 bank stability of Strawberry Creek was quite low (48%), but after additional field visits, this appears to be localized impacts that are not truly indicative of drastic or broadly deteriorating riparian conditions in the unit. Following discussions with the permittees and FS staff regarding that fact that this was a trailing area for livestock, which did not meet the MIM protocol for a key site, we determined that this would be treated as a critical DMA, not representative of the grazing unit as a whole; however, close monitoring of future grazing impacts on riparian conditions in this unit is warranted.

Wyoming DEQ assessed water quality conditions on the South Fork Fish Creek in the reach within the project area. The assessment determined that all water quality standards were attained within the entire assessment area except for E. Coli, which had insufficient data to be properly assessed (Wyoming Dept. of Environmental Quality 2014).

Mosquito Lake Unit

There are 4 pastures within this unit, Mosquito Lake SE, Mosquito Lake SW, Mosquito Lake NW, and Mosquito Lake NE.

Mosquito SE, SW, NE, & NW Pastures

The main stream within the Mosquito Pastures is Wagon Creek (see Appendix A Photo 20-21). Because this is the only major stream in the Unit, all pastures will be addressed together. Wagon Creek fishery is dominated by Brook Trout, and they occur in high abundance.

WHAM surveys on Wagon Creek were conducted in 2001. Habitat conditions reported during the surveys indicated generally high bank stability and well-vegetated riparian corridors with localized areas of grazing impacts. Similarly, MIM surveys conducted on two Wagon Creek sites in 2009 found bank stability ranging from 75-100% and bank alteration ranging from 0 to 32%. The bank stability is considered to be acceptable but some readings were near the threshold of concern.

The Wagon Creek Focus Area has been partially excluded from livestock access with electric fence since 2004 (Figures 20a and b). The exclusion reach has shown improvement in riparian vegetation establishment and bank stability over that time, but the reach is not fully recovered. An adjacent area, which is a road and livestock crossing, is still poorly vegetated and contributes some sediment to the stream.

Wagon Creek stream temperature monitoring has indicated that summer stream temperatures are above desired conditions for cold water fisheries. Continuous temperature loggers deployed in 2003 and in 2013 indicated that summer stream temperatures are warmer than desired coming into the Focus Area, increase further within the Focus Area, and then cool slightly from that point to an area near the mouth of the stream (see Table 6). The high stream temperatures are potentially a concern for Wagon Creek. The Wagon Creek exclosure provides some insight into the natural functioning condition of this system. The vegetation recovery in this reach has resulted in a healthy sedge community, but there has not been willow recruitment. Because willow communities are abundant just upstream of the exclosure, the 10 years of recovery would likely have been sufficient to allow some recovery of willows if they were a natural part of the potential riparian community in this segment. This is unsurprising since willow are often unable to colonize riparian areas of stream reaches with very low gradient (<0.5%) and stable water table elevations. Before and after monitoring of temperatures above and below the exclosure reach found MWMT increase of 0.9°F prior to the exclosure and 2.9°F after 10 years of exclosure recovery. While inconclusive, this small-

scale experiment does suggest that the riparian recovery in this type of system may do little to moderate stream temperatures. Despite the warm stream temperatures, the brook trout fishery in this stream is highly productive, which indicates that the current temperature regime is not in conflict with the primary beneficial use of supporting a cold-water fishery.

Tosi-Tepee Unit

There are four pastures within this unit, including Tosi Creek Pasture, Upper Tepee Creek Pasture, Lower Tepee Creek Pasture, and Kinky Creek. Major fish-bearing streams in this Unit include Tosi, Tepee, and Kinky creeks.

Lower Tosi Pasture

The major stream within this pasture is Tosi Creek. Within this pasture, Tosi Creek is a broad, willow-dominated riparian area with a low gradient stream. Tosi Creek is a brook trout dominated fishery with an average density of 945 trout per mile (Rhea and Gardiner 2011). WHAM surveys conducted in 2009 found the stream and riparian area to match the criteria for Riparian Condition Class I. A MIM survey in this pasture found the bank stability to be 65% in 2009 and 85% in 2012.

Upper Tepee-Tosi Pasture

Upper Tosi and Tepee Creeks are found within this pasture. Much of upper Tosi Creek is similar to the lower section with a wide, willow-dominated valley, but there is also a section of high-gradient stream with a relatively narrow valley and a forested riparian area. There is a natural fish barrier, but brook trout have been introduced upstream of the barrier and are found in high density above the barrier as well. Upper Tepee Creek contains a conservation population of CRCT (Hirsch et al. 2006). Rhea and Gardiner (2011) discuss the results of fishery monitoring in Tepee Creek:

Tepee Creek has been the subject of more intense electrofishing surveys in the past, with as many as four separate stations routinely monitored throughout the drainage. As recently as 2001, CRCT were collected from sites located throughout the drainage, however, in 2010, CRCT were restricted to the upper ½ of the drainage, a segment approximately 7.5 miles long. Brook trout densities within the drainage have remained similar, though estimates in 2010 were towards the lower end of the range collected in 2001. The composition of BKT/CRCT has remained relatively unchanged in areas of sympatry.

The segment of Tosi Creek and much of the segment of Tepee Creek, including two tributaries, within this pasture rated as a riparian condition class I. A portion of Tepee Creek (<0.2 mi) within this pasture had a riparian condition class III rating. In part, this low condition class rating is because the reach is part of the same reach in the highly impacted stream segment in Lower Tepee Pasture; however, even within this upper pasture, there are some areas of heavy livestock trailing through the riparian area and stream.

Lower Tepee Pasture

The Lower Tepee Pasture contains the downstream segment of Tepee Creek and the upper reaches of Kinky Creek. As discussed in the Upper Tepee-Tosi Pasture description, Tepee Creek is an important stream for Cutthroat Trout. This upper segment of Kinky Creek is a small stream, which does not have a cutthroat trout population.

Tepee Creek within this pasture has a low-gradient segment from the upstream end of the pasture to a distinct gradient break approximately 1.2 miles downstream. Downstream of this point, the stream becomes steeper and less vulnerable to management impacts, but few areas are completely impervious. WHAM surveys identified Tepee Creek to have a reaches of riparian condition class I, II, and III. The condition class III segment has been identified in the document as a Focus Area.

The Tepee Creek Focus Area has been identified as a location that is not meeting the Forest Plan bank stability guideline. According to photo monitoring that has been occurring over the past 30 years, there is an apparent upward trend in riparian vegetation condition (see Appendix A photos 22a & b). The site has been subject to numerous past management effects including logging in the watershed that resulted in heavy erosion, past herbicide treatments that reduced sage brush and willows, heavy grazing, placement of logs in the stream for fish habitat, and the replacement of an undersized culvert with a bridge. As a result of these past management activities, the riparian and stream processes have been altered and the stream has become badly incised. Over the past decade, the stream has been managed with a 6-inch minimum greenline stubble height, achieved by increased effort to push cattle into the uplands and shorter grazing periods in the pasture, to promote riparian recovery. The combination of improved grazing practices and the natural evolution of the channel, as the stream redevelops a meander pattern and a new, lower floodplain, has resulted in an apparent improving trend in riparian vegetation based on photo monitoring. Two MIM bank stability surveys, one in 2009 and one in 2012, indicate that the bank stability is either not improving or that the improvement is quite slow. This reach of Tepee Creek is a low-gradient, meandering stream with fine substrate in the bed and banks; a type of stream that characteristically has slow recovery from disturbance.

Kinky Creek Pasture

Kinky Creek is the main stream within this pasture though the western edge of the pasture borders the Gros Ventre River. This pasture has not been grazed since the 1990's except by horses near the Darwin Ranch. Where season-long grazing has been allowed by these horses, there are heavily impacted areas on Kinky Creek, near the mouth of the stream and on the Gros Ventre River. Most of Kinky Creek is fishless due to two sets of waterfalls only several hundred yards above its confluence. There is a core conservation population of YCT in the Gros Ventre (May et al. 2003).

Wagon Creek Allotment

Streams within Wagon Creek Allotment include the lower reaches of Wagon Creek and the Green River. This allotment is managed in conjunction with two private parcels of

land bordering the allotment on the east and west, effectively creating a rotational pasture grazing system. A 2001 stream survey of Wagon Creek identified sensitive stream channel segments from the confluence with the Green River to the northern allotment boundary. Although this portion of Wagon Creek showed signs of grazing and some stream bank trampling; present channel disturbance from livestock was within acceptable levels to prevent aquatic habitat degradation. WHAM surveys in 2009 surveys indicated influence from past and present beaver activity and a riparian area with a healthy willow component. The riparian is intact and functioning in the lower reaches of Wagon Creek.

River Bottom Pasture

The Upper Green, Roaring Fork, and Noble Pastures allotments share a common driveway along the Green River for moving livestock to and from the various allotments and pasture units. During the spring, cattle move through the driveway relatively quickly, with little time allowed for grazing. In the fall, cattle are allowed to drift, spending additional time within the driveway grazing. Because of the dispersed grazing in this area, we have considered this a separate pasture for analysis. Streams within the River Bottom Pasture include the Green River and portions of Rock, Lime, Whiskey, Klondike, and Tosi creeks and Kendall Warm Springs.

Grazing and livestock trailing impacts are observed in this pasture. Generally the impacts are highest adjacent to roads and attenuate with distance from the primary roadways. There are large areas within this designated pasture that are grazed very rarely and lightly. Livestock trails and watering areas are observed on many of the streams immediately adjacent to the road.

Approximately 160 acres around the Kendall Warm Springs have been fenced since 1969 to exclude livestock. Since the original construction of the fence, the enclosure has functioned at times, while maintenance has lapsed allowing grazing at times. Livestock have been excluded fairly effectively from the springs since 2004.

In order to analyze the potential effects of grazing on the Green River and its riparian area, five Proper Functioning Condition (PFC) assessments were conducted on the Green River (see Figure 4). Four of those locations were rated as Proper Functioning Condition and one was rated as Functioning at Risk. The two sites that are located within the River Bottom Pasture were determined to be Proper Functioning Condition and showed little to no impacts from livestock grazing.

C. Management Framework

The **Biological Assessment** (BA) is a requirement of the Endangered Species Act (50 CFR 402.02) to determine the impact to federally listed species and designated critical

habitat from the proposed project. Kendall Warm Springs dace is the only designated endangered fish species on the Forest.

Sensitive species are managed under the authority of the National Forest Management Act (PL 94-588). The Regional Forester (FSM 2670.5) designates those species for which population viability is a concern as sensitive. A **Biological Evaluation** (BE) is prepared to determine the impact to designated species by the proposed project. A determination is based on significant current or predicted downward trends in: 1) population numbers or density; or 2) habitat capable of supporting viable populations that affects species distribution. CRCT and YCT are designated Forest Service sensitive fish species in the project area.

Management Indicator Species (MIS) are species used to indicate the effects of habitat changes associated with forest management activities. The Bridger-Teton Land and Resource Management Plan (LRMP) has identified CRCT, YCT, RBT, and Bonneville cutthroat trout (BCT) as aquatic indicator species for the forest. MIS in the Upper Green allotments project area include CRCT, YCT, and RBT.

The Bridger-Teton National Forest (BTNF) is participating in a “Conservation Strategy for Colorado River Cutthroat Trout” with the states of Colorado and Utah (CRCT Coordination Team 2006). The strategy was developed to direct implementation of conservation measures for Colorado River cutthroat trout in Colorado, Utah, and Wyoming as a collaborative and cooperative effort among resource agencies.

The BTNF is also participates in a “Conservation Strategy for Yellowstone Cutthroat trout (YCT) with the States of Idaho, Montana, Nevada, Utah, and Wyoming. The goal of the Conservation Strategies is to assure the long-term viability of CRCT and YCT throughout their historic range. Forest Service and WG&FD goals are to maintain genetic integrity of the species and maintain and enhance current populations.

The Bridger-Teton Land and Resource Management Plan provides the following direction for managing fisheries (USDA Forest Service 1990):

- Goal 3.3 - Sensitive species are prevented from becoming a federally listed Threatened species (pg. 118).
- Goal 4.7 – Grazing use of the National Forest sustains or improves overall range, soils, water, wildlife, and recreation values or experiences (pg. 120).
- Kendall Warm Springs Management Standard – The existing population and habitat of the Kendall Warm Springs Dace will be maintained and enhanced (pg. 125)
- Sensitive Species Management Standard – Quantifiable objectives will be developed to identify and improve the status of Sensitive species and eliminate the need for listing (pg 126).
- Fish Habitat Management Guideline – For fish habitat providing a fishery at or near its potential, fish populations should be maintained at existing levels. For

habitat below its potential, habitat should be improved and maintained to at least 90 percent of its natural potential. First priority for improvement should be streams supporting Colorado River and Bonneville cutthroat trout which are sensitive species (pg 126).

- Streambank Stability Guideline – At least 90 percent of the natural bank stability of streams that support a fishery, particularly Threatened, Endangered, and sensitive species, and all trout species, should be maintained. Streambank vegetation should be maintained to 80 percent of its potential natural condition or an HCI rating of 85 or greater (pg. 126).
- Sensitive Cutthroat Trout Habitat Guideline – Habitat occupied by existing and reintroduced populations of Colorado River, Bonneville, and Snake River cutthroat trout should be managed to protect species purity (pg. 126).
- Livestock Grazing of Riparian Areas Standard – Livestock grazing in riparian areas will be managed to protect stream banks. This may be achieved through the use of gravel crossings, tree debris barriers, fencing, riparian pastures, development of alternate watering sites out of the riparian area, longer allotment rests, or improved livestock distribution (pg. 128).
- Threatened, Endangered, and Sensitive Species Standard – Range improvements, management activities, and trailing will be coordinated with and designed to help meet fish and wildlife habitat needs, especially on key habitat areas such as crucial winter range, seasonal calving areas, riparian areas, sage grouse leks, and nesting sites. Special emphasis will be placed on helping to meet the needs of Threatened, Endangered, and Sensitive species (pg. 129).

D. Environmental Consequences

Spatial and Temporal Context for Effects Analysis

The affected environment, also known as the action area, is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action [50 CFR §402.02]. For the purposes of this analysis, the affected environment is defined as all areas that could be authorized for grazing or trailing of livestock, as well as aquatic habitat areas downstream where potential effects could occur. Short-term impacts are those impacts that could recovery to baseline conditions within 1-3 years, examples could include small volume of sediment deposition, reduced stream canopy from browse of annual production, and effects to individual fish. Long-term impacts are those that result in a change of state, which could take from 2-50 years to recover to baseline conditions. Examples of long-term impacts include a change in stream channel form or type, a conversion of vegetation community type, a large-scale sediment deposition event, or a change in trend in fish population.

Methodology

The analysis method utilized to determine potential impact to fish, aquatic invertebrates, and their associated habitat are listed below.

