Aquatic Biological Assessment for Bull Trout

2020 Forest Plan for the Helena Lewis and Clark National Forest

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List of Terms and Abbreviations

Terms used in this document

Terms	Additional information/full name
amendment forests	Collective term for the Helena-Lewis and Clark, Kootenai, and Lolo National Forests
the Forest	Helena-Lewis and Clark National Forest
the Service	U.S. Fish and Wildlife Service
assessment	Assessment of the Helena Lewis and Clark National Forest
2020 Forest Plan	Helena–Lewis and Clark National Forest Revised Land Management Plan
Helena 1986 forest plan	Helena National Forest Land and Resource Management Plan (1986)
Lewis and Clark 1986 forest plan	Lewis and Clark National Forest Land and Resource Management Plan (1986)
2012 planning rule	National Forest System land management planning rule (effective 2012)

Abbreviations used in this document

Abbreviation	Description
ACS	Aquatic Conservation Strategy
BA	biological assessment
BASI	best available scientific information
BO	biological opinion
CDNST	Continental Divide National Scenic Trail
CFR	Code of Federal Regulations
CWN	conservation watershed network
d.b.h.	diameter at breast height
DC	desired condition (forest plan component)

Abbreviation	Description
DCA	demographic connectivity area
EIS	environmental impact statement
ESA	Endangered Species Act
FMO	forage, migration, and overwintering
FS	Forest Service
FW	forestwide (forest plan component)
GA	geographic area
GBCS	Grizzly Bear Conservation Strategy
GDL	Guideline (forest plan component)
GIS	geographic information system
GO	goal
HLC NF	Helena – Lewis and Clark National Forest
HNF	Helena National Forest
ICEBMP	Interior Columbia River Basin Ecosystem Management Project
INFISH	Inland Native Fish Strategy
IRA	inventoried roadless area
LCNF	Lewis and Clark National Forest
MA	management area
mi	mile
mmbf	million board feet
mmcf	million cubic feet
MDFWP	Montana Department of Fish Wildlife and Parks
MPI	matric of pathway indicator
NCDE	Northern Continental Divide Ecosystem
NEPA	National Environmental Policy Act
NFS	National Forest System
NRLMD	Northern Rockies Lynx Management Direction
OBJ	objective
PACFISH	Pacific Fish Strategy
PCA	primary conservation area
PCE	primary constituent element
PIBO	PACFISH/INFISH Biological Opinion
RWA	recommended wilderness area
RHCA	riparian habitat conservation area
RMO	riparian management objective
RMZ	riparian management zone
S&R	spawning and rearing
STD	standard (forest plan component)
SUIT	suitability
TCEF	Tenderfoot Creek Experimental Forest
TMDL	total maximum daily load
USDA	United States Department of Agriculture

Abbreviation	Description
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WCF	watershed condition framework
WSR	wild and scenic river

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Introduction

This portion of the programmatic biological assessment (BA) addresses the effects of implementing the revised Land and Resource Management Plan (hereinafter referred to as the 2020 Forest Plan) on the only listed threatened aquatic species known to occur on the Helena–Lewis and Clark National Forest, the bull trout (*Salvelinus confluentus)* and bull trout critical habitat. Throughout this portion of the document, the Helena–Lewis and Clark National Forest will be referred to as “the HLC NF” when referencing the single administrative unit, the staff that administers the unit, or the National Forest System (NFS) lands within the unit.

Threatened, endangered, and proposed species are managed by the U.S. Fish and Wildlife Service (USFWS) under the authority of the Endangered Species Act (PL 93-205, as amended) and by the U.S. Forest Service (USFS) under the authority of the National Forest Management Act (PL 94-588). Section 7(a)(1) of the Endangered Species Act (ESA) of 1973 directs all Federal agencies to “utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act.” Section 7(a)(2) of the ESA requires federal agencies to ensure that any actions authorized, funded, or carried out by the agency are not likely to jeopardize the continued existence of any threatened, endangered, or proposed species or adversely modify its critical habitat. Section 7 consultation does not include candidate species.

A biological assessment (BA) must be prepared for federal actions [defined under the National Environmental Policy Act (NEPA) as a project significantly affecting the quality of the human environment] to evaluate the potential effects of the proposal on listed or proposed species (50 CFR 402.12(b)). The contents of the BA are at the discretion of the federal agency and will depend on the nature of the federal action (50 CFR 402.12(f)). The Forest Service (FS) also has direction in Forest Service Manual 2670 that guides habitat management for threatened, endangered, and proposed species. This document satisfies those requirements. Additional consultation occurs as site-specific projects are implemented under the programmatic framework provided by the national forest plans.

Federally Designated Species and Designated Critical Habitat

In accordance with section 7(c) of the Act, the USFWS has determined that the following federally designated species may be present on the HLC NF (Table 1) (USFWS data originally reviewed on 10/23/2018).

Table 1. Federally designated species on the HLC NF

Common Name	Scientific Name	Status[1]	Range – Montana
Bull Trout	*Salvelinus confluentus*	Threatened; Critical Habitat	Resident in cold water streams, rivers, lakes; west of the continental divide
Grizzly Bear	*Ursus arctos horribilis*	Threatened	Resident, transient; Alpine/subalpine coniferous forest; western Montana
Canada Lynx	*Lynx canadensis*	Threatened; Critical Habitat	Resident – core lynx habitat, western Montana, montane spruce/fir forests. Transient – secondary/peripheral lynx habitat
Wolverine	*Gulo luscus*	Proposed	High elevation alpine and boreal forests that are cold and receive enough winter precipitation to reliably maintain deep persistent snow late into the warm season

Common Name	Scientific Name	Status[1]	Range – Montana
Whitebark Pine	*Pinus albicaulis*	Candidate	Forested areas in central and western Montana in high-elevation, upper montane habitat near treeline

1. **Endangered** - Any species that is in danger of extinction throughout all or a significant portion of its range.
 Threatened - Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
 Candidate - Those taxa for which the Service has sufficient information on biological status and threats to propose to designate them as threatened or endangered. We encourage their consideration in environmental planning and partnerships, however, none of the substantive or procedural provisions of the Act apply to candidate species.
 Critical Habitat - The specific area (i) within the geographic area occupied by a listed species, at the time it is listed, on which are found those physical or biological features (I) essential to conserve the species and (ii) that may require special management considerations or protection: and (iii) specific areas outside the geographic area occupied by the species at the time it is listed upon determination that such areas are essential to conserve the species.
 Proposed - Once a species is proposed, a year-long review period commences at the end of which the Service will make a final listing determination. ESA regulation 50 C.F.R. 402.10(a) states: "Each Federal Agency shall confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed." Conferencing is not required for anything less than a jeopardy call, but conferencing or concurrence may be requested by the action agency.

Consultation history

The combined HLC NF has been managed to date under two separate forest plans, both first approved in 1986. Because the Lewis and Clark National Forest is not within the Columbia Basin, it was not covered by INFISH that was implemented in 1995 for forests west of the Continental Divide. Later, when bull trout were listed, no aquatic consultation with the USFWS occurred for the portion of the Helena east of the Continental Divide, nor for the Lewis and Clark National Forest.

The record of consultation for the 2020 Forest Plan is found in appendix A of this BA. The following is a summary synopsis of key ESA Section 7 consultations for bull trout completed on the 1986 Helena Forest Plan amended by INFISH in 1996 for NFS lands west of the Continental Divide. A biological opinion (BO) was received by the USFWS in 1998 for all forests within the range of bull trout. On October 18, 2010, the USFWS posted the "Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for Bull Trout in the Coterminous United States: Final Rule" in the *Federal Register* ("Final Rule"). 75 Fed. Reg. 63898 (October 18, 2010). The final rule designated bull trout critical habitat in certain portions of rivers across Montana, Idaho, Nevada, Oregon, and Washington. The HNF consulted on and received concurrence for effects of ongoing projects in bull trout critical habitat in 2011.

Recently, Thomas et al. (2018) submitted the BA addressing the Effects of Ongoing Implementation of 26 Land Resource Management Plans on the Bull Trout and Bull Trout Critical Habitat as amended by the 1994 Northwest Forest Plan, the Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon, Washington, Idaho, and portions of California and the Inland Native Fish Strategy, and the Southwest Idaho Ecosystem and the Beaverhead-Deerlodge Revised Forest Plans. On December 21, 2018, the USFWS issued a BO Effects of Ongoing U.S. Forest Service Implementation of 26 Land Resource Management Plans, as amended by Five Aquatic Conservation Strategies, on the threatened Bull Trout *(Salvelinus confluentus)* and Bull Trout Critical Habitat In Oregon, Washington, Idaho, Montana (U.S. Department of the Interior 2018).

Description of the Proposed Action

The HLC NF proposes to revise its land and resource management plan in compliance with the NFS land management planning rule (USDA 2012a) (36 CFR § 219). The area covered under this revision is shown in Figure 1. Only the effects of the proposed action west of the continental divide would have any bearing on bull trout and bull trout critical habitat.

To develop a proposed action that makes changes to a forest plan, the management direction in the current plan and its amendments was reviewed. Effective management component and direction in the existing plan were retained in whole or in part and modified or augmented by incorporating relevant new scientific information or direction from other regulatory documents. The 2012 Planning Rule requirements also mandate that new management direction be developed to address sustainability. Consideration of ecologic, economic, and social sustainability is required by the 2012 Planning Rule.

Purpose and need

In 2015, the formerly separate Helena National Forest and Lewis and Clark National Forest were combined administratively to form the HLC NF. Each separate forest had its own forest plan that has continued to direct management on the formerly separate portions of the combined HLC NF. As a result of combining the two forests to be managed as one unit, there is a need to develop a single forest plan for the entire administrative area.

The HNF and LCNF forest plans were both completed in 1986, over 30 years ago. Since that time, some conditions of the land and resources have changed, some social, economic, or ecological needs and conditions have changed, and new scientific and other information has become available. There is a need to revise the forest plans to consider or incorporate those changes.

In May 2012, the Department of Agriculture began using new planning regulations, commonly called the 2012 Planning Rule, to guide collaborative and science-based revision of forest plans. The purpose of the 2020 Forest Plan is to provide an integrated set of plan direction (or plan components) in accordance with the 2012 Planning Rule.

The 2020 Forest Plan would guide natural resource management activities on the Forest and address changed conditions and direction that have occurred since the 1986 forest plans were prepared and amended while meeting the objectives of federal laws, regulations, and policies. The 2020 Forest Plan does not authorize site-specific prohibitions or activities; rather it establishes broad direction, like zoning in a community. Project or activity decisions would be made following appropriate procedures. Site-specific analysis in compliance with the NEPA would be conducted in order for activities to be in compliance with the broader direction of the 2020 Forest Plan.

The 2020 Forest Plan provides guidance for project and activity-level decision making on the Forest for approximately the next 15 years. This guidance includes:

1. Forest wide components to provide for integrated social, economic, and ecological sustainability, and ecosystem integrity and diversity, while providing for ecosystem services and multiple uses. Components must be within FS authority and consistent with the inherent capability of the plan area (36 Code of Federal Regulations (CFR) 219.7 and CFR 219.8–219.10).