- Determine known and suspected locations of federally listed or proposed aquatic species, designated critical habitat, essential fish habitat, Region 4 Regional Forester's sensitive species, and Bridger-Teton National Forest management indicator species in relation to proposed project activities.
- Assess proposed project activities and determine the aquatic habitat elements potentially impacted and the geographic area where effects could occur (i.e. the affected environment).
- Overlap the species/habitat locations with the affected environment and determine which species/habitat could be affected by project activities.
- When species/habitat overlaps with affected environment predict impacts from proposed project activities to individuals and their associated habitat. This analysis relies upon the Soil Productivity and Water Quality Specialist Reports to determine the potential effects to physical resources (i.e. habitat).
- Potential effects to aquatic fauna and habitat were determined from the following:
 - Direct effects from proposed activities;
 - Potential effects to riparian condition and associated stream channel modifications;
 - Potential reductions in stream shade and subsequent increases in water temperature compared to existing levels;
 - Potential increases in erosion and fine sediment input to streams and wetlands compared to existing levels;
 - Cumulative effects associated with ongoing or proposed projects in the affected environment.
- Where changes to habitat parameters discussed above result from proposed project activities, the potential impacts to aquatic species/habitat were analyzed and then the effects to the biological resource were determined based on professional experience, applicable surveys/studies, and best available science literature/research.

Assumptions associated with the methodology are listed below.

- Aquatic faunal and habitat survey data utilized is the latest available and utilized standard survey protocols. It is assumed that this information is representative of current conditions unless otherwise noted.
- All Best Management Practices (BMP) and Project Design Features (PDF) listed would be fully implemented and effective.
- The areas of impact outlined in the EIS are the actual areas of disturbance.
- Monitoring effectiveness of PDF and compliance would be a component of project implementation.

Incomplete and Unavailable Information

Extensive stream habitat surveys have been completed on streams within the project area; however there are some habitat components that have limited information available. Continuous summer stream temperature data has been collected from some streams, but temperature regimes from other stream are unknown. Even on streams that have some temperature data, the information is not spatially complete. Sediment samples have been collected in some locations, but those samples are not related specifically to key spawning areas for native trout. As a result, there is limited inference that can be drawn from the samples. While an extensive fisheries and fish population has been collected, there are areas of the project that the information is limited and relatively dated. In general, areas with known or suspected cutthroat trout populations, thorough fish surveys have been conducted.

Alternative 1 – No Action

Alternative 1 responds to concerns about the effects of grazing on vegetation, soil, and native wildlife and fish habitats by discontinuing livestock grazing on the allotments. It provides a comparison of the effects of authorizing grazing on all of the allotments with the effects of not authorizing grazing. Forest Service Handbook (FSH 2209.13. Ch. 10, 16.1) directs that a Term Grazing Permit cannot be cancelled without a two-year notification. The Responsible Official has discretion to implement a no grazing decision phased over a longer but specified time frame.

Direct and Indirect Effects

Riparian Condition

Most of the riparian areas in the project area are currently in functioning condition; however, there are some riparian areas, most identified as focus areas, which are not meeting resource objectives. Reaches of condition class II or III in Lime Creek, Tosi Creek, and the upper reaches of Roaring Fork are outside of the grazing allotments, so there would be no effect from any alternative to the conditions of those reaches. Miner Creek, Packer Creek, and North Beaver Creek all have reaches that are in condition class II; however, livestock impacts on the stream are minimal, so the no action alternative would not be expected to cause a change in those condition class ratings. One reach on Tepee Creek classified as condition class III and one condition class II on Tepee Creek and on a tributary to Tepee Creek would like have beneficial effects from the removal of livestock. The tributary reach would likely have a fairly rapid response to the removal of disturbance, but the reaches on Tepee Creek are expected to have a slow recovery (10-50 years) because of the low gradient, fine channel and bank substrate, and channel incision from past impacts. Although this riparian area has experienced an apparent recovery trend over the past three decades with grazing as part of the management, the recovery would likely be accelerated if livestock grazing were removed. The upper reach of Jim Creek, determined to be in riparian condition class II, has little impact from grazing and

would continue to recover from past fire effects at approximately the same rate as the currently observed. The lower reach of Gypsum Creek was also a riparian condition class II. In this case, livestock grazing does impact the riparian condition, but the riparian area and channel are largely intact and a very rapid recovery to desired conditions would be expected under the no grazing alternative. The lowest reach of Roaring Fork rated riparian condition class II. This reach is near the elk feed ground and elk appear to be the primary grazing impact in this reach. The no action alternative could reduce the impact of grazing on this reach, but would be unlikely to change the condition class of the reach.

Bank Stability

The banks along most of the length of streams in the project area are stable or within the natural range of variability; however, there are areas that cattle grazing has contributed to bank instability that is not meeting resource condition objectives (identified as focus areas). Numerous sources in the literature indicate that removing or significantly reducing grazing pressure can lead to a rapid improvement in bank stability where grazing is the primary factor in destabilizing banks (Myers and Swanson 1995, Platt 1991). The no grazing alternative would lead to a quick recovery of bank stability in most stream reaches that are not currently meeting resource objectives. Some streams that have bank stability problems and are seriously incised, such as Tepee Creek in the Lower Tepee Pasture and Tosi Creek in the Noble Pasture 1, will require a long period of time to recover, although the bank stability recovery would likely be fastest under the no grazing alternative.

Fine Sediment

Removing cattle from the project area would result in a reduction of fine sediment entering the streams. Currently, part of the fine sediment entering streams in the project area is generated from the uplands in areas where grazing decreases ground cover (see Soils Specialist Report), from stream banks, due to bank alteration and reduced bank stability (see Water Quality Specialist Report), and from disturbance to stream beds. In many streams, the impacts that cattle have on fine sediment entering streams are minimal, as evident by good ground cover, intact riparian vegetation, high bank stability, and minimal bank alteration; therefore, this alternative would have a limited beneficial effect to the quantity of fine sediment in those streams. Where problems with these parameters exist, many of which have been identified as focus areas, the no action alternative would have a beneficial effect by removing the disturbance to the soil and vegetation.

Stream Temperature

The no action alternative would have some beneficial effects to water temperature conditions for native fish populations. The only streams monitored with any indication of elevated stream temperatures were Wagon Creek, Tosi Creek, Gypsum Creek. Reduced grazing of streamside herbaceous and woody vegetation on these streams would result in a modest increased summer shade to stream channels, which could moderate summer high temperatures. Improved stream channel function and riparian vegetation could play

an important role for native fisheries in buffering the effects of global warming to stream temperature conditions.

Kendall Warm Springs Dace

The current management of the Kendall Warm Springs, the only known habitat of the Kendall Warm Springs dace, allows access to the springs by native ungulates, but excludes access of livestock. Relative population density of the Kendall Warm Springs dace is believed to have declined since monitoring began in 1997, but the population appears to have stabilized since 2007. The cause of the decline is unknown, but a narrowing and deepening of the stream has been noted. These channel changes may be related to effective exclusion of domestic livestock; however, native ungulates can easily pass the fence and still have access to the springs. This alternative would remove livestock grazing broadly, which would effectively maintain the current management of exclusion of livestock from the spring with fencing. As a result, this alternative would be not likely to adversely affect the Kendall Warm Springs dace or their habitat.

Colorado River Cutthroat Trout

Because there would be no physical presence of cattle in the project area under Alternative 1, there would be no direct effects to fish. Scientific literature provides abundant documentation of the positive effects on riparian and stream habitat conditions and trout population responses upon eliminating streamside grazing of domestic livestock (Platts 1981, Li *et al.* 1994, Myers and Swanson 1995). Trout populations have been reported to increase in response to improved stream habitat once livestock grazing is removed. Platts (1981) reported that fish densities were more than ten times higher in lightly grazed or no grazing in comparison to heavily grazed stream sections; however, since none of the stream sections in the project area meet the author's definition of a heavily grazed stream, a smaller response would be expected. It is highly probable that the site specific desired conditions and habitat objectives listed for the project area would be met at most locations within 10 years of implementing Alternative 1. Some stream and riparian conditions, such as the Tepee Creek Focus Area, may have a timeframe for recovery that is longer than 10 years. Therefore, implementation of Alternative 1 would result in improving current habitat conditions for cutthroat trout populations within the analysis area. Improved stream function and riparian condition could help moderate the effects of global warming on stream temperatures.

Cutthroat trout populations within the project area are declining, and the primary factor for that trend is invasion by non-native trout, particularly brook trout (Hirsch *et al.* 2006). Because the invasion of non-native trout is the constraining factor in cutthroat trout distribution and abundance in degraded and highly-functioning habitats alike, the habitat elements that would improve under the no grazing alternative may do little to recover cutthroat trout or affect the current downward trend (Quist and Hubert 2005). Within the project area, CRCT are found in Rock Creek, Klondike Creek, Tepee Creek, Gypsum Creek, and Jim Creek. Currently, there is little effect of livestock grazing on Rock Creek,

so the no action alternative would not affect this CRCT population. Klondike Creek CRCT are isolated from invasion. Lower Klondike Creek is within Noble Pastures and the River Bottom Pasture, but cattle grazing primarily occurs downstream of the CRCT occupied habitat, so the no action alternative would have little effect on this population. Tepee Creek has a conservation population that is invaded by brook trout, and there are current and historic grazing impacts that have impaired fish habitat. The no action alternative would result in an improved rate of recovery for the riparian area and stream habitat conditions for CRCT. Habitat conditions for CRCT in Tepee Creek would improve under this alternative, but the brook trout invasion would continue to cause a decline in the population abundance and distribution of CRCT in Tepee Creek. Gypsum Creek has few CRCT remaining in a brook trout dominated fish community, and those that remain are likely the result of WGFD native cutthroat stocking efforts. The no grazing alternative may improve CRCT habitat, but would not improve the population. The Jim Creek CRCT population has largely been eliminated due to brook trout invasion; current livestock grazing impacts to this stream are minimal, so the no action alternative would not affect this population.

Overall, the no action alternative would benefit CRCT by improving habitat conditions; however, because many of the populations are limited by competitive relationships with introduced trout species, any improvements to habitat would likely have limited benefits to the species' status or distribution (Quist and Hubert 2005).

Yellowstone / Snake River Fine-spotted Cutthroat Trout

As for CRCT, there would be no mechanism for direct affects to YCT in Alternative 1. Fisheries sampling in Fish Creek in September 2012 found a mix of YCT and brook trout. The no action alternative may result in habitat conditions that favor the persistence of YCT. Strawberry Creek has both YCT and brook trout and has been found to have some grazing impacts to riparian conditions. This alternative could have a benefit to the YCT in this stream. A stream reach sampled on Raspberry Creek found only YCT, and the fish density was quite high. Habitat and MIM surveys have indicated light grazing impacts to this stream, but the no action alternative may have some beneficial affect on this stream population. The No Action alternative would have a beneficial impact on YCT.

Rainbow Trout

Within the project area, rainbow trout are found in the Green River and in the lowest segments of some of the tributaries. The reaches of the Green River above the river bend have low natural productivity and very little natural recruitment, so this has historically been maintained with stocking. There is some rainbow trout spawning in the lower reaches of the tributaries to the Green River. The no action alternative may eventually cause a reduced level of fine sediment in these stream segments, which could have a beneficial effect to egg to fry survival of rainbow trout.

Cumulative Effects

Improved habitat conditions for trout species as a result of removing domestic livestock grazing under Alternative 1 would slightly offset other factors negatively impacting the aquatic environment such as road/stream crossings, recreational impacts, timber sales, and fire. The projected time for improved stream habitat conditions could be 3 to 10 years. Increased fish populations may mirror the habitat conditions with a 1 to 3 year delay.

Determination

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

- Goal 3.3 - Sensitive species are prevented from becoming a federally listed Threatened species in Wyoming (pg. 118).

The no action alternative does not contribute to a federal listing for fish species.

- Goal 4.7 – Grazing use of the National Forest sustains or improves overall range, soils, water, wildlife, and recreation values or experiences (pg. 120).

Water and fisheries values and experiences would be enhanced under this alternative.

- Kendall Warm Springs Management Standard – The existing population and habitat of the Kendall Warm Springs dace will be maintained and enhanced (pg. 125)

The no action alternative does prevent potential livestock impacts to the Kendall Warm Springs dace and their habitat, which is ranked a low risk in the draft recovery plan (2012), but it does not contribute to maintaining or enhancing habitat through a potentially needed disturbance of the habitat. Exclusion of livestock is ranked as a medium risk to the population in the draft recovery plan (2012).

- Sensitive Species Management Standard – Quantifiable objectives will be developed to identify and improve the status of Sensitive species and eliminate the need for listing (pg. 126).

The BTNF adopted Sensitive Species Quantifiable Objectives (2013 letter from Clint Kyle to the Forest Leadership Team). The objectives set time frames for developing conservation assessments, identifying the status of the species, and improving the status of the species. Until the conservation assessments are finalized, the best available science regarding the species habitat requirements and the potential risk factors associated with the project will be used to analyze the potential effects of the project on the status and trend of sensitive fish species. Removing livestock grazing from the project area would generally have beneficial effects to fish habitat; therefore, the no action alternative would be consistent with this Forest Plan Standard.

- Fish Habitat Management Guideline – For fish habitat providing a fishery at or near its potential, fish populations should be maintained at existing levels. For habitat below its potential, habitat should be improved and maintained to at least 90 percent of its natural potential. First priority for improvement should be streams supporting Colorado River and Bonneville cutthroat trout which are Sensitive species (pg. 126).

The no action alternative would result in a general benefit to fish habitat and would result in a trend toward all habitats functioning within 90 percent of natural potential; therefore, this alternative is consistent with the guideline.

- Streambank Stability Guideline – At least 90 percent of the natural bank stability of streams that support a fishery, particularly Threatened, Endangered, and Sensitive species, and all trout species, should be maintained. Streambank vegetation should be maintained to 80 percent of its potential natural condition or an HCI rating of 85 or greater (pg. 126).

Removing livestock grazing from the project area would result in the quickest recovery of any of the alternatives of those focus areas that are not currently meeting this guideline.

- Livestock Grazing of Riparian Areas Standard – Livestock grazing in riparian areas will be managed to protect stream banks. This may be achieved through the use of gravel crossings, tree debris barriers, fencing, riparian pastures, development of alternate watering sites out of the riparian area, longer allotment rests, or improved livestock distribution (pg. 128).

The no action alternative would help to protect streambanks by removing livestock grazing impacts to riparian vegetation and reducing bank alteration.

- Threatened, Endangered, and Sensitive Species Standard – Range improvements, management activities, and trailing will be coordinated with and designed to help meet fish and wildlife habitat needs, especially on key habitat areas such as crucial winter range, seasonal calving areas, riparian areas, sage grouse leks, and nesting sites. Special emphasis will be placed on helping to meet the needs of Threatened, Endangered, and Sensitive species (pg. 129).

The no action alternative would be consistent with this standard since removal of livestock grazing would have a broadly beneficial effect on fish habitat.

- Consistency with Desired Future Conditions described in the Forest Plan:
 - Habitat maintained for viable populations of management indicator species (all DFCs)

Under alternative 1, habitat would not limit viable populations of fisheries MIS species.

- Meets State objectives. Provides habitat for populations, harvest levels, success rates, and recreation days (DFC 3, 6, 10, and 12).

Alternative 1 would be consistent with the direction to provide habitat to meet fisheries objectives regarding harvest levels, success rates, and recreation days.

- Habitat will be managed to help meet state wildlife populations, harvest levels, success rates and recreation days and fully meet standards for fish size success rates, and recreation days (2A).

Alternative 1 would be consistent with the direction to provide habitat to meet fisheries objectives regarding populations, harvest levels, success rates, and recreation days in the area of DFC 2A.

- May meet state objectives depending upon the area and recreation emphasis (9A).

Alternative 1 would be consistent with this direction.

Other Relevant Mandatory Disclosures

There are no irreversible or irretrievable effects to fish resources that would result from selecting this alternative.

*The project as described in Alternative 1 – No Action will have No Impact on the Sensitive Colorado River cutthroat trout, although Colorado River cutthroat trout may continue to decline within the project area, the alternative would have No Impact Yellowstone cutthroat trout and rainbow trout; AND is **Not Likely to Adversely Affect or Adversely Modify Proposed Critical Habitat of the Endangered Kendall Warm Springs dace.***

Alternative 2 – Grazing as Currently Permitted/ Current Management

Alternative 2 would continue current permitted grazing management practices (See FEIS Chapter 2 for a full description of the alternative). This means that the Forest would continue to authorize the same maximum livestock numbers, seasons, and grazing systems, and utilization would continue to be capped at 50-60% for uplands and 55-65% for riparian, depending upon the pasture. The environmental consequences of this alternative may result in different conditions compared to the existing conditions. Over the past decade, livestock have not been run in full numbers in all cases, and the utilization has often been below maximum allowable utilization levels (FEIS Chapter 2). While it is likely that utilization would be close to the same level as it has in the recent past, it is important to analyze the potential effects of each alternative assuming maximum utilization and grazing intensity. The grazing authorization would be comprised of six allotments covering approximately 170,641 acres and would permit

9,089 livestock, including 9,042 head of cattle and 47 horses. The total permitted use would be approximately 46,148 animal unit months (AUMs). The permitted core season of use varies by allotment but generally occurs from June 14th to October 15th. Grazing systems would remain the same as currently used, including season-long grazing in the Badger Creek, Beaver-Twin Creeks, and Roaring Fork Allotments.

Direct and Indirect Effects

Livestock grazing would have direct and indirect effects on fisheries within the project area. Direct effects include immediate interaction of livestock with fish. Since livestock enter streams, for drinking, crossing streams in route to other forage, or for a cool place on the landscape, they can be in near-contact with fish. Because they are in streams, livestock could trigger avoidance or flight behavior or impact fish redds where there are temporal and spatial overlap of active redds and livestock utilization. Livestock grazing can also negatively affect fish habitat by altering watershed or riparian conditions. Grazing impacts to streamside vegetation can result in increased summer water temperatures from lack of cover and increased icing during winter months (Platts and Nelson 1989). Widening of stream channels and reduction of bank stability can occur due to bank impacts from physical alteration or reduction of deep-rooted vegetation in the riparian area (Platts 1984). Where grazing reduces vegetation cover and increases runoff and sediment delivery to streams, there will be subsequent changes in stream function and modified fish habitat.

Grazing can be managed to have neutral or beneficial impacts to streams and riparian areas when carefully controlled and managed in accordance with other ecosystem and resource objectives (Leonard 1997). Managing stream and riparian ecosystems, there are key elements that will maintain ecosystem integrity including provide sufficient channel and floodplain roughness to slow velocities, maintain a sediment transport balance, provide sufficient root strength to maintain channel form and bank stability, provide adequate riparian vegetation canopy to shade the stream and support riparian macroinvertebrate communities. While it is possible to achieve these functions while allowing grazing, overgrazing or poor grazing management can have negative effects on stream and riparian ecosystem integrity (Clary and Webster 1989). Poorly managed riparian grazing can also have negative effects on fisheries (Li *et al.* 1994, Knapp and Matthews 1996). The most frequent recommendations for compatible grazing with riparian systems is to limit timing, frequency, and duration of grazing to mitigate impacts to riparian plant vigor, soil compaction, physical bank damage, and water quality. Recommended strategies for appropriate management include developing appropriate grazing systems (Platts 1984), limiting intensity based on greenline stubble height, utilization (Clary and Webster 1989), and bank alteration (Cowley 2002, Bengueyfield 2006), managing timing, and providing structural improvement, and improve distribution (Perry 2005).

Grazing systems or grazing strategies are an important element in grazing management because they affect the timing, duration, and to some extent distribution based on seasonality. Although there are numerous factors and additional elements that can

modify or mitigate the effects, Platts (1984) rated the compatibility of different grazing systems with fisheries resources from 1 (poorly compatible) to 10 (highly compatible). The grazing systems that would be authorized under this alternative rank from 1 to 5, and include continuous season-long (1), deferred rotation (2), and rest-rotation (5). The only other system under this alternative is a two-herd, multiple-pass rotation on irrigated pasture, which is not evaluated by Platts (1984).

Percent utilization and greenline stubble height measurements are monitoring parameters that are used to gauge grazing intensity. Stubble height is a measure of residual height of herbaceous vegetation and numerous authors have advocated a particular stubble height along the greenline, or first continuous line of perennial vegetation along a stream, to accomplish both plant vigor and streambank protection (Leffert 2005). Clary and Webster (1989) state that a minimum stubble height of 4 or 6 inches should be maintained on all riparian areas to maintain plant vigor, streambank protection, and bank roughness. Clary (1999) examined important habitat parameters for salmonids, including width-depth ratios, embeddedness, bank stability and willow growth, and found general improvement to historically overgrazed riparian areas with 4 inch greenline stubble height retention and an improvement of all parameters with 6 inch greenline stubble height retention in mountain meadow riparian areas in central Idaho. Utilization is a measurement of the percent of the annual growth taken by grazing animals. Again, numerous authors have recommended limiting utilization to moderate impacts to riparian areas. Clary and Webster (1989) state that “the level of utilization on the site – including riparian areas – is the most important consideration” in evaluating good grazing practices. Those authors felt that utilization limits should be set based on the season (65% in spring, 40-50% in summer, and 30% in fall) due to the relative ability of the plants for post-grazing regrowth. After reviewing the literature, Leffert (2005) concluded that the literature supported riparian utilization rates less than 50% with higher utilization acceptable on streams in good ecological condition and those that are less sensitive to grazing impacts and lower levels acceptable on streams that need improvement or are highly sensitive. It is important to note that greenline stubble height and alteration should not be used as long-term riparian goals but are monitoring parameters of annual operations to be utilized to gauge intensity and to be adjusted where riparian objectives are not been met.

Bank instability is often the first sign of overgrazing impacts on a stream (Platts 1991). The direct effects of hooves on streambanks can modify the shape of banks and reduce the ability of those banks to resist erosion during subsequent high flows (Trimble and Mendal 1995). Bengueyfield (2006) stated, “the most widespread impact livestock have on riparian areas is trampling stream banks,” and found that bank alteration criteria were often met before greenline stubble height criteria. If bank alteration is used as an criteria for moving livestock off a pasture, it is typically recommended to limit annual-year alteration to some level less than 30% (20% or even 10% maximum alteration have been suggested). Cowley (2002) indicates that the level of alteration that is acceptable on a given stream reach will vary based on site conditions and the level should be adjusted based on the response of long-term indicators such as bank stability or width-depth ratios.

Levels of bank alteration should not be considered a riparian goal but should be used as a short-term indicator of use in riparian areas.

Riparian Condition

This alternative has a maximum utilization of 65% in riparian areas and there are no limits set on greenline stubble height. Range monitoring data suggest that upland utilization based on these stocking rates and season in the recent past has been well below the maximum allowable. Prior to the cooperative permittee and Forest Service monitoring effort, there are few records of annual utilization, and so it is possible utilization levels were much higher than have been recorded in more recent years. If vegetation conditions or permittee management changed dramatically, this alternative would allow for a near-doubling of utilization levels experienced in recent years. In that case, downward trends in riparian vegetation conditions and bank stability would be expected. On the other hand, if vegetation conditions and permittee management were consistent with the past decade, current trends in riparian condition across the project area would be expected. Under maximum utilization, riparian conditions classes depicted across the project area would be expected to begin to trend downward where there were stream segments that are sensitive to management and are in capable and suitable grazing areas.

Some specific locations have been identified as having riparian conditions that are not meeting riparian resource objectives such as Tepee Creek, Tosi Creek, Klondike Creek, Fish Creek, Strawberry Creek, and Wagon Creek. Photo point monitoring of Tepee Creek indicates that there has been a gradual but very slow recovery of riparian conditions; no improvement in bank stability was detected between 2009 and 2012 using MIM monitoring. This very gradual improving trend would be expected to be reversed at 65% utilization under this alternative based on the recommendations of maximum utilization in the literature discussed above. There is no information available regarding the trend in conditions on Tosi Creek focus area in Noble Pastures, so conditions in this focus area would be expected to remain below desired condition for bank stability. Klondike Creek riparian condition has improved since the initial installation of an exclusion fence (1985) but may have declined somewhat since the exclusion fence has not been fully operational (since 2004). Current grazing management, without restoring this enclosure fence, would be expected to fail to meet the bank stability objective at this site. The Fish Creek Focus Area has combined recreational and livestock impacts, and there is no evidence that the site has an improving trend under current management; therefore, the site would be expected to continue to fail to meet riparian condition objectives under this alternative. Wagon Creek focus area is at a heavily used road and livestock crossing and the conditions at this site would likely remain below riparian objectives under this alternative. Strawberry Creek, near the location that the MIM was measured was determined to be influenced by a trailing area. This area would be expected to continue to fail to meet bank stability during some years under this alternative.

Bank Stability

Bank stability, which currently is generally high across the project area according to the WHAM surveys, would be expected to remain high in much of the project area because there are many miles of high gradient stream with large substrates and intact riparian willow communities. However, more sensitive stream reaches could see declining bank stability. With utilization rates as high as 65%, greenline stubble height would be expected to be below 3 inches (Clary and Webster 1989), and Hall and Bryant (1995) suggest that damage to stream banks and riparian willow communities are likely to increase rapidly as greenline stubble height goes below 3 inches. At high levels of grazing in riparian areas, vegetation would be expected to have a reduced ability to hold banks and bank alteration from trampling would be expected to be high on low gradient reaches with streambanks composed of fine sediment sizes. Cattle grazing, as prescribed by this alternative, would have impacts on bank stability in each of the streams within the allotments; cattle watering areas, trails crossing streams, and streams near fence lines and roads would continue to be heavily used, which would result in bare and eroding soils. Focus areas with bank stability problems would remain in a degraded condition, and areas that have seen recovery may trend downward under the full levels of utilization.

Fine Sediment

Maximum allowable utilization under this alternative would result in an increase in fine sediment levels in streams since bank stability would decline in sensitive stream reaches. This alternative would result in continued erosion from areas with unstable or uncovered banks and bare ground. Areas with reduced ground cover related to livestock grazing would continue to be prevalent near fence lines, roads, and trailing areas.

Stream Temperature

According to global warming predictions, stream temperatures in the intermountain region are expected to increase regardless of which alternative is selected; however, this alternative could have a negative impact on the resiliency of aquatic ecosystems. Fully functioning stream and riparian area have extensive refugia and are able to buffer stream temperature fluctuation (Poole and Berman 2001). Although most streams in the project area are currently in a highly functioning condition that would enable resilience to stream temperature increases, this alternative could lead to simplified channels, altered banks, or reduced riparian vegetation that can cause less stream shading and less stream-groundwater exchange under maximum levels of riparian utilization. This alternative would not lead to improved stream and riparian conditions in the areas that have been identified as having resource concerns.

Effects by Allotment/ Rotation

Badger Creek

Big Twin Creek within the Badger Creek Allotment is a low-gradient stream with fine substrate, which could be susceptible to grazing impacts. However, this pasture has a 55% maximum riparian utilization level and there are extensive beaver ponds, which typically limit the extent of the riparian and stream impacts of livestock. Based on the existing high ecological condition, and maximum utilization levels that are at or near

recommended levels in the literature, riparian conditions and fisheries habitat would be expected to maintain near current conditions under this alternative.

Beaver-Twin Creek Allotment

There are numerous miles of low-gradient stream habitat within this allotment. This allotment would be managed as a single pasture with season-long grazing under this alternative. The WHAM analysis indicated riparian condition class I and II segments through the allotment, though there is little indication of grazing impacts to streams on this allotment. Actual previous use has been 30% and the proposed maximum allowable riparian utilization under this alternative is 55%. With the increased utilization, there would be some decrease in bank stability and a reduction of fish habitat within the allotment.

Noble Pastures Allotment

The lower extent of Tosi and Klondike Creek are found within Noble Pastures. Both of these streams have focus areas identified. This alternative would continue 2-3 times over grazing on irrigated pasture and season-long grazing in pasture 4. The actual utilization level has been around 50%, but the allowable utilization would be 65%. Not only would the riparian conditions at the focus areas not be expected to improve, there would likely be further bank stability problems, and reduced riparian vegetation conditions at the maximum levels of utilization.

Roaring Fork Allotment

There are some areas of Roaring Fork that are sensitive to livestock impacts, but surveys have indicated that riparian ecosystem are in good ecological status and that grazing impacts have been fairly light. Actual use has been around 30% and maximum allowable use would be 65% north of the Green River and 55% south of the Green River. The low-gradient reaches of Roaring Fork would likely have downward trends in riparian condition under maximum utilization.

Wagon Creek

This segment of Wagon Creek has an intact riparian area, but shows some impacts to livestock grazing. The allotment has received approximately 50% maximum utilization in recent years. Under higher use levels, we would anticipate additional impacts to willows and additional trailing and trampling impacts to Wagon Creek and the banks.

Upper Green River –Mud Lake/Fish Creek Rotation

This three-pasture rotation covers a very large area and numerous streams. Mud Lake West pasture has some portions of Wagon Creek and Crow Creek. Mud Lake East pasture has portions of Crow Creek, the lower reach of Roaring Fork, and a segment of the Green River. The Fish Creek Pasture has S.F. Fish Creek, Raspberry Creek, and Strawberry Creek. Areas of riparian concern were found around the Fish Creek Focus Area, the area near the Green River Elk Feed grounds, located on the Green River near the mouth of Roaring Fork, Strawberry Creek, and Crow Creek. Outside of the focus areas, riparian conditions were generally found to be in functioning condition according to the WHAM surveys. This rotation has been found generally to have been grazed at approximately

30% during recent utilization monitoring. Although most of the streams and riparian areas are in good shape, grazing at 65% would likely result in downward trends in many of the more sensitive stream reaches. The areas that are currently identified as having less than desired conditions would remain in that condition and may trend downward.