2. Recommendations to Congress (if any) for lands suitable for inclusion in the National Wilderness Preservation System and/or rivers eligible for inclusion in the National Wild and Scenic Rivers System (36 CFR 219.7(2)(v) and (vi)).

3. The plan area's distinctive roles and contributions within the broader landscape.

4. Identification or recommendation (if any) of other designated areas (36 CFR 219.7 (c)(2)(vii).

5. Identification of suitability of areas for the appropriate integration of resource management and uses, including lands suited and not suited for timber production (36 CFR 219.7(c)(2)(vii) and 219.11).

6. Identification of the maximum quantity of timber that may be removed from the plan area (36 CFR 219.7 and 219.11 (d)(6)).

7. Identification of geographic area- or management area-specific plan components (36 CFR 219.7 (c)(3)(d).

8. Identification of watersheds that are a priority for maintenance or restoration (36 CFR 219.7 (c)(3)(e)(3)(f).

9. Plan monitoring program (36 CFR 219.7 (c)(2)(x) and 219.12

Action area

The HLC NF (Figure 1) is at the heart of the northern Rocky Mountain ecosystem and is encircled by the Flathead, Custer-Gallatin, Beaverhead-Deerlodge, and Lolo National Forests. Large designated wilderness areas; such as the Scapegoat - Bob Marshall Wilderness Complex in concert with other undeveloped backcountry areas, lands managed for production of timber, and interspersed private lands, primarily in the valley floor, provide habitat for diverse plant and animal species, including fluvial bull trout. For the purposes of this BA, the action area for bull trout includes all HLC NF lands west of the continental divide. Within the planning area west of the continental divide there are 420,980 acres, of the total there are 19,233 acres of private lands (Table 2).

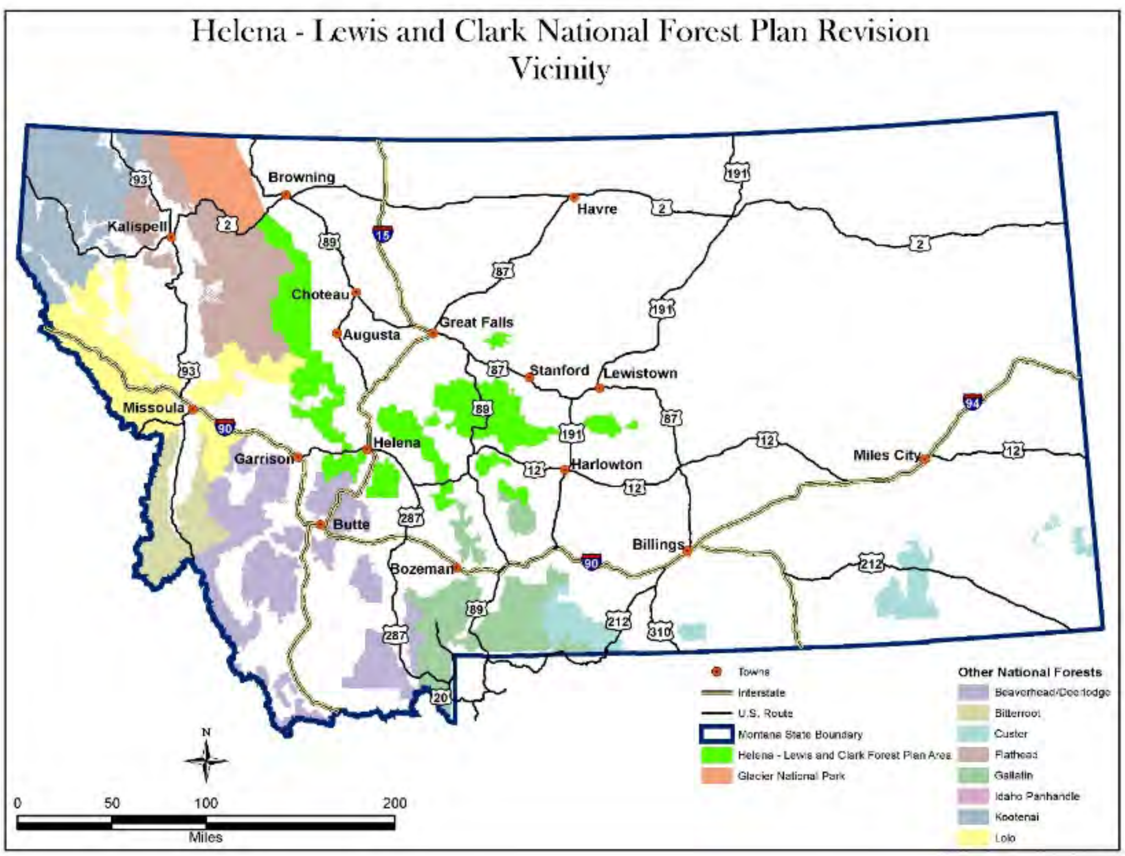

Figure 1. Helena-Lewis and Clark National Forest and vicinity

Table 2. Number of acres by land ownership type within the planning area, west of the continental divide

Ownership	Acres
NFS	396,803
Private	19,233
State	4,904
County	6
City of Helena	6
Water	28
Total	420,980

Forest planning framework

The provisions in the 2012 Planning Rule (USDA 2012b) were used to develop the 2020 Forest Plan. Those expected to be most relevant to this BA include the sections on sustainability and the diversity of plant and animal communities, in that they will influence the planning process and plan content with respect to federally listed species, species proposed for listing, and candidate species; the ecosystems upon which they depend; and furtherance of ESA goals.

Within the requirements set forth in the 2012 Planning Rule, land management plans provide a programmatic framework and the sideboards to guide decisions for all natural resource management activities on their respective NFS units. Plans include plan components (desired conditions, objectives, standards, guidelines, and suitability of areas) that influence the design and choice of future proposals for projects and activities in a plan area and include monitoring items. They provide additional definitions of resource management activities needed to implement and achieve desired conditions and objectives and, through suitability determinations, standards, and guidelines, they establish constraints upon the decision space for on-the-ground management decisions.

The forest plan provides the framework and text guiding day-to-day resource management. It is strategic and programmatic and does not provide project-level decisions or result in irreversible or irretrievable commitments of resources.

The purpose of the 2020 Forest Plan is to guide management toward the attainment of long-term desired conditions. Given the multiple resource nature of land management, the many types of projects, and the various activities that can occur over the life of the 2020 Forest Plan, it is not likely that a project or activity would maintain or contribute to the attainment of all desired conditions. Additionally, not all desired conditions are relevant to every activity (e.g., recreation desired conditions may not be relevant to a fuels treatment project). Most projects and activities are developed specifically to maintain or move conditions toward one or more of the desired conditions of the 2020 Forest Plan. It should not be expected that each project or activity would contribute to all desired conditions in a plan; usually it would contribute to one or a subset.

Changes in aquatic plan components from INFISH

The term Riparian Habitat Conservation Area (RHCA) has been replaced with the term Riparian Management Zone, or RMZ. While the term is different in this plan revision, the intent of RMZ remains the same as RHCAs in INFISH. The name was changed because RHCA for some groups became synonymous with “buffer” or “no activity”. Management in RHCAs was always expected so long as activities improved riparian function, or at least maintained it. Standards and guides in INFISH have been carried forward and continue to limit those activities that could cause long term damage in the RMZ.

For this plan revision, the RMZ retains the original total interim width minimums for fish bearing (300 feet) and perennial (150 feet) streams. The 100 ft width for intermittent streams has remained the same for those watersheds originally identified as priorities; all intermittent streams for this plan revision are now 100 feet. The RMZ total width has been split into Inner and Outer in this plan revision to meet the original intent of INFISH. Original INFISH interim widths were conservative and were expected to both get smaller and larger based on individual site conditions. While some RHCA widths were increased when site conditions warranted, RHCAs were rarely reduced in size when site conditions allowed. Therefore, the inner RMZ in this revision is based on best available scientific information on the widths needed to protect riparian conditions in nearly all instances. The outer width, still a part of the RMZ, allows some management flexibility so long as activities do not diminish the function of the inner RMZ.

Other changes include adding components called Desired Conditions to help guide project activities. Some standards and guides have been modified when they have been found to be unobtainable as originally written. An example change would be RM-1 in INFISH. It required all recreation sites retarding attainment of Riparian Management Objectives (RMOs) to be repaired. In this plan revision, the equivalent guideline for recreation sites does not require all sites retarding function to be repaired immediately as that was and is beyond the fiscal capacity of the agency. Instead, it recommends relocation where possible and when not, to reduce effects by other means.

Finally, this plan does not utilize RMO's as they were originally structured in INFISH. In the 1990's, single values were identified for several habitat processes regarding what constituted good habitat and there was an expectation that those values could be reached for all pathways and all streams simultaneously. Research since that time has shown this was an unrealistic expectation that never naturally occurred prior to modern forest management. Therefore, the Desired Condition plan components in this plan revision guide projects towards restoring processes. Monitoring now houses RMO's as ranges in the managed environment to be compared against ranges in similar reference conditions.

Programmatic decision

The 2020 Forest Plan is programmatic in scope. It provides the framework for future site-specific actions that are subject to section 7 consultation but does not authorize, fund, or carry out future site-specific actions. Future project-level activities must be consistent with the direction in the 2020 Forest Plan and must undergo their own NEPA planning and decision-making procedures, including the appropriate ESA section 7 consultation. The management direction contained in the 2020 Forest Plan will go into effect once the final record of decision is signed by the Forest Supervisor. Project-level environmental analysis will still need to be completed for proposals that would implement the direction in the forest plan.

Management, geographic, and designated areas

Every plan must have management areas or geographic areas or both. The plan may identify designated or recommended designated areas as management areas or geographic areas (36 CFR 219.7(d)). These areas are assigned sets of plan components such as desired conditions, suitable uses, and in some areas either standards or guidelines or both. Geographic area (GA) desired conditions describe what we want to achieve in specific GAs that are not necessarily covered by forest wide desired conditions. Although all resources have been considered, the only desired conditions specified for a GA are those that are not adequately addressed by forest wide desired conditions. The 2020 Forest Plan only has GAs.

Designated areas are features that are identified and managed to maintain their unique special character or purpose. Some categories of designated areas may be designated only by statute and some categories may be established administratively in the land management planning process or by other administrative processes of the Federal executive branch. Examples of statutorily designated areas are national heritage areas, national recreational areas, national scenic trails, inventoried roadless areas, wild and scenic rivers, wilderness areas, and wilderness study areas. Examples of administratively designated areas are experimental forests, research natural areas, scenic byways, botanical areas, and significant caves (36 CFR 219.19).

Plan components

Plan components guide future projects and activities and the plan monitoring program. Plan components are not commitments or final decisions approving projects or activities. Some plan components have also been designed to address drivers and stressors of ecosystems. Plan components most relevant to bull trout can be found in appendix B of this document.

Desired conditions, objectives, goals, standards, guidelines, suitability, and monitoring questions and monitoring indicators have been given alpha-numeric identifiers for ease in referencing within the 2020 Forest Plan. The identifiers include:

- the level of direction (e.g., forest wide = FW or geographic area = GA; for bull trout, the only geographic areas applicable to the bull trout section of this BA is the Divide (DI) and Upper Blackfoot (UB);
- the resource, e.g., WTR = Watershed, RMZ = Riparian Management Zones, and FAH = Fisheries and Aquatic Habitat;
- the type of direction (where DC = desired condition, OBJ = objective, GO = goals, STD = standard, GDL = guideline, SUIT = suitability);
- a unique number (i.e., numerical order starting with "01").

Thus, forest wide direction for desired conditions associated with watersheds would be identified starting with FW-WTR-DC-01 and desired conditions for the Divide GA would be identified starting with DI-FAH-DC-01.

The following are definitions and description of the context of the required plan components (36 CFR 219.7(e)). These can also be found in the introductory paragraphs of Appendix B: Key plan components.

Desired conditions

A DC is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions must be described in terms that are specific enough to allow progress toward their achievement to be determined but must not include completion dates (36 CFR 219.7(e)(1)(i)).

Desired conditions are not commitments or final decisions approving projects and activities. The DC for some resources may currently exist, but for other resources they may only be achievable over a long time period.

This plan presents two types of DCs, as follows:

- Forest wide DCs apply across the landscape but may be applicable to specific areas as designated on a map.

- Geographic area DCs are specific to an area or place, such as a river basin or valley, and reflect community values and local conditions within the area. They do not substitute for or repeat forest wide DCs. These DCs allow a focus on specific circumstances in specific geographic locations. The Divide GA west of the continental divide, which is the Little Blackfoot drainage, and the Upper Blackfoot GA, which is the headwaters and tributaries of the Blackfoot River, are the two GAs endemic to bull trout.

Objectives

An OBJ is a concise, measurable, and time-specific statement of a desired rate of progress toward a DC or conditions. Objectives should be based on reasonably foreseeable budgets (36 CFR 219.7(e)(1)(ii)). Objectives describe the focus of management in the plan area within the plan period. Objectives occur over the life of a forest plan, considered to be over the first 15 years of plan implementation, unless otherwise specified**.** Objectives can be forest wide or specific to GAs.

It is important to recognize that OBJs were developed considering historic and expected budget allocations as well as professional experience with implementing various resource programs and activities. It is possible that OBJs could either exceed or not meet a target based upon several factors, including budget and staffing increases/decreases, increased/decreased planning efficiencies, and unanticipated resource constraints.

Goals

A plan may include goals (GOs) as plan components. Goals are broad statements of intent, other than DCs, usually related to process or interaction with the public. Goals are expressed in broad, general terms, but do not include completion dates. (36 Code of Federal Regulations 219.7(e)(2)). Goals may be appropriate to describe a state between current conditions and DCs but without specific amounts of indicators. Goals may also be appropriate to describe overall desired conditions of the plan area that are also dependent on conditions beyond the plan area or FS authority.

Standards

A standard (STD) is a mandatory constraint on project and activity decision-making, established to help achieve or maintain the DC or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iii)). Standards can be developed for forest wide application or be specific to a management area or GA.

Guidelines

A guideline (GDL) is a constraint on project and activity decision-making that allows for departure from its terms, so long as the purpose of the GDL is met. Guidelines are established to help achieve or maintain a DC or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iv)). A GDL can be forest wide or specific to a management area or a GA.

Suitability of lands

Specific lands within the Forest are identified as suitable (SUIT) for various multiple uses or activities based on the DCs applicable to those lands. The plan identifies lands within the Forest as not suitable for uses that are not compatible with DCs for those lands. The suitability of lands are not identified for every use or activity following guidance provided at 36 CFR 219.7 (e)(1)(v)). Suitability identifications may be made after consideration of historic uses and of issues that have arisen in the planning process.

Identifying suitability of lands for a use in the forest plan indicates that the use may be appropriate but does not make a specific commitment to authorize that use. Final suitability determinations for specific authorizations occur at the project or activity level decision making process. Generally, the lands on the Forest are suitable for all uses and management activities appropriate for national forests, such as outdoor recreation, range, or timber, unless identified as not suitable. Every plan must identify those lands that are not suitable for timber production (§ 219.11). (36 Code of Federal Regulations 219.7(e)(1)(v)). For forest wide suitability determinations, please see Chapter 2 in the 2020 Forest Plan and for GA specific suitability determinations, see chapter 3.

Monitoring program

The monitoring program is designed to test assumptions used in developing plan components and to evaluate relevant changes and management effectiveness of the plan components. Typically, monitoring questions seek additional information to increase knowledge and understanding of changing conditions, uncertainties, and risks identified in the best available scientific information (BASI) as part of an adaptive management framework. BASI can identify indicators that address associated monitoring questions. The BASI is also important in the further development of the monitoring program as it may help identify protocols and specific methods for the collection and evaluation of monitoring information (from FS Handbook 1909.12 07.11). Appendix B of the 2020 Forest Plan contains the monitoring program and additional information about adaptive management.

Other required plan content

The 2020 Forest Plan is designed to communicate the concepts of strategic guidance and adaptive management for the HLC NF. In addition to requiring that a plan have components, the 2012 Planning Rule requires that a plan have “other required content” (36 CFR 219.7(f)(1)). So, in addition to plan components, the 2020 Forest Plan includes information on priority watersheds, distinctive roles and contributions of the plan area, monitoring, proposed and possible actions, and conservation watersheds. Technically, conservation watersheds are not “required other plan content” found in the 2012 planning rule. Rather, conservation watersheds, collectively known as conservation watershed networks (CWN), are regionally required by the Northern Region of the Forest Service and meet intended outcomes of INFISH and the Interior Columbia River Basin Ecosystem Management Project (ICEBMP) Framework (2014).

Priority watersheds

The 2012 Planning Rule requires land management plans to identify “priority watershed(s)” that are a priority for maintenance or restoration [36 CFR 219.7(f)(1)]. Priority watersheds are identified by the Forest using guidance from the Watershed Condition Classification Technical Guide (U.S. Department of Agriculture 2011a)), and step A of the Watershed Condition Framework (U.S. Department of Agriculture 2011b). Often, these watersheds are selected based on a broad array of partner needs such as high risk of fire in a municipal watershed or a 303(d) listing. While at risk aquatic species may be a reason for Priority Watershed selection, often they are not. The four sub watersheds currently identified as Priority Watersheds for restoration are all on the State of Montana’s 303(d) list. Three of the four (Headwaters Sheep Creek, Cabin Gulch, Upper Tenmile) are in the Missouri River Drainage east of the Continental Divide. Only Telegraph Creek is located west of the Continental Divide in the Little Blackfoot core area; bull trout have been extirpated from this watershed. It too is on the 303(d) list for water quality impairment. Priority watersheds can also include watersheds that are designated in the conservation watershed networks, municipal watersheds, and watershed that include Montana 303 d listed stream segments, although inclusion of these types of designated watersheds are not required in order to become a priority watershed.

Distinctive roles and contributions within the broader landscape

The description of the plan area's distinctive roles and contributions within the broader landscape reflects those things that are truly unique and distinctive (36 CFR 19.2(b)). This description is important because it is a source of motivation or reasons behind desired conditions. It is important to understand the ecological, social/economic, and cultural/historic context of the plan area in order to better gauge the relative importance of each role. Doing so helps to set realistic and achievable DCs, which are the basis for management direction over the next 15 years. Each of the ten GAs has its own set of distinctive roles and contributions and can be found in chapter 3 of the 2020 Forest Plan. Within the broader landscape, the ecological; social and economic; and cultural and historic characteristics are described in the 2020 Forest Plan.

Proposed and possible actions

The 2012 Planning Rule requires land management plans to "…contain information reflecting proposed and possible actions that may occur on the plan area during the life of the plan, including: the planned timber sale program; timber harvesting levels; and the proportion of probable methods of forest vegetation management practices expected to be used (16 United States Code 1604(e)(2) and (f)(2)). Such information is not a commitment to take any action and is not a 'proposal' as defined by the Council on Environmental Quality regulations for implementing the NEPA (40 CFR 1508.23, 42 U.S.C. 4322(2)(C)). (36 CFR 219.7(f)(1))." Management approaches and strategies presented in this section may include suggestions for on-the-ground implementation, analysis, assessment, inventory or monitoring, and partnership and coordination opportunities the Forest is proposing as helpful to make progress in achieving its desired conditions. The potential approaches and strategies are not intended to be all-inclusive, nor commitments to perform particular actions.

Conservation Watershed Network (CWN)

The purpose of the CWN is to create a network of watersheds where management helps support the maintenance and recovery of aquatic at risk and listed species. Based on consultation discussions after the DEIS was published, the network has been refined where bull trout are present. West of the Divide, the network has been reduced to increase focus on those watersheds with local populations of bull trout, also watersheds that historically had populations of 50 spawning adults but now have less and are therefore called "other remnant populations", and or watersheds with bull trout critical habitat. Conservation watersheds west of the Continental Divide are listed in Table 3. and described in greater detail later in this BA and appendixes. Watersheds in the CWN west of the Divide are intended to meet the original intent of INFISH, as well as direction in the ICBEMP Framework (2014). The rationale for inclusion in CWN west of the divide also includes patches of unoccupied habitat with a greater than 75% probability to provide suitable spawning and rearing habitat for bull trout in warming climate scenario modelled for 2040.

Table 3. Conservation watershed network west of the Continental Divide

Geographic area	4th code HUC (HUC #)	5th code HUC (HUC #)	6th code HUC (HUC #)	6th code HUC acres	Reason for inclusion in CWN
Divide	Upper Clark Fork (17010201)	Little Blackfoot River Headwaters (1701020105)	Ontario Creek (170102010501)	12,801	Bull Trout Present
			Little Blackfoot River-Larabee Gulch (170102010502)	18,162	Bull Trout Present
			Little Blackfoot River-Hat Creek (170102010507)	13,522	Bull Trout Present

Geographic area	4th code HUC (HUC #)	5th code HUC (HUC #)	6th code HUC (HUC #)	6th code HUC acres	Reason for inclusion in CWN
Upper Blackfoot	Blackfoot (17010203)	Blackfoot River Headwaters (1701020302)	Blackfoot River-Anaconda Creek (170102030202)	17,154	Mainstem Critical habitat
			Blackfoot River-Hardscrabble Creek (170102030206)	12474	Mainstem Critical habitat
			Lower Alice Creek 170102030204	11,697	Bull Trout Present
			Hogum Creek 170102030205	7,630	Bull Trout Present
		Landers Fork (1701020301)	Copper Creek (170102030103)	26,005	Bull Trout Present
			Lower Landers Fork (170102030104)	15,662	Bull Trout Present
		Blackfoot River-Keep Cool Creek (1701020309)	Poorman Creek (170102030302)	25,783	Bull Trout Present
			Blackfoot River-Lincoln (170102030301)	11,399	Mainstem Critical habitat
			Arrastra Creek (170102030309)	15,084	Climate Shield
			Blackfoot River-Little Moose Creek (170102030310)	20,036	Mainstem Critical habitat
		Nevada Creek (1701020304)	Nevada Creek Headwaters (170102030401)	25,255	Climate Shield
		North Fork Blackfoot (1701020306)	East Fork North Fork Blackfoot (170102030603)	20,685	Climate Shield
			Meadow Creek (170102030601)	11,877	Climate Shield
			Mineral Creek (170102030602)	9,492	Climate Shield

The possible actions and potential management approaches and strategies the HLC NF may undertake to make progress in achieving the DCs can be found in appendix C of the 2020 Forest Plan.