Upper Green River – Mosquito Lake Rotation

The primary stream system in the Mosquito Lake Rotation is Wagon Creek. This stream has been found to have high bank cover and stability (both MIMs and WHAM surveys), but the stream has higher than desirable stream temperatures for salmonids. Grazing, as proposed in alternative 2, may have some detrimental impacts to the riparian vegetation and bank stability in this rotation. The greatest concern would be that grazing at 65% utilization in the riparian area could reduce vigor and canopy density in both the willows and high-mountain sedge communities resulting in reduced shading and increased stream temperatures.

Upper Green River – Tosi Creek/ Tepee Creek Rotation

This rotation has Tepee Creek, Tosi Creek, and Kinky Creek. Tepee Creek, which has a CRCT population, has been found to have less than desired riparian vegetation and bank stability conditions. This is the only area with a Riparian Condition Class III within the project area with substantial livestock grazing impacts. The stream in this segment has an incised channel, due to management impacts, and a riparian area showing signs of a fragile recovery. Grazing this reach to 65% utilization would eliminate any signs of recovery that have been achieved over the past couple of decades and cause further declines in bank stability and riparian vegetation condition. Broadly across the rotation, there are many reaches of low-gradient stream that currently have some grazing impacts, but are generally intact and function streams (as evident from site visits, WHAM surveys, and Tosi Creek MIM key site). Grazing this rotation to 65% utilization would impact willow communities, reduce bank stability, and reduce fish habitat conditions.

Upper Green River – Gypsum Creek Rotation

The Gypsum Creek rotation area contains Gypsum Creek, South Gypsum Creek, Jim Creek, Moose Creek, and segments of the Green River. Stream and riparian conditions across this rotation are generally in acceptable condition (based on MIM key sites, WHAM surveys, and site visits), but there are some grazing impacts apparent. Jim Creek has some stream and riparian measures that are not at desired conditions, but the stream is recovering from a large-scale fire disturbance. Grazing at the 65% utilization that would be allowable under this alternative would have detrimental impacts to riparian vegetation and to bank stability in sensitive reaches. Much of the stream habitat is high-gradient, so generally would not be expected to completely unravel. Stream temperature in Gypsum Creek could become a concern if the riparian canopy were reduced from the current condition. The recovering stream and riparian conditions in Jim Creek would likely suffer a significant set-back from heavy grazing. There is little grazing in this rotation along the Green River at this time, and that would be expected to be the same under this alternative.

Upper Green River – River Bottom Pasture and Livestock Driveway

The driveway and river bottom pasture is a unique part of the project. Most of the impacts to this part of the project area is physical damage or grazing that is relatively heavy near the driveway and attenuates to no livestock grazing as you move away from the driveway. Analyzing the impacts based on allowable utilization is therefore, probably not appropriate. The Green River has been found to have almost no grazing pressure within the River Bottom Pasture (based on PFC assessments and the big-river MIM site - see Wildlife Specialists Report for details). Most of the impacts occur on tributaries to the Green River, such as Whiskey Creek, Lime Creek, No Name Creek, Klondike Creek, and Tosi Creek. The impacts are immediately adjacent to the road and are caused by livestock crossings and watering opportunities. At full stocking numbers, these impacts would be greater, but would not be expected to cause broad changes in riparian conditions.

Kendall Warm Springs Dace

Grazing livestock would be excluded from the Kendall Warm Springs except that cattle would be allowed through the enclosure while herding the cattle to the allotment or back off the Forest. When cattle would be allowed in the enclosure, they would be required to be actively herded through to the other side. Based on current management, the permittees would often opt to herd the cattle around the enclosure or allow them to drift around the enclosure. When cattle are being herded through the enclosure, there would likely cause some bank and channel alteration, which some believe could have a beneficial effect to the dace habitat. The Forest Service is responsible for maintaining the enclosure fence, but at times, the fence could fail and cattle could access the springs, which could result in livestock-related impacts. This alternative would be not likely to adversely affect the Kendall Warm Springs dace or their habitat.

Colorado River Cutthroat Trout

This alternative would have both direct and indirect effect to Colorado River cutthroat trout within the project area. Where cattle are able to enter streams during the period and in the locations that cutthroat trout have active redds, there is a risk of trampling redds and reducing egg survival (Greggory and Gamet 2009). For this alternative, cattle are allowed on the allotments by June 14th. For CRCT, spawning can occur from May until July, and fry emergence is typically in late July or early August (Young 1995). CRCT spawning would occur within the grazed area on Rock Creek, Tepee Creek, Gypsum Creek, Jim Creek, Klondike Creek, and an unnamed tributary to the Green River. Rock Creek is within the Beaver-Twin Allotment, which would have season-long grazing under this alternative, so there would be a risk of redd trampling through the entire season from middle of July until all cutthroat trout fry have emerged. Tepee Creek is located in the Lower Tepee Pasture, which has a rotational grazing system; as a result, there would be a risk of redd trampling in this stream but the risk of direct impacts is reduced somewhat because this is a three-pasture rotation. Gypsum Creek would be managed as a deferred rotation with the possibility of CRCT spawning in either pasture, so there would be a risk of redd trampling regardless of which pasture was the first; however, CRCT densities are

so low (Rhea and Gardiner 2010) that the likelihood of direct effects is low. Jim Creek is in the Lower Gypsum Pasture, so the risk of redd trampling on this stream would only occur every other year, and the density of CRCT is very low so the likelihood of direct effects is very low. Klondike Creek and the unnamed tributary to the Green River may have spawning within the River Bottom Pasture. There would be some risk of redd trampling during spring trailing. During the spring, cattle typically move through relatively quickly, and few cattle stray up into these two side streams. Based on the occurrence of CRCT and the grazing system, likely impacts would only occur on Rock Creek and Tepee Creek.

Under alternative 2, cutthroat trout habitat could see declining conditions since high utilization levels (up to 65%) could reduce stream bank stability in sensitive reaches and could lead to increased impact to riparian vegetation. Much of the habitat for cutthroat populations is currently in good condition, and in high-gradient streams with cobble or boulder-dominated bed and banks, this would not be expected to change. The focus areas would be likely to remain below desired condition, and in some cases would have further degraded conditions. Due to projected climate trends, stream temperature would be expected to rise, and this alternative would do the least out of the three alternatives to buffer the effects of climate change on stream temperatures. Because the alternative fails to address bank stability concerns, some cutthroat trout habitat would have slightly higher levels of fine sediment as compared to the other alternatives. Although many of the populations of cutthroat trout that are being invaded by brook trout may have little chance of long-term persistence under any of the alternative, the fact that this alternative does not address resource concerns at focus areas, improve grazing systems to benefit riparian and aquatic conditions, may further reduce the likelihood of cutthroat trout populations persisting under the competitive pressure of non-native trout.

Because this alternative would lead to reduced habitat conditions, specifically increased stream temperature and fine sediment deposition, which would likely favor brook trout over cutthroat trout (Staso and Rahel 1994, Shepard 2004), this alternative may impact individuals and habitat and would contribute to a decline in populations within the project area. At the Forest level, these impacts may reduce the level at which CRCT were well-distributed across the planning area. As a result, the alternative may contribute to a trend toward listing.

Yellowstone/ Snake River Fine-spotted Cutthroat Trout

This alternative could affect YCT in Raspberry, Strawberry, SF Fish Creek, and in the Gros Ventre River. Although the stream habitat conditions were found to be relatively intact with fairly light grazing impacts except for a couple of local areas, 65% utilization in the riparian areas could cause riparian and stream habitat conditions to decline. Because this project could reduce the YCT population within the project area, but would not likely lead to an extirpation, and because the project area accounts for a relatively small fraction of the habitat provided for this sub-species of cutthroat trout on the Forest, YCT would still be well-distributed, maintain connectivity, and maintain a resilient population on the Forest. Therefore, although this alternative may impact individuals and habitat, it would not contribute to a trend toward listing.

Rainbow Trout

Alternative 2 would generally reduce riparian function and bank stability and increase fine sediment contributions to streams which rainbow trout rely on for spawning. As a result, this alternative would contribute to current downward trends for rainbow trout.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

- Goal 3.3 - Sensitive species are prevented from becoming a federally listed Threatened species in Wyoming (pg. 118).

This alternative could lead to reduced riparian condition, lower bank stability and other resource concerns for CRCT and YCT. These populations are in decline due primarily to introduced non-native species. This alternative would result in higher levels of fine sediment and higher stream temperature conditions than the other alternatives, and both of these elements could favor brook trout success over cutthroat trout.

Goal 4.7 – Grazing use of the National Forest sustains or improves overall range, soils, water, wildlife, and recreation values or experiences (pg. 120).

Under the maximum allowable utilization, this alternative would reduce the condition of riparian habitat for fisheries.

- Kendall Warm Springs Management Standard – The existing population and habitat of the Kendall Warm Springs dace will be maintained and enhanced (pg. 125)

This alternative would not be likely to adversely affect Kendall Warm Springs dace. The livestock exclosure fence would continue to be maintained. This alternative would continue to allow livestock to be actively herded through the exclosure, but the impacts to the spring from this activity would be short duration and low intensity.

- Sensitive Species Management Standard – Quantifiable objectives will be developed to identify and improve the status of Sensitive species and eliminate the need for listing (pg. 126).

The BTNF adopted Sensitive Species Quantifiable Objectives (2013 letter from Clint Kyle to the Forest Leadership Team). The objectives set time frames for developing conservation assessments, identifying the status of the species, and improving the status of the species. Until the conservation assessments are finalized, the best available science regarding the species habitat requirements and the potential risk factors associated with the project will be used to analyze the potential effects of the project on the status and trend of sensitive fish species.

- Fish Habitat Management Guideline – For fish habitat providing a fishery at or near its potential, fish populations should be maintained at existing levels. For habitat below its potential, habitat should be improved and maintained to at least 90 percent of its natural potential. First priority for improvement should be streams supporting Colorado River and Bonneville cutthroat trout which are Sensitive species (pg. 126).

This alternative would result in degrading habitat conditions in many locations under the maximum allowable utilization levels. Tepee Creek focus area is one of the areas of stream supporting Colorado River cutthroat trout, and this is a population that is in danger of extirpation from non-native invasion and has habitat that is below resource objectives. Under this alternative, there would be a down-turn in riparian condition trends under the maximum levels of utilization.

- Streambank Stability Guideline – At least 90 percent of the natural bank stability of streams that support a fishery, particularly Threatened, Endangered, and Sensitive species, and all trout species, should be maintained. Streambank vegetation should be maintained to 80 percent of its potential natural condition or an HCI rating of 85 or greater (pg. 126).

Streambanks stability objectives in some of the focus areas would not be expected to be attained under this alternative. Across the project area, bank stability conditions could decline under the maximum allowable utilization level in the riparian area. As a result, this alternative is not consistent with the guideline.

- Sensitive Cutthroat Trout Habitat Guideline – Habitat occupied by existing and reintroduced populations of Colorado River, Bonneville, and Snake River cutthroat trout should be managed to protect species purity (pg. 126).

There is literature that suggests that hybridization between cutthroat trout and rainbow trout is more likely to occur and spread in streams with warm water temperatures and increased land use disturbance (Muhlfield et al. 2009). However, within the project area most hybridization concern is between sub-species of cutthroat trout, and I am not aware of literature that evaluates habitat condition on the risk of intra-specific hybridization rates. Conservatively, we feel that it is important to maintain habitat quality to reduce the risk of hybridization.

- Livestock Grazing of Riparian Areas Standard – Livestock grazing in riparian areas will be managed to protect stream banks. This may be achieved through the use of gravel crossings, tree debris barriers, fencing, riparian pastures, development of alternate watering sites out of the riparian area, longer allotment rests, or improved livestock distribution (pg. 128).

This alternative fails to address areas with specific riparian concerns. There would be no improvement to grazing management systems, livestock distribution or structural improvements such as livestock crossings or fencing. The livestock grazing prescription under this alternative that has no minimum greenline stubble height and a maximum utilization of 65% is insufficient to protect stream bank

condition on stream reaches that are sensitive to grazing impacts. The alternative is not consistent with this Standard.

- Threatened, Endangered, and Sensitive Species Standard – Range improvements, management activities, and trailing will be coordinated with and designed to help meet fish and wildlife habitat needs, especially on key habitat areas such as crucial winter range, seasonal calving areas, riparian areas, sage grouse leks, and nesting sites. Special emphasis will be placed on helping to meet the needs of Threatened, Endangered, and Sensitive species (pg. 129).

This alternative fails to implement range improvements where impacted riparian areas have been identified. The alternative would continue protections for the Kendall Warm Springs dace population and habitat, but no provisions would be made to improve impaired conditions that effect cutthroat trout habitat. As a result this alternative is not fully consistent with the Standard.

- Consistency with Desired Future Conditions described in the Forest Plan:

- Habitat maintained for viable populations of management indicator species (all DFCs)

Under alternative 2, habitat impacts from the project may limit viable populations of Colorado River cutthroat trout but not for populations of rainbow trout. This alternative is not consistent with the DFC prescriptions.

- Meets State objectives. Provides habitat for populations, harvest levels, success rates, and recreation days (DFC 3, 6, 10, and 12).

Alternative 2 would not be inconsistent with fisheries objectives regarding harvest levels, success rates, and recreation days; however, the alternative may contribute to a decline in Colorado River cutthroat trout populations.

- Habitat will be managed to help meet state wildlife populations, harvest levels, success rates and recreation days and fully meet standards for fish size success rates, and recreation days (2A).

Alternative 2 would be consistent with the direction to provide habitat to meet fisheries objectives regarding populations, harvest levels, success rates, and recreation days in the area of DFC 2A.

- May meet state objectives depending upon the area and recreation emphasis (9A).

Alternative 2 would be consistent with this direction.

Other Relevant Mandatory Disclosures

The project as described in Alternative 2 Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To The Population or Species of Sensitive Colorado River cutthroat trout, May Impact Individuals Or Habitat. But Will Not Likely Contribute To A Trend Towards Federal Listing or Cause A Loss Of Viability To The Population Or Species of Yellowstone/ Snake River cutthroat trout, and MIS Rainbow trout species; AND is **Not Likely to Adversely Affect or Adversely Modify Proposed Critical Habitat** of the Endangered Kendall Warm Springs dace.