INFISH standards and guidelines

The Inland Native Fish Strategy (INFISH) (USDA 1995), which is the current aquatic conservation strategy for the Forest, was designed to halt degradation caused by land management practices in place at that time and preserve future management options. The greatest emphasis was placed on standards and guidelines which restricted activities that could further degrade habitat. INFISH was expected to be interim guidance followed by a decision document known as the Interior Columbia Basin Ecosystem Management Project (ICBEMP). This document is like the Northwest Forest Plan (NWFP) and would have made longer term conservation commitments. The 1986 Helena Forest Plan was amended to include INFISH in 1996 and as a result, the intensity and risks associated with new and ongoing land management activities have been greatly reduced compared to the decades prior to the 1986 amended plan.

INFISH has been implemented considerably longer than its intended 18 months. The strategy has been documented to be effective in protecting aquatic resources through ongoing PACFISH/INFISH biological opinion (PIBO) effectiveness monitoring (Meredith et al. 2011, Roper, Saunders and Ojala 2019, Thomas et al. 2018). However, conservation commitments with an active restoration plan were never adopted in a decision. The absence of a clearly stated aquatic restoration goal in the existing plan was one of the many items identified as needing to be changed during the plan revision process. Therefore, the 2020 Forest Plan includes direction for restoration. See Table 4.

Table 4. Crosswalk of plan components under INFISH to 2020 Forest Plan

1995 INFISH component	Comparable INFISH component/strategy in 2020 Forest Plan	Differences between 1995 INFISH and 2020 Forest Plan	Rationale for changes
Riparian goals	The 2020 Forest Plan uses desired conditions rather than goals.	More description listed in plan revision for desired conditions, focused on ecological conditions that sustain riparian and aquatic habitat. The intent is similar.	Goals are optional components in 2012 Planning Rule that according to rule are "other than desired conditions, usually related to process or interaction with the public".
Riparian management objectives (RMOs)	Not carried forward as written in 1995 as BASI no longer supports a site-by-site approach without placing in context with conditions and drivers beyond the stream reach. Some interim RMOs did not apply to all stream channel forms.	The 2020 Forest Plan relies on DCs, which focus on retaining process function in combination with PIBO monitoring data and analysis, which compares habitat attributes of managed against unmanaged or reference sub watersheds.	BASI since 1995 has moved away from the expectation that numerical values found in high value habitat could occur everywhere at the same time. Also, objectives in 2012 Planning Rule require a completion date, which would be difficult to predict for dynamic riparian instream conditions.
Riparian habitat conservation areas (RHCAs)	Component carried forward with name change to riparian management zone (RMZ), to be consistent with 2012 Planning Rule.	Some adjustments to widths for wetlands and intermittent streams (increase), otherwise plan components do require minimum widths same as 1995 INFISH. Widths are broken down into inner and outer zones.	Review of BASI show that the most important area for protecting water resources is the inner zone where only activities that benefit the RMZ are allowed. Activities in outer zone must maintain and not retard function of inner zone.
Standards and guidelines (for activities in or affecting RHCAs)	Component carried forward with few exceptions; now distinguish between standards and guidelines.	No longer just standards and guidelines, split into either standard or a guideline. Also, some text changes in individual standards and guidelines	Concept was retained for standards and guidelines, but language was sometimes changed to ensure a standard or guideline was achievable, and/or to clarify intent. Split aligns with 2012 Planning Rule.
Priority watersheds	Carried forward in two ways: 1. priority watersheds as other plan content identified for	Four sub-watersheds under this revision will be identified as priorities for restoration	WCF recognizes the agency moving towards attaining desired outcomes from

1995 INFISH component	Comparable INFISH component/strategy in 2020 Forest Plan	Differences between 1995 INFISH and 2020 Forest Plan	Rationale for changes
	WCF as required by 2012 rule and 2. Identification of a conservation watershed network with objectives for storm-proofing. 2nd way builds on the intent of priority watersheds in INFISH	activities via WCF on forest to be compatible with 2012 Planning Rule. Identification of Conservation Watershed Network, a new term, is actually what originally occurred in INFISH as priority watersheds. and corresponding objectives for storm proofing prioritizes the most important watersheds to treat during the span of the new plan	project, versus the standard outputs typically associated with target accomplishment. CWN favors selection of watersheds with aquatic biota needs and prioritizes them for treatment.
Watershed analysis	Not carried forward as described in 1995 INFISH. Instead, multi-scale analysis is included in other plan content as a strategy of the revised forest plan, mostly consistent with ICEBMP 2014 framework.	Multi-scale analysis strategy provides guidance on integration commensurate with issues being addressed.	Watershed analysis as originally practiced became cumbersome and struggled to integrate resources. Existing tools provide much greater capabilities for data analysis than in 1995. Multi scale sharpens focus on the need to integrate information commensurate with issues.
Watershed restoration	See priority watersheds	See priority watersheds	See priority watersheds
Monitoring	2020 Forest Plan will use PIBO monitoring data at the Forest scale (or BASI replacement) to show if conditions are trending towards improving conditions.	PIBO generated from INFISH and PACFISH requirements	With 19 years of data collection across the Interior Columbia Basin and numerous peer reviewed publications, this program is uniquely positioned and funded to effectively monitor aquatic trends on the forest.

Watershed Assessments/Multi-scale Analysis

Like the preceding discussions about RCAs and RMOs, understanding and use of watershed assessments (WAs) introduced in the 1990s has evolved. Prior to WAs, aquatic analyses often suffered from "unclear logic used in weighting or combining individual elements, reliance on simple indices to explain complex phenomena, and assumptions of direct or linear relations between land use intensity and watershed response (U.S. Department of Agriculture and U.S. Department of Interior 1994)." As described by the NWFP, WAs were, "a technically rigorous procedure with the purpose of developing and documenting a scientifically-based understanding of the ecological structures, functions, processes and interactions occurring within a watershed (U.S. Department of Agriculture and U.S. Department of Interior 1994).

In 1995, a manual was developed with a six-step process to guide completion of WAs (Regional Interagency Executive Committee and Intergovernmental Advisory Committee 1995). WAs are required by the NWFP, PACFISH, and INFISH prior to salvage harvest, road- building in key and priority watersheds, and before the width of RCA's could be adjusted. WAs were completed for most watersheds in the NWFP area, and for key and priority watersheds on forests with plans amended by PACFISH and INFISH. These early analyses were expensive and time consuming, and often frustrated managers (personal observation of the authors). While completed as required, WAs did not always meet the intent as they were originally envisioned, which was: "…blending of social expectations with the biophysical capabilities of specific landscapes (U.S. Department of Agriculture and U.S. Department of Interior 1994)." RCA widths have not often changed, nor were terrestrial restoration goals realized as planned. (Thomas et al. 2006).

Geospatial data management and computer analysis of natural resource data sets were just emerging in the early1990s and have continually advanced. In the late 1990's, the BLM and the FS worked to develop a broad scale conservation plan for the Interior Columbia River Basin. This effort was expected to create a conservation strategy for the region that would replace PACFISH and INFISH. While the Interior Columbia River Basin Ecosystem Management Project (ICBEMP) did not deliver a decision in 2000, it summarized best available information that led to a framework for amending forest plans (ICBEMP 2014). The science contained in the framework has improved the WA process, and the ICBEMP summary recommending consideration of natural resource information at differing scales prompted the inclusion of "multi-scale analysis" into the WA process.

As well, in the NWFP arena, the compliance with the Aquatic Conservation Strategy (ACS) was tested on March 30, 2007, in the District Court, Western District of Washington, where the judge ruled adverse to the USFS, BLM, USFWS, and National Marine Fisheries Service in Pacific Coast Fed. Of Fishermen's Association, et al. v. Natl. Marine Fisheries Service, et al. and American Forest Resource Council, Civ. No. 04-1299RSM (W.D. Wash). The courts told the agencies projects must now assess project consistency with the nine ACS objectives prior to the 2004 Record of Decision for the ACS amendment (U.S. Department of Agriculture 1994). This case also defined that project review must utilize analysis at the project or site scale rather than only at the watershed scale, and for both short term and long-term effects, etc. (U.S. Department of Agriculture and U.S. Department of the Interior 2007).

Land management has continued to become more complex since WA was introduced, with overlapping administrative boundaries, increasing numbers of stakeholders, and competing species needs. In addition to considering data at multiple scales, methodologies and computer applications continue to emerge to deal with areas as small as subwatersheds and as large as multistate areas (Benda et al. 2009). Methods have also been developed to predict stream temperatures and warming reaches (Isaak et al. 2015), and to more reliably predict bull trout occupancy (Young et al. 2017). Several tools have been developed help managers understand various conditions on the landscape such as sediment delivery (Black, Cissel and Luce 2012, Flanagan, Gilley and Franti 2007); fire conditions and movement using the following models; FlamMap (Finney 2003), and LANDFIRE (Rollins and Frame 2006). Roads were identified using from LiDAR (Clode et al. 2007). All of these advances, combined with the recommendations contained in the USFWS's Bull Trout Recovery Plan (USFWS 2015b), help managers today to compare and contrast restoration actions and fit them within other agency actions and threats to increase the effectiveness of restoration actions. The evolution of understanding and application of WA/multi-scale analysis are helping Forest Service managers to: (1) better understand ecological processes affecting aquatic and riparian-dependent resources; (2) identify management actions that would maintain ecological conditions or move them towards desired conditions; and (3) provide a better landscape context for developing projects.

Description of the preferred alternative – alternative F

Alternative F has been identified as the preferred alternative for the FEIS. Alternative F is the result of public engagement efforts and responds to the identified purpose of and need for the 2020 Forest Plan. This alternative emphasizes moving towards desired future conditions and contributing to ecological, social, and economic sustainability.