Alternative 3 – Modified Grazing Management

Alternative 3 involves additional grazing management strategies to improve resource conditions that do not meet desired conditions while sustaining livestock operations (see FEIS chapter 2 for a full description of the alternative). The proposed action is to continue to authorize grazing on all six allotments with approximately the same number and season of livestock but implement a grazing management with maximum key forage species utilization of 50% and minimum greenline stubble height of 4 inches, or 6 inches at certain locations, site-specific range improvements, and progressive design features to meet resource objectives. The permitted core season of use varies by allotment but the season of use generally extends from June 14th to October 15th annually across the project area, which is the same as Alternative 2. Under this alternative, an extension of one week to either the start or end of the core season of use could be authorized by the District Ranger. Alternative 3 would change the number of cattle by decreasing the number permitted in Mosquito Lake Pastures in the Upper Green River Allotment by 15 percent or 270 head of cattle to a maximum of 1,530 livestock. Actual livestock numbers and/or season of use could be administratively adjusted within the established permitted use in any given year in order to meet allowable use standards, design features, and/or resource objectives under this alternative. Rotational grazing systems would be implemented in the Badger Creek, Roaring Fork, and Beaver-Twin Creeks Allotments that are currently grazed season long. All allotments would be managed under a deferred rotation system with the option to rest. Kinky Creek Pasture would be incorporated into the Tosi/Tepee Creek Area deferred rotation pasture system within the Upper Green River Allotment.

Direct and Indirect Effects

Riparian Condition

Many of the types of effects to riparian condition of alternative 3 are similar to alternative 2, grazing as currently permitted; however, there are numerous changes to management under this alternative, which would modify the level of effects to fisheries, riparian areas, and aquatic ecosystems. Livestock grazing under this alternative would negatively affect some aspects of watershed and riparian conditions. Grazing livestock would impact streamside vegetation resulting in erosion and reduced stream shading in some locations.

Physical alteration of streambanks from livestock trampling would occur where capable grazing areas overlapped with streams. Across the project, there is a utilization limit that would require a pasture move before riparian vegetation along the greenline of streams was grazed below 4 inches greenline stubble height. In some cases, where resource problems have been identified, this alternative limits those impacts based on site specific designs including bank alteration limits, 6 inch minimum greenline stubble heights, or livestock exclusion fences. In addition, if desired conditions are not met, progressive design features are in place to reduce impacts by reducing utilization levels.

The types of effects of alternative 3 to fisheries habitat are similar to alternative 2, including a risk of reduced bank stability, reduces riparian canopy cover, increased stream temperature, and fine sediment deposition in stream, but there are a number of design features in alternative 3 that are intended to reduce those impacts. The effects of this alternative will be compared to the effects of alternative 2 and the no action alternative and will refer to the literature summary on the effects of grazing intensity on riparian areas detailed in the effects analysis of alternative 2.

Under this alternative, grazing across the project area would be limited to 50% utilization in the uplands and riparian areas, and there would be a minimum greenline stubble height requirement of 4 inches. Clary and Webster (1989) recommend that a minimum of 4 inch greenline stubble height should be left on all riparian areas, regardless of the grazing system, to help maintain riparian plant vigor and help prevent other impacts to streams that are caused by grazing riparian areas too intensively. Clary (1999) found that most measures of habitat variables important for salmonids moved closer to desirable conditions with 4 inch greenline stubble height and virtually all measures improved with 6 inch greenline stubble height. Livestock grazing preference has been found to switch from herbaceous to woody vegetation at or below 3 inch greenline stubble height, so a 4 inch minimum would result in minimal woody species browse (Hall and Bryant 1995). Clary (1995) found that grazing intensities up to 50% utilization resulted in improving riparian trends on streams that had been subjected to heavy grazing historically. Based on this literature, it appears that 4 inch minimum greenline stubble height and 50% maximum utilization would be sufficient to maintain conditions in stream and riparian areas that are in high ecological status, which is the case across most of the project area, and in most cases would even result in improving trends in condition in locations that are impaired due to historical overgrazing. The primary drawback to relying on greenline stubble heights as a method of limiting riparian grazing is that, depending on the morphology of the stream and valley and the nature of the existing riparian vegetation, the greenline may be either easily accessible to livestock grazing or quite difficult for livestock to access. As a result there are situations in which greenline stubble height can be a poor indicator of riparian grazing intensity. In areas where livestock grazing along the greenline is limited, the 50% utilization limits would be the trigger for moving livestock off of the grazing unit. In some cases this could result in higher utilization than has been observed in the recent past.

Bank Stability

Bank stability, which is generally high across the project area according to the WHAM surveys (see existing conditions), would be expected to remain high in much of the project area because there are many miles of high gradient stream with large substrates and intact riparian willow communities. Sensitive stream reaches would be expected to maintain bank stability at or above the desired conditions for the bank stability by stream type due to the minimum greenline stubble height and 50% maximum riparian utilization limits (Clary and Webster 1989). Because the proposed action limits riparian grazing to moderate levels, stream-side vegetation would generally be expected to be maintained sufficiently to hold banks and bank alteration from trampling would be expected to be maintained to reasonable low levels to maintain bank stability. Key MIM sites would be monitored at 3-5 year intervals to ensure that bank stability conditions were being maintained on streams within the project (see monitoring recommendations). Cattle grazing, as prescribed by this alternative, would be expected to have impacts on bank stability in each of the streams with allotments; cattle watering areas, trails crossing streams, and streams near fence lines and roads would continue to be heavily used, which would result in bare and eroding soils. However, these trailing and watering impacts would generally be expected to be lighter under this alternative compared to alternative 2 because grazing intensity would be limited by the lower maximum utilization limits. Focus areas with bank stability problems are expected to show improvement under this alternative and progressive design features would be implemented if conditions did not improve. Specifically, Tosi Creek, Tepee Creek, Klondike Creek, Strawberry Creek, Fish Creek, will have bank stability monitoring and will be expected to improve over the timeframe of the project (see monitoring recommendations).

Fine Sediment

Under this alternative, livestock impacts would continue to cause erosion that contributed to the level of fine sediment in streams; however, fine sediment delivery to streams would be expected to decrease as stream bank conditions improved where they are currently elevated near Focus Areas. Since bank stability is expected to be maintained where it is at acceptable levels or improved where in the focus areas where it has been found to be below desired conditions, erosion and fine sediment deposition are expected to decrease under this alternative. As with alternative 2, there will continue to be areas with low ground cover associated with livestock trails, watering areas, and near fence lines.

Stream Temperature

This alternative implements minimum greenline stubble height and riparian utilization limits that will help leave some herbaceous vegetation mats immediately adjacent to streams and reduce the likelihood that livestock will apply much browse pressure to willows and other woody vegetation. As a result, streams should be able to maintain undercut banks in many locations and sedge and willow canopies will continue to contribute shade to the stream. While the grazing pressure under this alternative will reduce the stream-shading canopy in some cases, the streams would be expected to receive as much or more shade under this alternative as the existing conditions. As a result, stream temperature conditions are expected to be similar to those discussed in the

existing conditions. In the long-term, stream temperatures are expected to rise under predicted global climate change scenarios, and this alternative would provide moderate resiliency to those climate-level impacts.

Effects by Allotment/ Rotation

Badger Creek

As described in alternative 2, the streams within this allotment are currently in high ecological status. Riparian and stream conditions would be maintained by applying the 50% maximum riparian utilization and 4 inch minimum greenline stubble height.

Beaver-Twin Creek Allotment

There are numerous miles of low-gradient stream habitat within this allotment. This allotment would be changed from a single pasture with season-long grazing under current management to a three pasture deferred rotation under this alternative. This change would improve riparian conditions by alternating the timing of grazing between the three pastures. Actual current use has been 30% and the proposed maximum allowable riparian utilization under this alternative is 50%. If the pasture received maximum allowable utilization, there would be some impacts to the stream and riparian area, but the 4 inch minimum greenline stubble height should insure that grazing intensities do not lead to substantial downward trends. Riparian conditions would continue to be monitored with MIM key sites and progressive design features to adjust utilization and greenline stubble heights would be implemented as needed if downward trends in riparian conditions were detected.

Noble Pastures Allotment

The lower extent of Tosi and Klondike Creek are found within Noble Pastures. Both of these streams have focus areas identified. This alternative would eliminate season-long grazing in pasture 4 and allow 2 times over grazing on irrigated pasture. On the Tosi Creek focus area, there would be a 6 inch minimum greenline stubble height and 20% maximum bank alteration limits to create a trend toward desired bank stability conditions. Monitoring at the MIM site would ensure that there is at least a stable trend in bank stability at the first reading of the MIM site (after 3-5 years) and a statistically detectable improvement at the second reading (another 3-5 years). If the desired trend was not detected, electrical fencing would be used to exclude livestock access to the stream. The measures proposed would be sufficient to lead to improving trends in stream and fisheries condition on Tosi Creek. Klondike Creek exclusion fence would be restored and expanded and two hardened crossings would be implemented on the stream. The alternative would allow limited riparian grazing as needed to help allow recovery of the willow community. Past exclusion fencing has allowed recovery of sedge and herbaceous vegetation, but willows have not recovered in this stream reach. Riparian fencing will allow for complete management of the stream and riparian area on Klondike Creek from experimentation with limited, controlled disturbance to complete exclusion of domestic livestock. The riparian conditions on Klondike Creek are expected to improve rapidly and reach desired conditions during the time frame of the project.

Roaring Fork Allotment

Surveys have indicated that riparian areas are in good ecological status and that grazing impacts have been fairly light in this allotment. Actual use has been around 30% and maximum allowable use would be 50% across the allotment. This alternative would alter the grazing strategy to a three pasture deferred rotation instead of season-long grazing, which would help reduce riparian impacts. For the reasons described under the general effects analysis, 50% maximum utilization and 4 inch minimum greenline stubble height would maintain conditions.

Wagon Creek

This segment of Wagon Creek has an intact riparian area, but shows some impacts to livestock grazing. The allotment has received approximately 50% maximum utilization in recent years, which would become the maximum allowable use under this alternative. In addition, 4 inch minimum greenline stubble height would be implemented to help protect riparian conditions. Because the livestock number, season, and utilization levels would be similar to what has been occurring, stream and riparian conditions would be stable.

Upper Green River –Mud Lake/Fish Creek Rotation

The proposed action would generally maintain functioning riparian conditions across this rotation by implementing 50% maximum forage utilization and 4 inch minimum greenline stubble height limits. The section of Crow Creek that is heavily utilized because it is a fence corner of the Mud lake East pasture would be improved by realigning the fence to run along the terrace and off-channel water would be provided either from Crow Creek or a small spring source on the site. Such a fence alignment would result in riparian recovery at this location. Cattle would be actively herded away from the Green River Elk Feedground, which would minimize the impacts that this project has on the riparian condition on the Green River and Roaring Fork near that facility. The Fish Creek focus area would be managed with a 6 inch minimum greenline stubble height and 20% maximum bank alteration limit. In addition, the two-track road that leads to that site would be obliterated to reduce recreational impacts to the site. In combination, that site is expected to have improving conditions and should meet the desired condition for streambank stability by the second round of monitoring (6-10 years). There would be a 6 inch minimum greenline stubble height used to improve riparian conditions on both Fish Creek and Strawberry Creek in the Fish Creek pasture. In combination with the 50% maximum forage utilization, each of the riparian areas that have been found to be in less than satisfactory condition should see improvement.

Upper Green River – Mosquito Lake Rotation

The primary stream system in the Mosquito Lake Rotation is Wagon Creek. Under this alternative, there would be a modest reduction in herd size, maximum utilization would range from 30-50%, and there would be a 4 inch minimum greenline stubble height. Within the Wagon Creek Focus Area, the electric fence would be maintained, the livestock crossing would be hardened, and a gate would be added to the administrative access road to reduce illegal use. The prescription should maintain or improve riparian conditions broadly along Wagon Creek and, specifically, should aid with the recovering

trend seen at the focus area. Stream temperatures are likely the greatest concern for fisheries on Wagon Creek. This alternative would likely maintain current riparian canopy and channel conditions which would not resolve current stream temperature concerns.

Upper Green River – Tosi Creek/ Tepee Creek Rotation

This rotation has Tepee Creek, Tosi Creek, and Kinky Creek. Tepee Creek, which has a CRCT population, has been found to have less than desired riparian vegetation and bank stability conditions. Under this alternative, a livestock exclusion fence would be constructed around the area considered the Tepee Creek focus area. The riparian area would be fenced along the first high terrace except for one crossing and watering gap. In addition, log habitat structures, which have been determined to be disrupting the natural stream processes, will be removed from the stream. Riparian recovery, even with an excluded riparian area, is expected to be a slow process given the fact that the site has numerous historical impacts and on-going disturbance from unstable beaver dams. Removing the logs may cause additional short-term instabilities but should help restore natural flow conditions, which will benefit the stream over time. Adding the fence enclosure will result in additional riparian fence lines, with some trailing and additional utilization upstream and downstream of the enclosure. The alternative would also result in the addition of the South Kinky Creek pasture, which would reduce the livestock use of the Lower Tepee Creek pasture, since the herd would be split between these two pastures. Generally across the rotation, riparian areas would be expected to be stable or improving with 50% maximum forage utilization and 4 inch greenline stubble heights.

Upper Green River – Gypsum Creek Rotation

Maintaining a maximum utilization of 50% and a minimum 4 inch greenline stubble height would generally be sufficient to maintain or improve riparian conditions across this rotation. South Gypsum Creek, which is recovering from fire effects, would be held to a 6 inch minimum greenline stubble height. Once the MIM site is found to have bank stability that meets the desired conditions for two consecutive monitoring rounds, the minimum greenline stubble height requirement would be reduced to 4 inches. This site has seen improving bank stability conditions, but additional time with light grazing impacts are warranted for full site recovery.

Upper Green River – River Bottom Pasture and Livestock Driveway

Similar to Alternative 2, most of the impacts occur on tributaries to the Green River, such as Whiskey Creek, Lime Creek, No Name Creek, Klondike Creek, and Tosi Creek. The impacts are immediately adjacent to the road and are caused by livestock crossings and watering opportunities. At full stocking numbers, these impacts would be greater, but would not be expected to cause broad changes in riparian conditions. Consistent with Alternative 2 and the existing conditions, some, but very little, grazing is expected to occur on the banks of the Green River and there would not be substantial effect to riparian are of the river.

Kendall Warm Springs Dace

See below in “Effects Common to All Action Alternatives” section

Colorado River Cutthroat Trout

Direct effects of cattle trampling CRCT redds would be similar under this alternative as compared to alternative 2, but the extent of the effects would be reduced because the lower utilization and added greenline stubble height requirements would reduce grazing intensity in the riparian area and changes to grazing strategies in some allotments or rotations would result in changes in the timing that livestock would have access to streams with cutthroat redds. The effects to the Rock Creek population would be slightly reduced as the Beaver-Twin Allotment would change from season-long grazing to a deferred pasture rotation. Livestock presence in Tepee-Tosi Pasture during CRCT egg incubation periods would be reduced as the project would add the Kinky Creek pasture to the rotation and the livestock enclosure on Tepee Creek would protect redds within that reach from being damaged. As in Alternative 2, the other CRCT populations would have very limited risk of redd trampling due to either low cattle density or low CRCT density.

This alternative would have some impact on CRCT habitat caused by damage to stream channels and banks from trailing and watering areas, increased fine sediment deposition, and decrease stream shade from riparian vegetation. However, the design features in place for this alternative, including maximum forage utilization, minimum greenline stubble heights, site-specific management elements and structural improvements at focus areas, and progressive design features, would help ensure that stream habitat and riparian conditions are maintained in high ecological condition or trend toward improved conditions where conditions are less than satisfactory.