Alternative F represents a mix of the proposed action (B) with features of the other alternatives. The balance of primitive and nonmotorized recreation opportunities versus less primitive and motorized recreation experiences is generally consistent with current travel plans, except in the case of recommended wilderness areas (RWAs). Features of this alternative include:

- 7 RWAs (Big Log, Mount Baldy, Electric Peak, Big Snowies, Silverking, Red Mountain, and Nevada Mountain).
- Motorized and mechanized means of transport would be prohibited in RWAs.
- All lands that were not withdrawn from timber suitability due to legal or technical factors would be suitable for timber production except for: RWAs; the Elkhorns GA; South Hills Recreation Area; Badger Two Medicine area; Highwoods GA; Snowies GA; Dry Range; and other remote or unroaded areas that the District and leadership identified where timber production would not be a feasible land management objective. Except when prohibited by other plan components, harvest for other purposes could occur on lands not suitable for production.
- Plan components that specifically address management of elk security would be included.
- Beaver-Willow/Green Timber Basin (appx 3,000 acres) would be included as a special area.
- RWA boundaries would be moved 300 feet from private land boundaries.
- The area east of Alice Creek would be designated as primitive and allow mountain bike use.
- The CDNST from Falls Creek to Lewis and Clark Pass would be open to mountain bikes.
- The Poe Manley candidate RNA would be included as a proposed RNA.
- The Nevada Mountain RWA boundary would be changed on the north to the Helmville Gould Trail (and this would stay open to mountain bike use).
- Mountain bikes would be prohibited in the Elkhorns Core area.
- Grandview Recreation Area

Table 5. Comparison of the existing plan's features and the preferred alternative (alternative F) forestwide and alternative F features west of the divide broken down into the Divide GA (DI) and Upper Blackfoot GA (UB)

Uses/goal/objectives under alternative F (preferred alternative)	Forestwide	West of the Divide		
	Existing plan acres	Alt F acres	Alt F acres DI GA	Alt F acres UB GA
Lands suitable for timber production[1]	414,936	368,814	29,955	34,569
Lands unsuitable for timber production where harvest may occur	1,654,916	1,673,853	45,006	140,749
Personal use of forest products *Allowed on all lands except Tenderfoot Creek Experimental Forest (TCEF)*	2,874,356	2,874,356	97,901	298,874
Commercial use of forest products *(Allowed on all lands except WILD, RWA, WSA, RNA, and TCEF)*	2,096,169	2,039,444	75,219	176,823
Designated wilderness	564,136	564,136	0	83,509
Recommended wilderness	34,212	153,325	22,682	38,509
Wilderness study areas (WSA)	168,271	168,271	0	0
Eligible wild and scenic rivers	140 miles	361 miles	15 miles	43 miles
Emphasis areas: Green Timber Basin-Beaver Creek Botanical area, Badger Two Medicine Cultural Area	0	132,649	0	0
Research natural areas (RNAs)	16,870	18,447	0	3,116

Uses/goal/objectives under alternative F (preferred alternative)	Forestwide	West of the Divide		
	Existing plan acres	Alt F acres	Alt F acres DI GA	Alt F acres UB GA
Experimental and demonstration forests	8,871	8,871	0	0
Inventoried roadless area	1,444,221	1,444,221	35,248	134,344
Recreation emphasis areas South Hills Recreation Area, Grandview Recreation Area, Smith River Corridor, Missouri River Corridor	0	89,439	2,732	0
Ski areas	970	970	0	0
National recreation trails	38 miles	38 miles	0 miles	0 miles
Continental Divide National Scenic Trail (CDNST)	237 miles	237 miles	26 miles	33 miles
Grazing allotments (current active & vacant allotments)	1,355,143	1,355,143	51,623	63,285
RMZs - Inner	NA	211,042	7,084	26,285
RMZs - Outer	NA	285,170	7,735	29,427
RHCAs (INFISH boundaries west of divide)	40,266	NA	NA	NA
Total Forest acres	2,883,227	2,883,227	97,901	298,874
Summer acres in which wheeled motorized is allowed (ROS categories SPM, RN, R, U)[2]	1,099,010	1,098,892	50,871	76,932
Winter over-snow acres in which wheeled motorized is allowed (ROS categories SPM, RN, R, U)[2]	1,043,323	1,008,035	67,337	128,922
Summer acres of nonmotorized (ROS categories P, SPNM)[2]	1,784,204	1,784,322	47,029	221,942
Winter acres of nonmotorized (ROS categories P, SPNM)[2]	1,839,900	1,875,187	30,563	169,953
Objective for hazardous fuel treatments in Wildland urban interface per decade	Unknown	Minimum of 15,000	Unknown	Unknown
Road decommission/store objective (miles)	NA	Minimum of 30	NA	NA
Reconstruction or road improvement (miles)	NA	Minimum of 100	NA	NA
Minimum annual maintenance objective for system roads (miles)	NA	Minimum of 100	NA	NA
Minimum annual maintenance objective of NFS trails (miles)	NA	100	NA	NA
Reconstruction/improvement of trails every five years	Unknown	Minimum of 10	Unknown	Unknown

1-RMZ areas were removed from lands suitable for timber production.

2. Recreation opportunity spectrum (ROS): semiprimitive motorized (SPM), roaded natural (RN), rural (R) , urban (U), primitive (P), semiprimitive nonmotorized (SPNM)

Vegetation management, timber production, and fire and fuels management

Desired conditions for vegetation are based on maintaining and promoting forest conditions that are resilient in the face of potential future disturbances and climate warming and that contribute to social and economic sustainability. Under alternative F, a variety of vegetation management techniques would be employed, including timber harvesting, planting, thinning, fuel treatments, natural unplanned ignitions, and prescribed burns. The role of fire, both planned and unplanned ignitions, as a tool to achieve desired vegetation and wildlife habitat conditions, is articulated in the plan, and direction related to its use and management is provided. Direction is also provided for fuels management to protect identified values, such as in wildland urban interface areas. Biodiversity is addressed by providing DCs and management direction associated with a diverse array of plant communities and species, such as aquatic and riparian areas, deciduous forests, burned forests, grasslands and shrublands, and whitebark pine. Groundwater dependent ecosystems, such as fens and other unique botanical areas, would be provided protection by various plan components.

Timber harvest would be conducted to provide for societal goods and to move the vegetation towards desired conditions. Approximately 64,524, acres or 16.3 percent of the Forest west of the continental divide, are lands suitable for timber production. Under alternative F, with the budget and organizational constraints, the projected timber quantity per decade that may be sold from lands both suitable and not suitable for timber production shall not exceed the sustained yield limit of 5.75 MMCF (27 MMBF) per year on the HLC NF, which includes lands both east and west of the continental divide. An exception exists for salvage or sanitation cutting of trees damaged by fire, windthrow, or other disturbance or to manage insect infestation or disease spread. Such trees may be harvested above the sustained yield limit, where it is not feasible to substitute such timber for timber that would otherwise be sold under the plan and where such harvest is consistent with desired conditions for terrestrial and aquatic ecosystems.

Acres of lands not suitable for timber production where harvest may occur for other purposes are about 185,755 acres or about 46.8 percent of the forest west of the continental divide. Under alternative F, approximately 42.7% of forest lands west of the continental divide are comprised of inventoried roadless areas (IRAs), where roading to support harvest would be greatly limited. Timber harvest on all NFS lands would have to be consistent with other plan components and direction.

In addition to lands suitable for timber production, timber harvest would be allowed on some lands not suitable for timber production, but harvest or other vegetation management for other resource benefits would be allowed as appropriate under the RMZ plan components, to address safety concerns in developed recreation areas, or to achieve desired conditions that address recreational values, public safety, or ecological restoration in designated areas. Wilderness study areas would not be suitable for timber production or timber harvest.

Wildlife and fish habitat

Alternative F has forestwide desired conditions, objectives, goals, standards, guidelines, and suitability to support long-term persistence of species listed as threatened, endangered, or species of conservation concern and to support key ecosystem characteristics for other species, such as those that are of interest for hunting, trapping, observing, and subsistence. Diversity is addressed by coarse-filter plan desired conditions and management direction as well as species-specific desired conditions and management direction. This alternative includes 83,509 acres (21.0 percent of the forest) in previously designated wilderness west of the continental divide, 61,191 acres (15.4 percent of the forest) in recommended wilderness areas west of the continental divide, and no acres in wilderness study areas west of the continental divide. These areas emphasize natural processes, with relatively high levels of habitat created by natural disturbances such as wildfire, insects, or disease and unmanaged hydrologic processes. Forest plan components related to vegetation conditions provide key ecosystem characteristics that support habitat needs and diversity (e.g., species associated with old-growth forests, riparian habitats, deciduous trees, grass/forb/shrub habitats, dead tree habitat that provides large wood recruitment, and habitat connectivity). The 2020 Forest Plan addresses key aquatic and riparian ecosystem characteristics and their integrity and to improve resilience considering the changing climate and the anticipated future environment. Along with fish habitat and water quality, wildlife habitat is emphasized in riparian management zones, which are not suitable for timber production, but where timber harvest would be allowed to meet desired conditions if it is compatible with management direction.

Access and recreation

Existing levels of motorized road access would be expected to support social and economic sustainability while addressing desired ecological conditions for soils, water, fish, and wildlife. Alternative F would use the designated travel plans west of the continental divide to provide the opportunity for public motorized vehicle use on suitable designated roads and trails on about 127,803 acres of land, or about 32.2 percent of the NFS lands west of the continental divide. Motorized over-snow vehicle use would be suitable on about 50.5 percent (200,516 acres) of the forest west of the continental divide. Summer nonmotorized recreation would be suitable on about 67.8 percent or 268,971 acres of the forest west of the continental divide.

Recommended wilderness

Under alternative F, in the 2020 Forest Plan, the responsible official is required to “identify and evaluate lands that may be suitable for inclusion in the National Wilderness Preservation System and determine whether to recommend to the Chief of the Forest Service any such lands for wilderness designation” (36 CFR Part 219 and Forest Service Land Management Planning Handbook 1909.12). The process by which lands are recommended for inclusion in the National Wilderness Preservation System is described in the 2012 Forest Service Planning Rule and Chapter 70 of the Forest Service Land Management Planning Handbook 1909.12. Detailed information regarding the inventory and evaluation steps the HLC NF followed during this process is available in appendix E of the FEIS, including maps and documentation.

Recommended wilderness areas are preliminary administrative recommendations since Congress has reserved the authority to make final decisions on wilderness designation. Until such time that Congress designates these areas by law, motorized and mechanized means of transport, timber production, road construction or reconstruction are not suitable in the identified recommended wilderness areas on the HLC NF. West of the continental divide, the recommended wilderness areas total 60,980 acres.

Designated areas, designated wilderness and inventoried roadless areas

In addition to areas designated as wilderness by Congress and the 2001 Roadless Area Conservation Rule areas, the 2020 Forest Plan includes recommended wilderness areas and eligible wild and scenic river reaches. These areas represent little human-caused alteration to the forest and focus on relatively passive management. No wilderness study areas are located on the HLC NF west of the continental divide. Table 6 shows the approximate acres in each designated area for the 1986 forest plan compared to the revised forest plan preferred alternative, alternative F.