Because this alternative would generally maintain or improve existing fisheries habitat conditions, but would have some direct effects and would cause some continuing habitat disturbance and impacts, the alternative would impact individuals and habitat but would not contribute to a decline in populations within the project area. Because most of the CRCT populations within the project area are being invaded by brook trout and are currently believed to be in decline, the improvements in the habitat are unlikely to have a substantial effect on the population density or distribution of the species (Quist and Hubert 2005). At the Forest level, the impacts from this alternative would not reduce the level at which CRCT or their habitat would be well-distributed across the planning area. As a result, the alternative may impact individuals and habitat but would not contribute to a trend toward listing.

Yellowstone/ Snake River Cutthroat Trout

This alternative would have some, although limited, risk of cattle trampling YCT redds. The majoring of the YCT habitat is found in the Fish Creek Pasture, which is grazed July 15th to Sept 15th each year. Since cutthroat trout fry emergence occurs in late July or early August, there would be a short window of temporal overlap between livestock grazing and egg incubation.

Similarly to Colorado River Cutthroat Trout, this alternative would result in continued impacts to stream habitat associated with livestock crossings, watering areas, and riparian grazing. Limiting the grazing intensity would moderate these effects and lead to overall maintenance of function stream and riparian conditions and recovery of degraded

conditions. Both the Fish Creek focus area and Strawberry Creek would have minimum 6 inch greenline stubble height requirements, which will result in limited grazing intensity in these riparian areas. As a result of the broad restrictions to grazing intensity and the proposed improvements near focus areas, fisheries habitat would improve from existing conditions. Since this alternative would maintain or improve habitat conditions for YCT, the project would not reduce the level at which YCT or their habitat would be well-represented or well-distributed on the Forest. As a result, the alternative may impact individuals and habitat, but would not contribute to a trend toward listing.

Rainbow Trout

Within the project area, rainbow trout are found in the Green River and in the lowest segments of some of the tributaries. The reaches of the Green River above the river bend have low natural productivity and very little natural recruitment, so this has historically been maintained with stocking. There is some rainbow trout spawning in the lower reaches of the tributaries to the Green River. Alternative 3 may eventually be expected to maintain or reduce the level of fine sediment in these stream segments, which could have a minor beneficial effect to egg to fry survival of rainbow trout.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

- Goal 3.3 - Sensitive species are prevented from becoming a federally listed Threatened species in Wyoming (pg. 118).

This alternative would result in some impacts to sensitive cutthroat trout habitat, but most stream and riparian areas would remain in high ecological condition or improve where grazing systems would be improved or where utilization levels would decrease. Where problems have been identified, this alternative includes utilization limits or other prescriptions to address those concerns.

Goal 4.7 – Grazing use of the National Forest sustains or improves overall range, soils, water, wildlife, and recreation values or experiences (pg. 120).

Under this alternative, fisheries values and experience would generally be maintained or improved.

- Kendall Warm Springs Management Standard – The existing population and habitat of the Kendall Warm Springs dace will be maintained and enhanced (pg. 125)

This alternative would not be likely to adversely affect Kendall Warm Springs dace. The livestock exclosure fence would continue to be maintained. This alternative would continue to allow livestock to be actively herded through the exclosure, but the impacts to the spring from this activity would be short duration and low intensity.

- Sensitive Species Management Standard – Quantifiable objectives will be developed to identify and improve the status of Sensitive species and eliminate the need for listing (pg 126).

The BTNF adopted Sensitive Species Quantifiable Objectives (2013 letter from Clint Kyle to the Forest Leadership Team). The objectives set time frames for developing conservation assessments, identifying the status of the species, and improving the status of the species. Until the conservation assessments are finalized, the best available science regarding the species habitat requirements and the potential risk factors associated with the project will be used to analyze the potential effects of the project on the status and trend of sensitive fish species.

- Fish Habitat Management Guideline – For fish habitat providing a fishery at or near its potential, fish populations should be maintained at existing levels. For habitat below its potential, habitat should be improved and maintained to at least 90 percent of its natural potential. First priority for improvement should be streams supporting Colorado River and Bonneville cutthroat trout which are Sensitive species (pg 126).

This alternative would result in maintaining current habitat conditions in most locations. Where locations are not currently meeting fisheries habitat objectives, site-specific prescriptions have been developed by the IDT to improve conditions.

- Streambank Stability Guideline – At least 90 percent of the natural bank stability of streams that support a fishery, particularly Threatened, Endangered, and Sensitive species, and all trout species, should be maintained. Streambank vegetation should be maintained to 80 percent of its potential natural condition or an HCI rating of 85 or greater (pg. 126).

Streambanks stability objectives in some of the focus areas would not be expected to be attained during the duration of this project; however, conditions are expected to improve in all locations not meeting current objectives due to the allotment-wide or site-specific measures. Across the project area, based on WHAM surveys, over 90% of fish bearing streams would continue to have streambanks within the range of natural variability.

- Sensitive Cutthroat Trout Habitat Guideline – Habitat occupied by existing and reintroduced populations of Colorado River, Bonneville, and Snake River cutthroat trout should be managed to protect species purity (pg. 126).

No element of this alternative would threaten the genetic purity of cutthroat trout.

- Livestock Grazing of Riparian Areas Standard – Livestock grazing in riparian areas will be managed to protect stream banks. This may be achieved through the use of gravel crossings, tree debris barriers, fencing, riparian pastures, development of alternate watering sites out of the riparian area, longer allotment rests, or improved livestock distribution (pg. 128).

Alternative 3 would involve improving grazing systems to meet Forest Plan standards, adding riparian fencing on Klondike Creek and Tepee Creek, hardening livestock crossings on Wagon Creek and Klondike Creek, and improving livestock distribution by setting riparian utilization limits across all allotments and more stringent limits in areas with identified resource concerns.

- Threatened, Endangered, and Sensitive Species Standard – Range improvements, management activities, and trailing will be coordinated with and designed to help meet fish and wildlife habitat needs, especially on key habitat areas such as crucial winter range, seasonal calving areas, riparian areas, sage grouse leks, and nesting sites. Special emphasis will be placed on helping to meet the needs of Threatened, Endangered, and Sensitive species (pg. 129).

This alternative implements range improvements where impacted riparian areas have been identified. The alternative would continue protections for the Kendall Warm Springs dace population and habitat, and provisions would be made to improve impaired conditions that effect cutthroat trout habitat.

- Consistency with Desired Future Conditions described in the Forest Plan:
 - Habitat maintained for viable populations of management indicator species (all DFCs)

Under alternative 3, habitat would not limit viable populations of fisheries MIS species.
 - Meets State objectives. Provides habitat for populations, harvest levels, success rates, and recreation days (DFC 3, 6, 10, and 12).

Alternative 3 would be consistent with the direction to provide habitat to meet fisheries objectives regarding harvest levels, success rates, and recreation days.
 - Habitat will be managed to help meet state wildlife populations, harvest levels, success rates and recreation days and fully meet standards for fish size success rates, and recreation days (2A).

Alternative 3 would be consistent with the direction to provide habitat to meet fisheries objectives regarding populations, harvest levels, success rates, and recreation days in the area of DFC 2A.
 - May meet state objectives depending upon the area and recreation emphasis (9A).

Alternative 3 would be consistent with this direction.

Other Relevant Mandatory Disclosures

The project as described in Alternative 3 **May Impact Individuals or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing or Cause A Loss of Viability To The Population Or Species (MIIH)** of Colorado River cutthroat trout, Yellowstone/ Snake River cutthroat trout, and MIS Rainbow trout species; AND is **Not Likely to Adversely Affect or Adversely Modify Proposed Critical Habitat** of the Endangered Kendall Warm Springs dace.

Alternative 4 – Modified Grazing Management with Riparian Emphasis

Alternative 4 involves additional grazing management strategies to improve resource conditions that do not meet desired conditions while sustaining livestock operations (see FEIS chapter 2 for a full description of the alternative). The alternative is to continue to authorize grazing on all six allotments with approximately the same number and season of livestock but implement a grazing management with maximum key forage species utilization of 50% in the uplands and 35% or 50% in riparian areas and meadows and minimum greenline stubble height of 4 inches, or 6 inches at certain locations, site-specific range improvements, and progressive design features to meet resource objectives. The permitted core season of use varies by allotment but the season of use generally extends from June 14th to October 15th annually across the project area, which is the same as Alternatives 2 and 3. Under this alternative, an extension of one week to either the start or end of the core season of use could be authorized by the District Ranger. Alternative 4 would change the number of cattle by decreasing the number permitted in Mosquito Lake Pastures in the Upper Green River Allotment by 15 percent or 270 head of cattle to a maximum of 1,530 livestock compared to alternative 2. Actual livestock numbers and/or season of use could be administratively adjusted within the established permitted use in any given year in order to meet allowable use standards, design features, and/or resource objectives under this alternative. Rotational grazing systems would be implemented in the Badger Creek, Roaring Fork, and Beaver-Twin Creeks Allotments that are currently grazed season long. All allotments would be managed under a deferred rotation system with an option to rest. Kinky Creek Pasture would be incorporated into the Tosi/Tepee Creek Area deferred rotation pasture system within the Upper Green River Allotment.

Direct and Indirect Effects

Riparian Condition

The types of effects of Alternative 4 to riparian condition are similar to alternatives 2 and 3; however, the management elements included in alternative 3 to reduce impacts to riparian areas are included also in this alternative as well as a maximum utilization of 35% in most riparian areas (some areas would maintain a maximum riparian utilization of

50%), which would modify the level of effects to fisheries, riparian areas, and aquatic ecosystems. Livestock grazing under this alternative would negatively affect some aspects of watershed and riparian conditions. Grazing livestock would impact streamside vegetation resulting in erosion and reduced stream shading in some locations. Physical alteration of streambanks from livestock trampling would occur where capable grazing areas overlapped with streams. Across the project, there is a limit that would require a pasture move before riparian vegetation along the greenline of streams was grazed below 4 inches average greenline stubble height. In some cases, where resource problems have been identified, this alternative limits those impacts based on site specific designs including bank alteration limits, 6 inch minimum for average greenline stubble heights, or livestock exclusion fences. In addition, if desired conditions are not met, progressive design features are in place to reduce impacts by reducing utilization levels.

The types of effects of alternative 4 to fisheries habitat are similar to alternatives 2 and 3, including including livestock impacts to bank stability, riparian canopy cover, stream temperature, and fine sediment deposition in stream, but there are a number of design features in alternatives 3 and 4 that are intended to reduce those impacts. The effects of this alternative will be compared to the effects of alternatives 2 and 3 and the no action alternative and will refer to the literature summary on the effects of grazing intensity on riparian areas detailed in the effects analysis of alternative 2.

Under this alternative, grazing across the project area would be limited to 50% utilization in the uplands, and there would be a minimum average greenline stubble height requirement of 4 inches. Clary and Webster (1989) recommend that a minimum of 4 inch greenline stubble height should be left on all streams, regardless of the grazing system, to help maintain riparian plant vigor and help prevent other impacts to streams that are caused by grazing riparian areas too intensively. Clary (1999) found that most measures of habitat variables important for salmonids moved closer to desirable conditions with 4 in greenline stubble height and virtually all measures improved with 6 inch greenline stubble height. Livestock grazing preference has been found to switch from herbaceous to woody vegetation at or below 3 inch greenline stubble height, so a 4 inch minimum would result in minimal woody species browse (Hall and Bryant 1995). Clary (1995) found that grazing intensities up to 50% utilization resulted in improving riparian trends on streams that had been subjected to heavy grazing historically. Based on this literature, it appears that 4 inch minimum greenline stubble height and 35-50% maximum utilization would be sufficient to maintain conditions in stream and riparian areas that are in high ecological status, which is the case across most of the project area, and in most cases would even result in improving trends in condition in locations that are impaired due to historical overgrazing. By limiting riparian utilization to 35% across most of the project area (except Wagon Allotment, Noble Pastures Allotment, and Mosquito NW and SW pastures), intensity of livestock use near streams will be lower than alternative 3 except where greenline stubble height is the initial indicator to trigger moving livestock off of a pasture. As a result, it is expected that there would generally be less impacts to stream and riparian conditions.

Bank Stability

Bank stability, which is generally high across the project area according to the WHAM surveys (see existing conditions), would be expected to remain high in much of the project area. There are many miles of high gradient stream with large substrates and intact riparian willow communities, which are generally resistant to livestock grazing impacts. Sensitive stream reaches, low gradient streams with fine channel and bank substrate, that are currently stable would be expected to maintain bank stability at or above the desired conditions for the bank stability by stream type due to the minimum greenline stubble height and maximum riparian utilization limits (Clary and Webster 1989). Because the proposed action limits riparian grazing to light or moderate levels, stream-side vegetation would be expected to be maintained sufficiently to hold banks, and bank alteration would generally be expected to be at reasonable low levels. Key MIM sites would be monitored at 3-5 year intervals to ensure that bank stability conditions were being maintained on streams within the project (see monitoring recommendations). Cattle grazing, as prescribed by this alternative, would be expected to have impacts on bank stability in each of the streams with allotments; cattle watering areas, trails crossing streams, and streams near fence lines and roads would continue to be heavily used, which would result in localized areas of bare and eroding soils. However, these trailing and watering impacts would generally be expected to be lighter under this alternative compared to alternative 2 or alternative 3 because grazing intensity would be limited by the lower maximum utilization limits in riparian areas. Focus areas with bank stability problems are expected to show improvement under this alternative and progressive design features would be implemented if conditions did not improve. Specifically, Tosi Creek, Tepee Creek, Klondike Creek, Strawberry Creek, and Fish Creek, will have bank stability monitoring and will be expected to improve over the timeframe of the project (see monitoring recommendations).

Fine Sediment

Under this alternative, livestock impacts would continue to cause erosion that would contribute to the level of fine sediment in streams; however, fine sediment delivery to streams would be expected to decrease as stream bank conditions improved where they are currently elevated near Focus Areas. Since bank stability is expected to be maintained, where it is at acceptable levels, or improved, in the focus areas with below desired conditions, erosion and fine sediment deposition are expected to decrease under this alternative. As with alternatives 2 and 3, there will continue to be areas with low ground cover associated with livestock trails, watering areas, and near fence lines. This alternative would result in the lowest contribution of fine sediment to stream of all of the alternatives except the No Action alternative.

Stream Temperature

This alternative implements minimum greenline stubble height and riparian utilization limits that will help leave some herbaceous vegetation mats immediately adjacent to streams and reduce the likelihood that livestock will substantially browse willows and other woody vegetation. As a result, streams should be able to maintain undercut banks in many locations and sedge and willow canopies will continue to contribute shade to the

stream. While livestock grazing under this alternative will have some impacts on stream-shading canopy, the streams would be expected to receive as much or more shade under this alternative as the existing conditions. As a result, stream temperature conditions are expected to maintain or improve relative to the existing conditions. In the long-term, stream temperatures are expected to rise under predicted global climate change scenarios, and this alternative would provide moderate to high resiliency to those climate-level impacts.

Effects by Allotment/ Rotation

Badger Creek

As described in the existing conditions, the streams within this allotment are currently in high ecological status. Riparian and stream conditions would be maintained by applying the 35% maximum riparian utilization and 4 inch minimum greenline stubble height.

Beaver-Twin Creek Allotment

There are numerous miles of low-gradient stream habitat within this allotment. This allotment would be changed from a single pasture with season-long grazing under current management to a three pasture deferred rotation under this alternative. This change would improve riparian conditions by alternating the timing of grazing between the three pastures. Actual current use has been 30% and the proposed maximum allowable riparian utilization under this alternative is 35%. Under maximum allowable utilization, impacts to the stream and riparian area would likely maintain the existing condition. Riparian conditions would continue to be monitored with MIM key sites.

Noble Pastures Allotment

The lower extent of Tosi and Klondike Creek are found within Noble Pastures. Both of these streams have focus areas identified. This alternative would eliminate season-long grazing in pasture 4 and allow 2 times over grazing on irrigated pasture. On the Tosi Creek focus area, there would be 6 inch minimum greenline stubble height and 20% maximum bank alteration limits to create a trend toward desired bank stability conditions. Monitoring at the MIM site would ensure that there is at least a stable trend in bank stability at the first reading of the MIM site (after 3-5 years) and a detectable improvement at the second reading (another 3-5 years). If the desired trend was not detected, electrical fencing would be used to exclude livestock access to the stream. The measures proposed would be sufficient to lead to improving trends in stream and fisheries condition on Tosi Creek. Klondike Creek exclusion fence would be restored and expanded and two hardened crossings would be implemented on the stream. The alternative would allow limited riparian grazing as needed to help allow recovery of the willow community. Past exclusion fencing has allowed recovery of sedge and herbaceous vegetation, but willows have not recovered in this stream reach. Riparian fencing will allow for complete management of the stream and riparian area on Klondike Creek from experimentation with limited, controlled disturbance to complete exclusion of domestic livestock. The riparian conditions on Klondike Creek are expected to improve rapidly and reach desired conditions during the time frame of the project. The effects of alternative 4 are the same as alternative 3 for this allotment.

Roaring Fork Allotment

Surveys have indicated that riparian areas are in good ecological status and that grazing impacts have been fairly light in this allotment. Actual use has been around 30% and maximum allowable use would be 35% across the allotment. This alternative would alter the grazing strategy to a three pasture deferred rotation instead of season-long grazing, which would help reduce riparian impacts. For the reasons described under the general effects analysis, 35% maximum utilization and 4 inch minimum greenline stubble height would maintain conditions.

Wagon Creek

This segment of Wagon Creek has an intact riparian area, but shows some impacts to livestock grazing. The allotment has received approximately 50% maximum utilization in recent years, which would become the maximum allowable use under this alternative. In addition, 4 inch minimum greenline stubble height would be implemented to help protect riparian conditions. Because the livestock number, season, and utilization levels would be similar to what has been occurring, stream and riparian conditions would be stable. The effects of alternative 4 are the same as alternative 3 for this allotment.

Upper Green River –Mud Lake/Fish Creek Rotation

The proposed action would generally maintain functioning riparian conditions across this rotation by implementing 35% maximum forage utilization and 4 inch minimum greenline stubble height limits. The section of Crow Creek that is heavily utilized because it is a fence corner of the Mud lake East pasture would be improved by realigning the fence to run along the terrace and off-channel water would be provided either from Crow Creek or a small spring source on the site. Such a fence alignment would result in riparian recovery at this location. Cattle would be actively herded away from the Green River Elk Feedground, which would reduce the impacts that this project has on the riparian condition on the Green River and Roaring Fork near that facility. The Fish Creek focus area would be managed with a 6 inch minimum greenline stubble height and 20% maximum bank alteration limit. In addition, the two-track road that leads to that site would be obliterated to reduce recreational impacts to the site. In combination, that site is expected to have improving conditions and should meet the desired condition for streambank stability by the second round of monitoring (6-10 years). There would be a 6 inch minimum greenline stubble height used to improve riparian conditions on both Fish Creek and Strawberry Creek in the Fish Creek pasture. In combination with the 35% maximum forage utilization, each of the riparian areas that have been found to be in less than satisfactory condition should see improvement.

Upper Green River – Mosquito Lake Rotation

The primary stream system in the Mosquito Lake Rotation is Wagon Creek. Under this alternative, there would be a modest reduction in herd size, maximum riparian utilization would be 35% in the SE and NE pastures and would average 30% over five years with a maximum 50% in a given year in SW and NW pastures, and there would be a four inch minimum greenline stubble height. Within the Wagon Creek Focus Area, the electric

fence would be maintained, the livestock crossing would be hardened, and a gate would be added to the administrative access road to reduce illegal use. The prescription should maintain or improve riparian conditions broadly along Wagon Creek and, specifically, should aid with the recovering trend seen at the focus area. Stream temperatures are likely the greatest concern for fisheries on Wagon Creek. This alternative would likely maintain or improve current riparian canopy and channel conditions, but would not likely resolve current stream temperature concerns on Wagon Creek.

Upper Green River – Tosi Creek/ Tepee Creek Rotation

This rotation has Tepee Creek, Tosi Creek, and Kinky Creek. Tepee Creek, which has a CRCT population, has been found to have less than desired riparian vegetation and bank stability conditions. Under this alternative, a livestock exclusion fence would be constructed around the area considered the Tepee Creek focus area. The riparian area would be fenced along the first high terrace except for one crossing and watering gap. In addition, log habitat structures, which have been determined to be disrupting the natural stream processes, will be removed from the stream. Riparian recovery, even with an excluded riparian area, is expected to be a slow process given the fact that the site has numerous historical impacts and on-going disturbance from unstable beaver dams. Removing the logs may cause additional short-term instabilities but should help restore natural flow conditions, which will benefit the stream over time. Adding the fence enclosure will result in additional riparian fence lines, with some trailing and additional utilization upstream and downstream of the enclosure. The alternative would also result in the addition of the South Kinky Creek pasture, which would reduce the livestock use of the Lower Tepee Creek pasture, since the herd would be split between these two pastures. Generally across the rotation, riparian areas would be expected to be stable or improving with 35% maximum utilization in riparian areas and 4 inch greenline stubble heights.

Upper Green River – Gypsum Creek Rotation

Maintaining a maximum utilization of 35% in riparian areas and a minimum 4 inch green line stubble height would generally be sufficient to maintain or improve riparian conditions across this rotation. South Gypsum Creek, which is recovering from fire effects, would be held to a 6 inch minimum greenline stubble height. Once the MIM site is found to have bank stability that meets the desired conditions for two consecutive monitoring rounds, the minimum greenline stubble height requirement would be reduced to 4 inches. This site has seen improving bank stability conditions, but additional time with light grazing impacts are warranted for full site recovery.

Upper Green River – River Bottom Pasture and Livestock Driveway

Similar to Alternative 2 and 3, most of the impacts occur on tributaries to the Green River, such as Whiskey Creek, Lime Creek, No Name Creek, Klondike Creek, and Tosi Creek. The greatest impacts are immediately adjacent to the road and are caused by livestock crossings and watering opportunities. At full stocking numbers, these impacts would be greater, but would not be expected to cause broad changes in riparian conditions. Consistent with alternatives 2, 3, and the existing conditions, some, but very

little, grazing is expected to occur on the banks of the Green River and there would not be substantial effect to riparian areas of the river.

Kendall Warm Springs Dace

See below in “Effects Common to All Action Alternatives” section

Colorado River Cutthroat Trout

Direct effects of cattle trampling CRCT redds would be similar under this alternative as compared to alternative 2 and 3, but the extent of the effects would be reduced because the lower utilization compared to both of the other action alternatives and added greenline stubble height requirements compared to alternative 2, which would reduce grazing intensity in the riparian area. As described in the effects of alternative 3, changes to grazing strategies in some allotments or rotations would result in changes in the timing that livestock would have access to streams with cutthroat redds compared to alternative 2. The effects to the Rock Creek population would be slightly reduced as the Beaver-Twin Allotment would change from season-long grazing to a deferred pasture rotation. Livestock presence in Tepee-Tosi Pasture during CRCT egg incubation periods would be reduced as the project would add the Kinky Creek pasture to the rotation and the livestock enclosure on Tepee Creek would protect redds within that reach from being damaged. As in Alternative 2, the other CRCT populations would have very limited risk of redd trampling due to either low cattle density or low CRCT density.

This alternative would have some impact on CRCT habitat caused by damage to stream channels and banks from trailing and watering areas, increased fine sediment deposition, and decrease stream shade from riparian vegetation. However, the design features in place for this alternative, including maximum riparian forage utilization, minimum greenline stubble heights, site-specific management elements and structural improvements at focus areas, and progressive design features, would help ensure that stream habitat and riparian conditions are maintained in high ecological condition or trend toward improved conditions where conditions are currently less than satisfactory. Although the alternative would impact stream and riparian areas greater than the no action alternative, those impacts would be modestly less than alternative 3 and substantially less than alternative 2.

Because this alternative would generally maintain or improve existing fisheries habitat conditions, but would have some direct effects and would cause some continuing habitat disturbance and impacts, the alternative would impact individuals and habitat but would not contribute to a decline in populations within the project area. Because most of the CRCT populations within the project area are being invaded by brook trout and are currently believed to be in decline, the improvements in the habitat are unlikely to have a substantial effect on the population density or distribution of the species (Quist and Hubert 2005). At the Forest level, the impacts from this alternative would not reduce the level at which CRCT or their habitat would be well-distributed across the planning area. As a result, the alternative may impact individuals and habitat but would not contribute to a trend toward listing.

Yellowstone/ Snake River Cutthroat Trout

This alternative would have some, although limited, risk of cattle trampling YCT redds. The majority of the YCT habitat is found in the Fish Creek Pasture, which is grazed July 15th to Sept 15th each year. Since cutthroat trout fry emergence occurs in late July or early August, there would be only a short window of temporal overlap between livestock grazing and egg incubation.

Similarly to Colorado River Cutthroat Trout, this alternative would result in continued impacts to stream habitat associated with livestock crossings, watering areas, and riparian grazing. Reducing maximum riparian utilization would reduce these effects compared to the other action alternatives and lead to overall maintenance of stream function and riparian conditions and recovery of degraded conditions. Both the Fish Creek focus area and Strawberry Creek would have minimum 6 inch greenline stubble height requirements, which may result in further limiting grazing intensity in these riparian areas. As a result of the broad restrictions to grazing intensity and the proposed management near focus areas, fisheries habitat would improve from existing conditions. However, since this alternative would maintain or improve habitat conditions for YCT, the project would not reduce the level at which YCT or their habitat would be well-represented or well-distributed on the Forest. As a result, the alternative may impact individuals and habitat, but would not contribute to a trend toward listing.

Rainbow Trout

Within the project area, rainbow trout are found in the Green River and in the lowest segments of some of the tributaries. The reaches of the Green River above the river bend have low natural productivity and very little natural recruitment, so this has historically been maintained with stocking. There is some rainbow trout spawning in the lower reaches of the tributaries to the Green River. Alternative 4 may eventually is expected to maintain or reduce the level of fine sediment in these stream segments, which could have a minor beneficial effect to egg to fry survival of rainbow trout.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

- Goal 3.3 - Sensitive species are prevented from becoming a federally listed Threatened species in Wyoming (pg. 118).

This alternative would result in some impacts to sensitive cutthroat trout habitat, but most stream and riparian areas would remain in high ecological condition or improve where grazing systems would be improved or where utilization levels would decrease. Where problems have been identified, this alternative includes utilization limits or other prescriptions to address those concerns.

Goal 4.7 – Grazing use of the National Forest sustains or improves overall range, soils, water, wildlife, and recreation values or experiences (pg. 120).

Under this alternative, fisheries values and experience would generally be maintained or improved.

- Kendall Warm Springs Management Standard – The existing population and habitat of the Kendall Warm Springs dace will be maintained and enhanced (pg. 125)

This alternative would not be likely to adversely affect Kendall Warm Springs dace. The livestock enclosure fence would continue to be maintained. This alternative would continue to allow livestock to be actively herded through the enclosure, but the impacts to the spring from this activity would be short duration and low intensity.

- Sensitive Species Management Standard – Quantifiable objectives will be developed to identify and improve the status of Sensitive species and eliminate the need for listing (pg 126).

The BTNF adopted Sensitive Species Quantifiable Objectives (2013 letter from Clint Kyle to the Forest Leadership Team). The objectives set time frames for developing conservation assessments, identifying the status of the species, and improving the status of the species. Until the conservation assessments are finalized, the best available science regarding the species habitat requirements and the potential risk factors associated with the project will be used to analyze the potential effects of the project on the status and trend of sensitive fish species.

- Fish Habitat Management Guideline – For fish habitat providing a fishery at or near its potential, fish populations should be maintained at existing levels. For habitat below its potential, habitat should be improved and maintained to at least 90 percent of its natural potential. First priority for improvement should be streams supporting Colorado River and Bonneville cutthroat trout which are Sensitive species (pg 126).

This alternative would result in maintaining current habitat conditions in most locations. Where locations are not currently meeting fisheries habitat objectives, site-specific prescriptions have been developed by the IDT to improve conditions.

- Streambank Stability Guideline – At least 90 percent of the natural bank stability of streams that support a fishery, particularly Threatened, Endangered, and Sensitive species, and all trout species, should be maintained. Streambank vegetation should be maintained to 80 percent of its potential natural condition or an HCI rating of 85 or greater (pg. 126).

Streambanks stability objectives in some of the focus areas would not be expected to be attained during the duration of this project; however, conditions are expected to improve in all locations not meeting current objectives due to the allotment-wide or site-specific measures. Across the project area, based on WHAM surveys, over 90% of fish bearing streams would continue to have streambanks within the range of natural variability.

- Sensitive Cutthroat Trout Habitat Guideline – Habitat occupied by existing and reintroduced populations of Colorado River, Bonneville, and Snake River cutthroat trout should be managed to protect species purity (pg. 126).

No element of this alternative would threaten the genetic purity of cutthroat trout.

- Livestock Grazing of Riparian Areas Standard – Livestock grazing in riparian areas will be managed to protect stream banks. This may be achieved through the use of gravel crossings, tree debris barriers, fencing, riparian pastures, development of alternate watering sites out of the riparian area, longer allotment rests, or improved livestock distribution (pg. 128).

Alternative 3 would involve improving grazing systems to meet Forest Plan standards, adding riparian fencing on Klondike Creek and Tepee Creek, hardening livestock crossings on Wagon Creek and Klondike Creek, and improving livestock distribution by setting riparian utilization limits across all allotments and more stringent limits in areas with identified resource concerns.