Table 6. Summary of existing designated area allocations’ and proposed designated area allocations’ in alternative F of the 2020 Forest Plan west of the continental divide affecting bull trout as of August 26, 2019

Designated area	Current number in existing plan	Existing plan acres/miles[1] (percent)	Number in alternative F	Alternative F acres/miles[1] (percent)
Designated wilderness (WILD)	1	83,509 (21%)	1	83,509 (21%)
Recommended Wilderness (RECWILD)	-	-	4	60,980 (15.4%)
Wilderness Study Areas (WSA)	0	0	0	0
Inventoried Roadless Area (IRA)	12	169,581 (42.7%)	12	169,581 (42.7%)
Eligible Wild and Scenic Rivers (WSR)	0	0 miles	5	59 miles

Designated area	Current number in existing plan	Existing plan acres/miles[1] (percent)	Number in alternative F	Alternative F acres/miles[1] (percent)
Research Natural Areas	2	2,850 (0.72%)	3	3,116 (0.78%)
Experimental and demonstration forests	0	0	0	0
Total **Forest Acres**	-	396,775 acres	-	396,775 acres

1. Acres and percentage calculated from GIS dataset. The official acres for NFS lands and wilderness areas may be found in a land area report.

One designated wilderness area, the Scapegoat Wilderness, is partially located within the Blackfoot core area for bull trout. A portion extends east of the continental divide and a portion is with the Lolo National Forest. As previously mentioned, this designated wilderness area comprises roughly 83,509 acres in the action area, or approximately 21 percent of the forest west of the divide.

Four recommended wilderness areas are included in alternative F; Silver King (18,568 acres) and Red Mountain (2,500 acres), both of which are in the Upper Blackfoot GA; Nevada Mountain (21,672 acres – of which 4,448 acres are in the Divide GA and 17,225 acres are in the Upper Blackfoot GA);and Electric Peak (18,239 acres) which is just in the Divide GA. These areas would affect land management activities which in turn could have an effect on bull trout and bull trout critical habitat. These areas total 60,980 acres, with 62.8 percent in the Upper Blackfoot and 37.2 percent in Divide GA. They represent 15.4 percent of HLC NFS lands west of the divide.

Inventoried roadless areas west of the continental divide on the HLC NF total about 169,581 acres, which is about 42.7 percent of the lands in the action area. The 2001 Roadless Area Conservation Rule prohibits road construction or reconstruction and cutting, selling, or removing timber in inventoried roadless areas unless a listed exemption applies. The 2020 Forest Plan cannot modify Roadless Area Conservation Rule direction.

The revised forest plan includes designation of 5 streams or rivers as eligible wild and scenic river (WSR) reaches, which totals 59 river miles (Table 6 and Table 7). Eligible WSRs must be managed to maintain the outstanding remarkable values for which they have been identified, which in this case is fish, and could result in greater protection for these stream and river segments. The Little Blackfoot (14.8 river miles) has tested positive for bull trout eDNA and 2019 redd counts have identified bull trout on a redd in the eligible area. All 44.2 river miles in the Upper Blackfoot GA are considered bull trout occupied. Copper and Snowbank creeks are known spawning and rearing streams.

Table 7. Eligible wild and scenic rivers by geographic area west of the continental divide in the preferred alternative, alternative F

River name	Segment description	Miles	Classification	Outstanding remarkable values	Past eligibility notes
Divide Geographic Area					
Little Blackfoot River	Segment 1: From mouth to private land boundary near Charter Oaks. Segment 2: From private land boundary south of Sawmill Creek to private land boundary north of Conner's Gulch. Segment 3: From private land boundary north of Kading Campground to the headwaters.	0.8 5.0 9.0	Recreational Recreational Wild	Fish Cultural	Eligible in 1989 for Fish.
Total miles in the Divide GA		14.8	-	-	-
Upper Blackfoot Geographic Area					
Alice Creek	From FS boundary to headwaters	7.0	Recreational	Cultural	
Copper Creek	From FS boundary to headwaters	14.0	Recreational	Fish	Eligible in 1989 for fish.
Landers Fork	From FS boundary to headwaters	18.8	Wild	Fish	
Snowbank Creek	From confluence with Copper Creek to headwaters	4.4	Scenic	Fish	
Total miles in the Upper Blackfoot GA		44.2	-	-	-
Total Miles of eligible sections of wild and scenic rivers		59.0	-	-	-

Aquatic Species Assessment

This section of the programmatic biological assessment addresses the effects of implementing the 2020 Forest Plan for the HLC NF on bull trout.

Bull trout

Status and distribution

Bull trout in the coterminous United States were listed as threatened on November 1, 1999 (USFWS 1998a). Earlier rulemakings had listed the Columbia River distinct population segment of bull trout as threatened on June 10, 1998 (USFWS 1998a). The Columbia River distinct population segment occurs throughout the entire Columbia River basin within the United States and its tributaries, excluding bull trout found in the Jarbidge River, Nevada. Critical habitat was designated for bull trout in 2010 (USFWS 2010).

According to (Lee et al. 1997) bull trout are widely distributed across the Columbia River Basin, although their current range is about 60 percent of historic distribution. In 2012, the USFWS "reported that bull trout were generally "stable" overall range-wide (species status neither improved nor declined during the reporting year). Generally speaking, since it was listed in 1999, many populations of the bull trout appear to be stable or increasing while some are declining and some appear extinct (USFWS 2015b). Some of the increasing populations documented in the literature occur in Idaho (Meyer, Garton and Schill 2014); (Erhardt and Scarnecchia 2014). Ecologically viable populations of bull trout are necessary to establish viable recovery units (USFWS 2015b). There are a number of studies that have been published that have described bull trout declines and the reduction and fragmentation (Rieman and McIntyre 1993) (Rieman, Lee and Thurow 1997), introduction of non-native species (Rieman, Peterson and Myers 2006) and angling pressure (Post et al. 2003) (Parker et al. 2007). A newer study suggests declines have occurred in areas with higher water temperatures and more often on private land (Al-Chokhachy et al. 2016b). Some reports in the literature suggest that increasing water temperatures, even when other factors such as invasive species and other habitat alterations are factored in, are likely to play the largest role in determining future bull trout site occupancy and persistence (Eby et al. 2014).

Habitat requirements and life history

Bull trout have more specific habitat requirements than most other salmonids (Rieman and McIntyre 1993). Habitat components that influence bull trout distribution and abundance include water temperature, cover, channel form and stability, substrate for spawning and rearing, and connectivity for migratory corridors (USFWS 2015b). Bull trout are found in colder streams and require colder water than most other salmonids for incubation, juvenile rearing, and spawning. Spawning and rearing areas are often associated with cold-water springs, groundwater infiltration, and/or the coldest streams in a watershed. Bull trout typically spawn from August to November during periods of decreasing water temperatures. However, migratory bull trout frequently begin spawning migrations as early as April and have been known to move upstream as far as 155 miles to spawning grounds (Fraley and Shepard 1989).

Throughout their lives, bull trout require complex habitats for cover, including large woody debris, overhanging banks, and deep pools (USFWS 2002). Bull trout typically exhibit three life history types—adfluvial, fluvial, and resident—and all require cold-water temperatures, typically less than 60 °F, during portions of their life cycle to persist. Bull trout are opportunistic feeders with food habits primarily a function of size and life history strategy. Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macro-zooplankton, and small fish (Donald and Alger 1993). Adult migratory bull trout are primarily piscivorous, known to feed on various fish species (Fraley and Shepard 1989).

For spawning and early rearing, bull trout require loose, clean gravel relatively free of fine sediments. Because bull trout have a relatively long incubation and development period within spawning gravel (greater than 200 days), transport of bedload in unstable stream channels may kill young bull trout. Bull trout use migratory corridors to move from spawning and rearing habitats to foraging and overwintering habitats and back. Different habitats provide bull trout with diverse resources, and migratory corridors allow local populations to connect, which may increase the potential for gene flow and the support or refounding of populations.

Maintaining bull trout habitat requires stream channel and flow stability (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (James and Sexauer 1997). These areas are sensitive to activities that directly or indirectly affect stream channel stability and alter natural flow patterns. For example, altered stream flow in the fall may disrupt bull trout during the spawning period, and channel instability may decrease survival of eggs and young juveniles in the gravel during winter through spring (Pratt 1992, Pratt and Huston 1993).

Existing condition

Bull trout critical habitat

The USFWS designated bull trout critical habitat in 2010 based on current knowledge of the life history, biology, and ecology of the species with the aim of providing enough habitat to allow for genetic and life history diversity and to help ensure that bull trout would be well distributed across representative habitats and providing connectivity between populations. The USFWS published a final critical habitat designation for the coterminous United States population of bull trout on October 18, 2010 (USFWS 2010); the rule became effective on November 17, 2010. Designated bull trout critical habitat is of two primary use types, (1) spawning and rearing and (2) foraging, migration, and overwintering, and identifies stream miles of the Upper Blackfoot Critical Habitat subunit within the HLC.

Critical habitat includes the stream channels within the designated stream reaches and has a lateral extent from the bankfull elevation on one bank to the bankfull elevation on the opposite bank.

The HLC NF supports one local population (Landers Fork) and encompasses two core areas for bull trout, the Upper Clark Fork River and Blackfoot River Core Areas.

All designated critical habitat on the HLC NF in the planning area is in the Blackfoot River Critical Habitat Subunit (31.8) of the Columbia Headwaters Recovery Unit–Clark Fork River Basin Critical Habitat Unit in the Upper Blackfoot drainage. Most of the bull trout designated critical habitat on Poorman (11.8 miles) and Copper (14.7 miles) creeks occurs within NFS lands and more specifically, the plan area. Landers Fork is also designated critical habitat from its confluence with the Blackfoot River upstream to Silver King Falls, 11.2 miles. Only a small portion of the upper reach is within the forest boundary. The Blackfoot River is also designated bull trout critical habitat for 118.7 miles from its confluence with the Clark Fork River to the confluence of Alice Creek. Small reaches of the Blackfoot River between Lincoln Gulch and Mineral Hill in the Blackfoot Canyon west of Lincoln include critical habitat that is in the planning area.

Within the administrative boundaries of the HLC NF, a total of 76.3 miles of streams and rivers are included in the designation of critical habitat for the Blackfoot core area on both NFS and private lands Within the Blackfoot River, there are approximately 38.6 miles of critical habitat both on and off the forest; 32.9 miles of foraging, migration and overwintering (FMO) critical habitat, and 5.7 miles of spawning and rearing (S&R) critical habitat upstream of Alice Creek. Landers Fork (11.2 miles) also has reaches on and off forest. Copper Creek is primarily on forest and comprises 14.7 miles of critical habitat. Poorman Creek includes 11.8 miles of critical habitat; most of the upper reaches are NFS lands, while the lower reaches are all on private land.

Designated critical habitat for bull trout is comprised of nine primary constituent elements (PCEs) (USFWS 2010). Within the designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, and sheltering. The PCEs represent the characteristics of the habitat necessary to sustain its essential life-history functions and are crucial for the conservation of bull trout and may require special management considerations and protection. These PCE's are features of critical habitat that can be represented by habitat indictors indicators, or some of the MPIs, (USFWS 1998b) which are used when data is available to evaluate and document baseline conditions. The relationship or crosswalk of MPIs and PCEs is shown in appendix C.