- Threatened, Endangered, and Sensitive Species Standard – Range improvements, management activities, and trailing will be coordinated with and designed to help meet fish and wildlife habitat needs, especially on key habitat areas such as crucial winter range, seasonal calving areas, riparian areas, sage grouse leks, and nesting sites. Special emphasis will be placed on helping to meet the needs of Threatened, Endangered, and Sensitive species (pg. 129).

This alternative implements range improvements where impacted riparian areas have been identified. The alternative would continue protections for the Kendall Warm Springs dace population and habitat, and provisions would be made to improve impaired conditions that effect cutthroat trout habitat.

- Consistency with Desired Future Conditions described in the Forest Plan:

- Habitat maintained for viable populations of management indicator species (all DFCs)

Under alternative 4, habitat would not limit viable populations of fisheries MIS species.

- Meets State objectives. Provides habitat for populations, harvest levels, success rates, and recreation days (DFC 3, 6, 10, and 12).

Alternative 4 would be consistent with the direction to provide habitat to meet fisheries objectives regarding harvest levels, success rates, and recreation days.

- Habitat will be managed to help meet state wildlife populations, harvest levels, success rates and recreation days and fully meet standards for fish size success rates, and recreation days (2A).

Alternative 4 would be consistent with the direction to provide habitat to meet fisheries objectives regarding populations, harvest levels, success rates, and recreation days in the area of DFC 2A.

- May meet state objectives depending upon the area and recreation emphasis (9A).

Alternative 4 would be consistent with this direction.

Other Relevant Mandatory Disclosures

The project as described in Alternative 4 May Impact Individuals Or Habitat. But Will Not Likely Contribute To A Trend Towards Federal Listing or Cause A Loss Of Viability To The Population Or Species of Colorado River cutthroat trout, Yellowstone/ Snake River cutthroat trout, and MIS Rainbow trout species; AND is **Not Likely to Adversely Affect or Adversely Modify Proposed Critical Habitat of the Endangered Kendall Warm Springs dace.**

Effects Common to All Action Alternatives

Noble Pastures Water Diversions

The Forest Service owns water rights for irrigating the Noble Pastures allotment on Klondike Creek and Tosi Creek. The diversions do not have fish screens and there is no proposal to screen the ditches. Sampling in the ditches during the summer of 2012 indicated that mottled sculpin and brook trout were present in the ditches. No CRCT were found in the ditches and cutthroat trout entrainment in the ditches would be a rare occurrence since Tosi Creek is not currently considered occupied habitat. There are cutthroat in Tepee Creek, which is a tributary to Tosi Creek, and it is possible that individuals may stray from that population and could potentially be entrained in the ditches. Klondike is a similar situation in which CRCT are located upstream, but it is an isolated population. It appears that a large beaver dam upstream of the diversion is the primary reason that the Klondike Creek CRCT population has not been invaded by brook trout. For that reason, any CRCT that move downstream from the beaver dam would be unable to return to the population. However, this would be a very rare occurrence and would not have population-level impacts. This effect would be common to both action alternatives and the No Action alternative as the Forest Service would maintain the water right even if grazing was discontinued.

Kendall Warm Springs Dace

Grazing livestock would be excluded from the Kendall Warm Springs except that cattle would be allowed through the enclosure while herding the cattle to the allotment or back off the Forest. When cattle would be allowed in the enclosure, they would be required to be actively herded through to the other side. Based on current management, the

permittees would often opt to herd the cattle around the exclosure or allow them to drift around the exclosure. When cattle are being herded through the exclosure, there would be some bank and channel alteration, which some believe could have a beneficial effect to the dace habitat but could also cause dace to temporarily switch habitat, elevate turbidity, and alter submergent vegetation cover. The Forest Service is responsible for maintaining the exclosure fence, but at times, the fence could fail and cattle could access the springs, which could result in livestock-related impacts. The action alternatives would be not likely to adversely affect the Kendall Warm Springs dace or their habitat.

Cumulative Effects (Common to all action alternatives)

Cumulative effects are the incremental impacts of the action when added to the impacts from past, present, and reasonably foreseeable future actions and that overlap with those impacts in space and in time.

Project/ Activity	Potential Effects	Overlap in		Measur able Effect?	Causal Factors & Extent	Aquatic Species or Habitat Effect
		Time	Space			
Forest road construction/ maintenance	Fine sediment	Y	Y	Y	Both forest road construction and maintenance produce fine sediment and, where those roads are hydrologically connected to fish-bearing streams, can cause increased levels of fine sediment deposition	All fish species including, but not limited to, cutthroat trout, rainbow trout, and brook trout. Fine sediment can reduce egg incubation success by smothering and reducing oxygenation of embryos and reduce habitat for juvenile rearing by filling interstitial spaces between larger substrates and filling pools.
Past timber harvest & fuels management	Fine sediment	N	Y	N	Sediment past timber activities have impacted streams in the affected area of this project from soil disturbance in the units and associated activities, such as road and landing construction, but those activities are no longer contributing further impacts to the stream. Although there may be some residual effects to fisheries habitat, they are indistinguishable from background conditions and are dealt with as existing conditions.	NA
Current and future timber harvest & fuels management	Fine sediment	Y	Y	N	Current timbers sales have sufficient design features and mitigation measures to have minimal effects on the aquatic environment.	NA

Project/ Activity	Potential Effects	Overlap in		Measur able Effect?	Causal Factors & Extent	Aquatic Species or Habitat Effect
		Time	Space			
Past livestock grazing	Riparian condition, bank stability, stream temperature, and fine sediment	Y	Y	Y	Historically, grazing intensity was much higher in the project area and there are residual effects to stream and riparian conditions that are still detectable in some areas in the project area. Some of the areas that have been identified as having low bank stability and impaired riparian vegetation conditions are on a recovery trajectory from cumulative grazing impacts. These areas that have long-term grazing impacts are limited in extent across the project area and most have been identified as focus areas including Tepee Creek, Wagon Creek, Klondike Creek, Tosi Creek focus areas.	Riparian vegetation, bank condition, fine sediment deposition have all been impacted in some areas that have been historically overgrazed. Because they are related to past grazing effects, the most notable of these locations have been identified as focus areas. In addition to the focus areas there are areas that have long-term impacts near fence lines and well-established livestock trailing areas.
Current sheep grazing	Fine sediment	Y	Y	N	Current sheep grazing occurs on the west side of the analysis area in the headwaters of Tosi, Klondike, Rock Creek, and other small tributaries of the Green River. The sheep grazing has and continues to reduce ground cover in the uplands, which accelerates erosion. Much of that sediment is likely filtered as most of the sheep impacts are not adjacent to stream channels; however, some sediment related to erosion from sheep grazing would enter stream channels.	Only a small increase in sediment delivery to streams is expected from sheep grazing compared to natural background erosion rates in these watersheds. As a result, there is not expected measurable impacts to aquatic habitats or fish populations.

Project/ Activity	Potential Effects	Overlap in		Measur able Effect?	Causal Factors & Extent	Aquatic Species or Habitat Effect
		Time	Space			
Green Corridor Recreation Planning	Riparian condition, bank stability, and fine sediment	Y	Y	Y	The project would involve eliminating some camping and stream access locations, while developing other location. Overall, the project would be designed to reduce recreational impacts to riparian vegetation and bank stability.	Although the project may have some local detrimental effect to riparian vegetation, there would be a net beneficial impact to riparian conditions along the Green River from the project.
Past fish stocking	Fish populations	Y	Y	Y	Past fish stocking has done more to shape the current condition of fisheries in the project area than all other activities combined. Widespread changes to fish community assemblages have resulted from fish stocking.	Brook trout, rainbow trout, and brown trout stocking have resulted in competitive pressure that has caused the current downward trend in cutthroat trout populations in the project area. Rainbow trout and non-native strains of cutthroat have also lead to hybridization of native cutthroat trout populations. The change from a cutthroat fishery to a fishery dominated by non-native trout has impacts on aquatic foodwebs and may have broader ecosystem impacts.
Angling	Fish populations	Y	Y	Y	Individuals are removed from the population or are injured, stressed, or killed by anglers. Most CRCT populations are in headwaters streams that tend to receive less angling pressure than the Green River or lower sections of tributaries. YCT in SF Fish Creek receive relatively heavy angling pressure.	Angling affects native cutthroat trout and whitefish and non-native rainbow trout, brook trout, and brown trout. The greatest angling pressure is on the Green River and as a result, non-native trout receive the greatest impact.

Summary of Cumulative Effects

Past, current, and reasonably foreseeable future actions have cumulative effects on the fisheries resource in the project area. Activities that have a cumulative effect on fisheries in the Upper Green project area include past livestock grazing, forest road construction and maintenance, Upper Green River Corridor Project, fish stocking, and angling. The largest cumulative effect to fisheries habitat is past livestock grazing. There are numerous locations within the project that have been impacted by livestock grazing. Alternatives 3 and 4 address some of those impacted areas specifically, but some impacts are inherent to authorized livestock grazing including trailing areas, impacted areas near fence lines, watering area, etc. Forest roads also have impacts on watershed processes and generate fine sediment that, in some cases, is delivered to streams that would be affected by the action alternatives. Because most of the cutthroat populations are above roaded areas or have contributing watersheds that have low road densities, these road impacts to sensitive cutthroat trout would be light. Fish stocking has had the greatest contribution to reduction of native cutthroat trout populations due to competition and hybridization. Without these impacts, cutthroat trout would be much more well-represented and well-connected on the Forest. Because of the impacts of stocking non-native trout, it is highly important that fisheries habitat is maintained or improved wherever native cutthroat trout persist. Angling has some cumulative effects on fish populations in the project area. The greatest impact are to harvest fish species in the Green River and on South Fork Fish Creek, although angling pressure occurs on the major fish-bearing tributaries to the Green River and the Gros Ventre River as well.

The effects of alternative 2, when combined with the cumulative effects, may contribute to a trend toward listing for Colorado River cutthroat trout because the alternative would degrade existing habitat conditions for populations that have been severely reduced due to the cumulative effects of other activities. The effects of alternatives 3 or 4, when combined with the cumulative effects, would not contribute to a trend toward listing because the alternative would result in either maintaining or, in most cases, improving current habitat conditions for the CRCT populations. The effect of the project when combined with cumulative effects, regardless of which alternative was selected, would not contribute to a trend toward listing of YCT would be expected to continue to be well-distributed both on the Forest and within the project area.

E. Project Design Features

Through the inter-disciplinary team process, fisheries considerations have been represented and integrated in developing the design features described under the action alternatives in Chapter 2 of the FSEIS.

F. Monitoring Recommendations

The monitoring for the project has been described in detail in appendix C of the FSEIS. Monitoring of riparian conditions using MIM protocols at both the identified focus areas

and representative key sites and the follow-up actions to improve conditions that are currently below desired conditions or that drop below thresholds as revealed by that monitoring process, should that situation arise, is essential to the determinations made for the fisheries resources.

Bank stability has been selected as the primary indicator for riparian monitoring (see the discussion of the importance of bank stability and its use as an indicator of stream and riparian condition under the Existing Conditions section of this report). The Forest Plan Streambank Stability Guideline states that “at least 90 percent of the natural bank stability of streams that support a fishery...should be maintained.” The inherent stability of a channel is dependent upon, among other things, the type of stream channel. We have adopted the minimum desired bank stability ratings developed on the nearby Caribou-Targhee National Forest in Leffert (2005), with the minor modification of increasing the threshold on E-channels from 75% to 85%. Those modified thresholds are displayed in Table 7 below.

Table 7 - Bank stability objective based on Rosgen channel type

Rosgen Channel Type	A1, A2, A6, B1, B2, B3, C1, C2, E3, E4, E5, E6, F1, F2, G1, G2	A3, A4, A5, B4, B5, B6, F3	C3, C4, C5, C6, D3, D4, D5, D6, DA4, DA5, DA6, F4, F5, F6, G3, G4, G5, G6
Bank Stability Objective	85%	80%	75%

Riparian Multiple Indicator Monitoring (MIM) at key sites

Goal: Monitor to determine if grazing at selected level is maintaining desired riparian conditions.

Approximately 10 key sites would be monitored every 3-5 years though the life of the project. Monitoring parameters would include streambank stability, streambank alteration, greenline-to-greenline width, and woody species age class. Monitoring would follow the protocol for Burton *et al.* (2011).

Riparian Multiple Indicator Monitoring (MIM) at focus areas

Goal: Ensure that the proposed grazing level and other measures are causing an upward trend toward desired riparian conditions at riparian focus areas. Sites would be monitored each 3-5

years following the start of the project. If conditions fail to improve the inter-disciplinary team would consider whether grazing impacts were a primary contributor to the failing of the site to move toward desired conditions and make a recommendation to the line officer regarding the appropriate progressive design feature to enact.

Monitoring of fence around Kendall Warm Springs

Goal: Ensure that the fence around Kendall Warm Springs remains in functional order to maintain exclusion of livestock.

Survey the fence line at least every other year to ensure that there are no fence failures. Correct any defects in the fence as they are detected.

G. Effects Summary

Table 8. Effects Summary Table

	No Action	2- Current Management	3- Modified Grazing Management	4- Modified Grazing Management with Riparian Emphasis
Riparian Condition	Improves general riparian conditions, quickest recovery of focus areas	Reduces general riparian conditions under maximum utilization levels; focus areas would remain below desired conditions	Maintains or improves areas currently functioning; improvement to focus areas; possible increase in riparian utilization	Maintains or improves areas currently functioning; improvement to focus areas
Bank Stability	Increases stability	Reduced stability in sensitive reaches	Maintains or increases stability	Maintains or increases stability
Fine Sediment	Reduces fine sediment delivery to streams	Increases fine sediment delivery to streams	Slightly reduces fine sediment delivery; fine sediment above to natural levels	Moderately reduces fine sediment delivery; fine sediment above natural levels
Stream Temperature	Increases shade and improves channel form, which would improve	Reduces shade and channel complexity, which would result in increased	Maintains current conditions	Maintains or modestly improves current conditions

	buffering from temperature fluctuation	temperature fluctuation		
Kendall Warm Springs Dace	Not likely to adversely affect individuals or habitat	Not likely to adversely affect individuals or habitat	Not likely to adversely affect individuals or habitat	Not likely to adversely affect individuals or habitat
Colorado River Cutthroat Trout	Improves habitats, but populations continue to decline	Degrades habitats and increases declines in populations	Maintains or improves habitats, but populations continue to decline	Maintains or improves habitats, but populations continue to decline
Yellowstone Cutthroat Trout	Improves habitats, and populations remain stable	Degrades habitats, and populations remain stable	Maintains or improves habitats, and populations remain stable	Maintains or improves habitats, and populations remain stable
Rainbow Trout	Slightly improves habitats, and populations continue to decline	Slightly degrades habitats, and populations continue to decline	Maintains habitats, and populations continue to decline	Maintains habitats, and populations continue to decline

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