Bull trout status in the plan area

Much of the following discussion is a combination of information taken from 2018 Bull Trout Critical Habitat consultation completed for National Forest Lands in the Columbia Basin (Thomas et al. 2018), the *Western Montana Bull Trout Conservation Strategy* (USDA-USFWS 2013) and Biological Assessment for Forest Plan Amendments—Incorporating habitat management direction for the NCDE grizzly bear population into the Helena, Lewis and Clark, Kootenai, and Lolo National Forest Plans (U.S. Department of Agriculture 2017).

The Western Montana Bull Trout Conservation Strategy (BTCS) was created in response to the expectation created by INFISH in 1995, and only partially met by in 2000 to create an active restoration plan for BLM and NFS lands in the Columbia basin similar to what was created by the 1994 Northwest Forest Plan. The strategy provided a standard process to update bull trout population and habitat status, a structured and more consistent assessment of fish habitat conditions including stressors on populations, and prioritized needs by core area on NFS lands to give line officers the best available information prior to making decisions on bull trout restoration opportunities. The HLC NF plan area includes two bull trout core areas, the Clark Fork River (Section 1) and the Blackfoot River, both of which are part of the Columbia Headwaters Recovery Unit as identified in the recovery plan (USFWS 2015b).

Since 2013, some of the information in the BTCS has changed based on new data, new sampling technology, crowd sourced data, and other rule makings and consultations. A warming climate at lower elevations in the project area also changed presence of bull trout in some stream reaches. There is a need therefore for this document to define what has previously been called “other important populations” and identify a rule set that clearly describes how these populations are identified and addressed in the Conservation Watershed Network in the Plan Revision.

Based on dialogue that has recently occurred in the preparation of this BA, going forward we now refer to “other important populations” as “other remnant populations.” We made this name change because these other remnant populations have less individuals than required to qualify as a local population. Areas that get this designation typically were local populations in decades to a century ago that have been steadily declining over the past few decades to point that bull trout are now absent in previously occupied habitat.

To be included as an “other remnant population”, a known patch in a sub-watershed (Climate Shield) would need to have a.) been surveyed and found to have bull trout eDNA present (The Aquatic eDNAtlas for the American West) it could be a patch or b.) a sub-watershed where bull trout are known to have occurred historically and are now extirpated, the habitat patch has to have a reasonable likelihood to support bull trout in 2040 under a moderate warming scenario, and the cause for extirpation should be a factor that could be remedied by restoration, such as barrier removal or channel reconnection; or C.) be identified as critical habitat.

In the following discussion, those subwatersheds that are reasonably known to retain bull trout are discussed in detail. Other sub watersheds that historically had bull trout and are included in the conservation watershed network are described in appendix D. Some of the information in the following discussion is partially reproduced in charts in appendix D.

Upper Clark Fork River Core Area (Section 1) on the HLC NF

None of the local populations within the Upper Clark Fork (section 1) are located on the HLC NF. Although not designated as a local population or as designated critical habitat by the FWS, the Little Blackfoot River, some of its tributaries, and some tributaries of the Clark Fork River on the HLC NF are still considered important habitat for bull trout recovery.

Little Blackfoot River – other remnant populations of bull trout

The Little Blackfoot River drainage in the Upper Clark Fork section 1 bull trout core area does not contain a local population. It does contain *other remnant populations* in Larabee Gulch, Hat creek and Ontario creek Sub watersheds. The climate shield cold water refuge streams for native trout data suggests low probability for bull trout persistence in the headwaters of the Little Blackfoot drainage by 2040 (Isaak et al. 2017). Large systems, like the Little Blackfoot River, which encompasses over 265,600 acres, were much more important as spawning and rearing streams historically. Between 2005 and 2010 the Little Blackfoot River was considered critical habitat for bull trout, but the Little Blackfoot is no longer included as critical habitat in the final 2010 Rule (USFWS 2010). The sub-watersheds in the upper portion of the drainage on NFS lands that contain other remnant populations and are included in the CWN are shown in Figure 2.

Since the early 2000's, bull trout in the Little Blackfoot River population are believed to be almost extirpated based on extensive sampling efforts by Montana Fish, Wildlife, and Parks (MDFWP) personnel during 2007 and 2008 and sampling by Forest Service fishery personnel in 2010. Currently, bull trout are known to exist in only three of the sixteen sub-watersheds influenced by NFS lands on the HLC NF in this drainage. The Range-Wide Bull Trout eDNA Project documented bull trout eDNA presence at ten sampling locations in the Upper Little Blackfoot drainage in 2015; Ontario Creek had 2 positive sites, Conners Gulch had 1 site and the Little Blackfoot River showed 7 sites positive.

The decline of bull trout in the drainage is likely caused by multiple stressors interacting over the past several decades: hybridization and competition with brook trout (Rieman et al. 2006) in the headwater reaches of the Little Blackfoot River (hybrids have been documented), sport harvest due to misidentification of bull trout as brook trout (Schmetterling and Long 1999), competition and possibly predation from increasing numbers of brown trout in the middle and lower reaches of the Little Blackfoot River, connectivity issues (Al-Chokhachy et al. 2016b), habitat alteration next to migration corridors, especially on private lands (Al-Chokhachy et al. 2016b), and less than optimum water temperatures for bull trout throughout the river but especially below the forest boundary (George Liknes, personal observation).

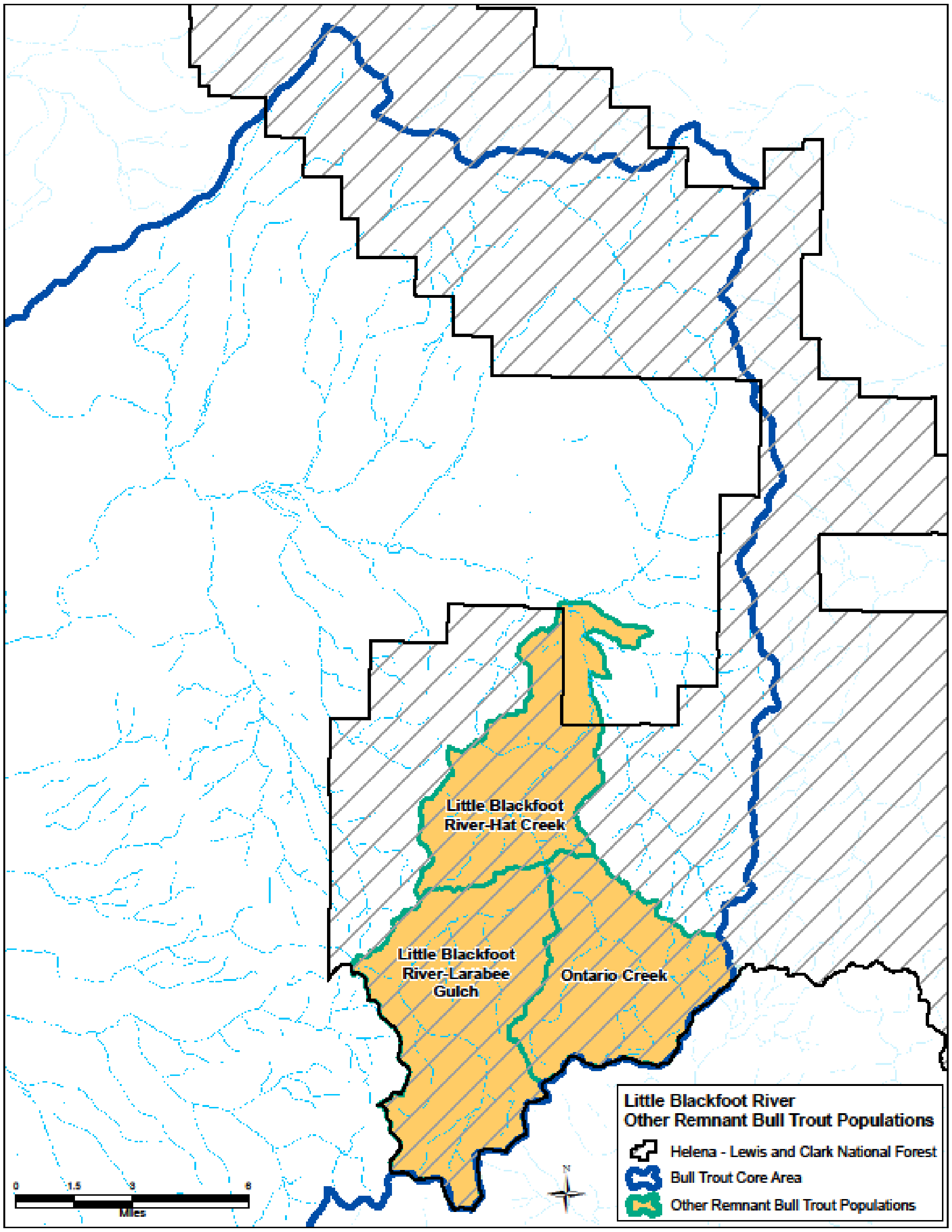

Figure 2. Little Blackfoot River other remnant populations in sub-watersheds

In the reaches of the Little Blackfoot (nonfederal lands) below the confluence of Dog Creek, brown trout are the dominant species in the river and thus are in competition with bull trout. Additionally, downstream of the Forest boundary there are multiple water diversions on the mainstem river between Elliston and Garrison. The low flows resulting from water diversion result in increased water temperature during the summer months that are above desired temperature ranges for bull trout. The low river flows below the Forest inhibit fish movements but do not present complete barriers to fish movements in most years. Habitat alterations resulting from the past placement of highway and railroad locations have affected stream morphology and reduced the quality of fish habitat, as have agricultural practices on some reaches. Tributaries below the Forest boundary also suffer from water diversion and elevated water temperatures as well. Regarding portions of tributaries below the Forest, there currently is a lack of connectivity from the river to the upper reaches of most tributaries during times when any remaining bull trout would be migrating to spawning areas. Within the Forest there are no barriers on the mainstem river and few barriers remaining on the tributaries. Ongoing work is addressing known barriers on the tributaries. Sediment levels, although somewhat elevated, are considered a secondary threat as compared to the presence of primary limiting factor of nonnative fish.

Water temperatures on NFS lands are close to but not optimum for bull trout and are near cold water criterion for native trout (Isaak et al. 2015). Mean August water temperatures measured in the Little Blackfoot were 11.3 °C (N=3 years), 11.1 °C (N=3 years) in Ontario Creek, and 10.1 °C (N=3 years) in Monarch Creek. Temperatures are expected to increase in the coming decades making this habitat potentially unsuitable for spawning and rearing (Climate Shield). There are additional opportunities to reduce sediment delivery to streams via improved road maintenance, which may include the obliteration and relocation of some damaging road segments. There are a few barriers to fish movement remaining on tributaries on forest lands, and cutthroat trout and brook trout are more likely to benefit from removal of barriers than bull trout. Below the Forest boundary, non-native fish as well as low flows and elevated water temperatures associated with water diversion are the most limiting.

Little Blackfoot River area summary

Table 8 provides a summary of the status, limiting factors, and threats to the bull trout population in the Little Blackfoot drainage. Table 9 identifies the relative importance and the management conservation strategy of each sub-watershed in the Little Blackfoot drainage other remnant subpopulation relative to the HLC NF. Although these watersheds do not comprise a designated local population of bull trout by the FWS they are listed due to their location in the Upper Clark Fork core area and their potential to contribute to recovery of the core area population. This summary provides a rating of the sub-watershed’s significance to the entire Upper Clark Fork River Core Area, their habitat’s effect on limiting the population, and the conservation strategy proposed for each sub-watershed within the borders of the HLC NF.

Table 8. Little Blackfoot River drainage bull trout remnant population status summary

# spawning adults	Short-term (5-year) population trend	Life history, connectivity	# known spawning reaches	Non-native species, threat
Less than 50.	Likely declining based on 2008-2010 survey.	Resident, barriers on many tributaries (culverts and/or diversions). However, some potential for an occasional fluvial fish remains, but potential is likely very low.	1 in the upper Little Blackfoot upstream from Ontario Creek confluence. Habitat is suitable in other reaches of the Little Blackfoot and Ontario Creek.	Brook trout, high threat throughout most of the drainage. Brown trout, threat is high but currently limited to the main stem of Little Blackfoot below Ontario Creek all the way to Garrison. Brown trout are also a threat on the following tributaries: Dog Creek, Lower Ophir Creek, Carpenter Creek, and Snowshoe Creek.

Significance of geographical location	Vulnerability to climate warming	Unique population attributes
Moderate significance. This is a large drainage that was thought to historically have several potential spawning and rearing tributaries. The Little Blackfoot in future climate scenarios is not likely to support bull trout based on higher temperatures, introduced non-natives, and challenges in the mainstem of the Clark Fork	Substantial vulnerability due to water temperatures that are currently less than optimum in all habitats within the local population except Ontario Creek. Very high vulnerability to climate change in the lower reaches of the Little Blackfoot River on nonfederal lands (both the mainstem and tributaries on private lands) due to water withdrawals and existing elevated water temperatures. High vulnerability on FS lands as well.	None, other than loss of the population would leave a substantial portion of habitat unoccupied in the core population area.

Table 9. Summary of the Little Blackfoot River other remant sub-population 12 digit subwatersheds and their relative importance to bull trout

Local Population	6th level HUC Name	Significance to other remnant sub populations	Contribution of Habitat in Limiting Population	Conservation Strategy
Little Blackfoot River**	Larabee	Moderate	Low	Conserve
	Hat	Moderate	Low	Conserve
	Ontario/Monarch	Low	Low	Active

Blackfoot River core area

Just one of the six bull trout local populations identified by the USFWS within the Blackfoot River core area is located within the HLC NF, the Landers Fork (USFWS 2015a). The Conservation Strategy for Bull Trout on USFS lands in Western Montana identified Poorman Creek as a local population; but that designation is no longer accurate as the USFWS 2015 Recovery Plan no longer considers Poorman Creek a local population. Poorman is now identified as an "other remnant population" based on the rule set previously disclosed in this document, as are: Blackfoot River-Anaconda Creek, Blackfoot River-Hardscrabble Creek, Copper, Lower Landers Fork, Blackfoot River- Lincoln, Arrasta, Blackfoot River-Little Moose Creek, Lower Alice, Hogum Creek, and Headwaters of Nevada Creek. Sauerkraut is not considered as another remnant population because it does not have eDNA present and probability of providing bull trout habitat in 2040 with no brook trout present is less than 75% (USDA-USFWS 2013) (Figure 3). The Nevada Creek Headwaters subwatershed was identified as another important population in the conservation strategy (USDA-USFWS 2013) and is forward as another remnant population in the CWN in the plan revision. In contrast to other subwatersheds in the Blackfoot, it does not contribute to the Blackfoot River core area due to the presence of Nevada Reservoir, but could provide for translocation habitat during the next planning cycle.

Historically, bull trout populations were well distributed throughout the core area and were likely in much higher densities than they are today. It is thought that up to 1,000 bull trout redds may have been historically present in the Blackfoot River core area. As with most bull trout populations, overall numbers were likely highly variable from year to year, based on natural climatic and disturbance patterns. These redd numbers were generated from professional opinion regarding the amount of spawning habitat and the potential to produce fish in each of the 16 major spawning tributaries to the Blackfoot River (Union, Gold, Belmont, Cottonwood, Monture, Chamberlain, and North Fork Blackfoot which are downstream of the HLC NF, and Nevada, Arrastra, Beaver, Willow, Poorman, Upper Willow, Landers, and Alice creeks as well as the Upper Blackfoot, which are within the HLC NF).

Bull trout populations in the Blackfoot River were likely first exposed to mining-caused impacts in the late 1800s in the form of small-scale mining. This mining was focused mainly south of the Blackfoot River in the Lincoln area (eastern Nevada Creek tributaries to Anaconda Creek) on the HLC NF. Mining methods often were an instream “placer” type operation that directly disrupted fish habitat and stream functions. Once disturbed in this fashion, streams rarely have the ability to naturally recover to their pre-disturbance level.

It is of primary concern that there are only two contiguous spawning reaches on Copper Creek and one on Snowbank Creek in the Landers Fork drainage within the HLC NF in the Blackfoot core area that have migratory bull trout populations high enough to warrant redd detection and subsequent counting. The total number of redds in the three reaches has been declining since peaking in 2008, although numbers remain higher than from 1984 -1995 (Figure 4). This may be partially due to the spawning surveys only occurring during that earlier time in the main index section of Copper Creek that do not include the upper section. Passage and dewatering issues, which have been remedied, on Snowbank Creek during that earlier time prevented fluvial bull trout from accessing the stream, so no redds were present. These spawning and rearing areas are minimally managed watersheds and have less anthropogenic impacts. However, they are in a landscape that is inherently stochastic and migration paths are sensitive to drought conditions and dry years. Restoration and conservation efforts are needed to secure the populations throughout the core area, especially in the headwaters to maintain bull trout populations long-term within the Blackfoot River and the HLC NF.

Landers Fork/Copper Creek local population of bull trout

Bull trout have been documented in Lander’s Fork below Silver King Falls. Fish collected in Landers Fork were juvenile bull trout or native trout with the exception of one brown trout; fluvial adults have been observed migrating through Landers Fork with radio telemetry. No brook trout were found in any of the samples. Lander’s Fork above Silver King Falls is not believed to be historical bull trout habitat as Silver King Falls is an upstream migration barrier. Streams currently known to support fisheries below barriers located within this drainage include Copper Creek and tributaries to Copper Creek, including lower Red Creek, lower Cotter Creek, Snowbank Creek, the North Fork of Copper Creek, and an unnamed tributary to Copper Creek in the headwaters where its confluence is in section 2.

Most of the basin is in public ownership. The Copper Creek drainage has been affected by wildfire, timber harvest, road construction, and recreation. Some of the past timber harvesting and existing roads, including approximately 5 miles of the main access road, are located within the riparian habitat conservation area of Copper Creek and its tributaries. Work was completed in summer 2019 to reroute

1.09 miles of the main road FSR 330 at the upper reach of bull trout spawning just below Cotter and Red creeks.

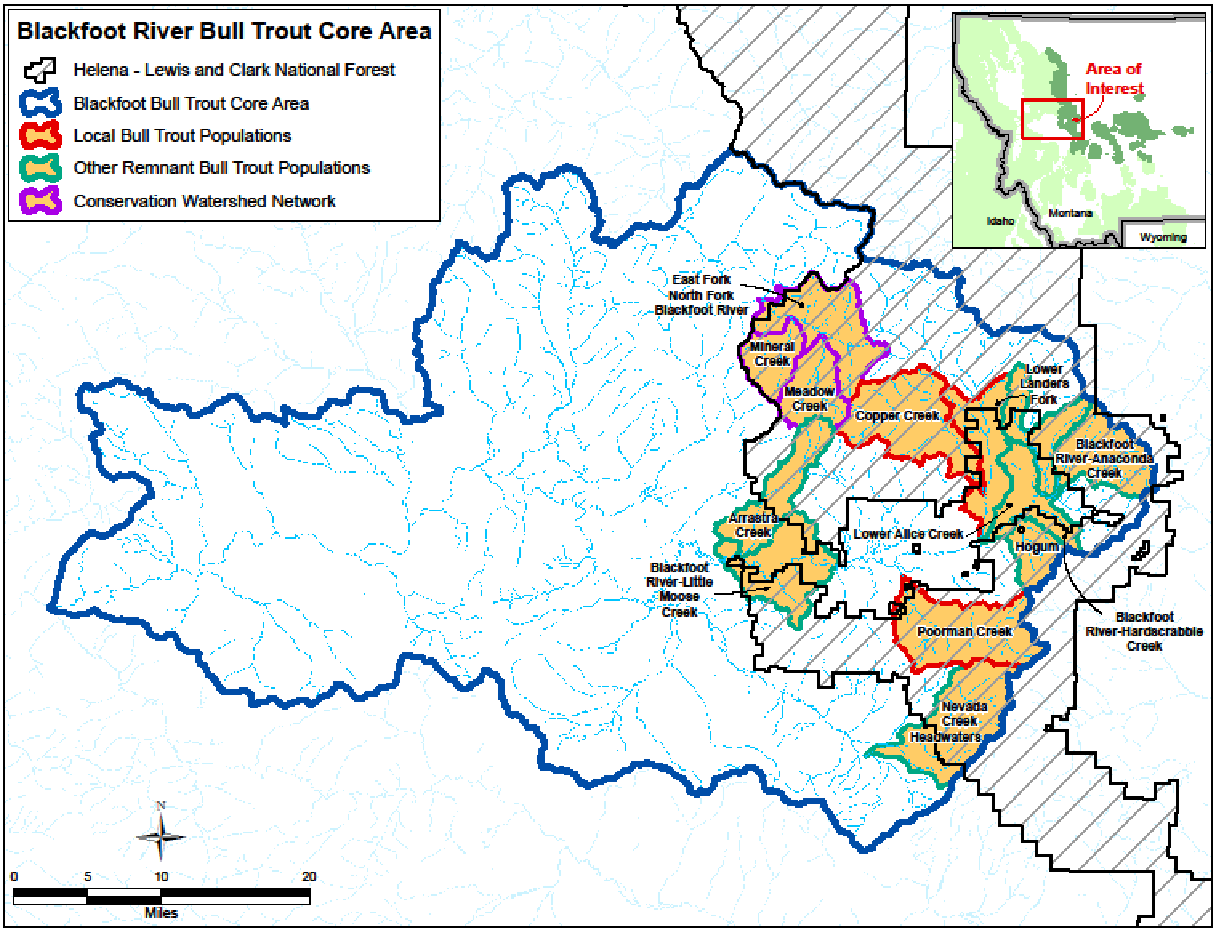

Figure 3. Map of the Blackfoot River core area

(The HLC NF plan area is located in the upper portion of the watershed.)

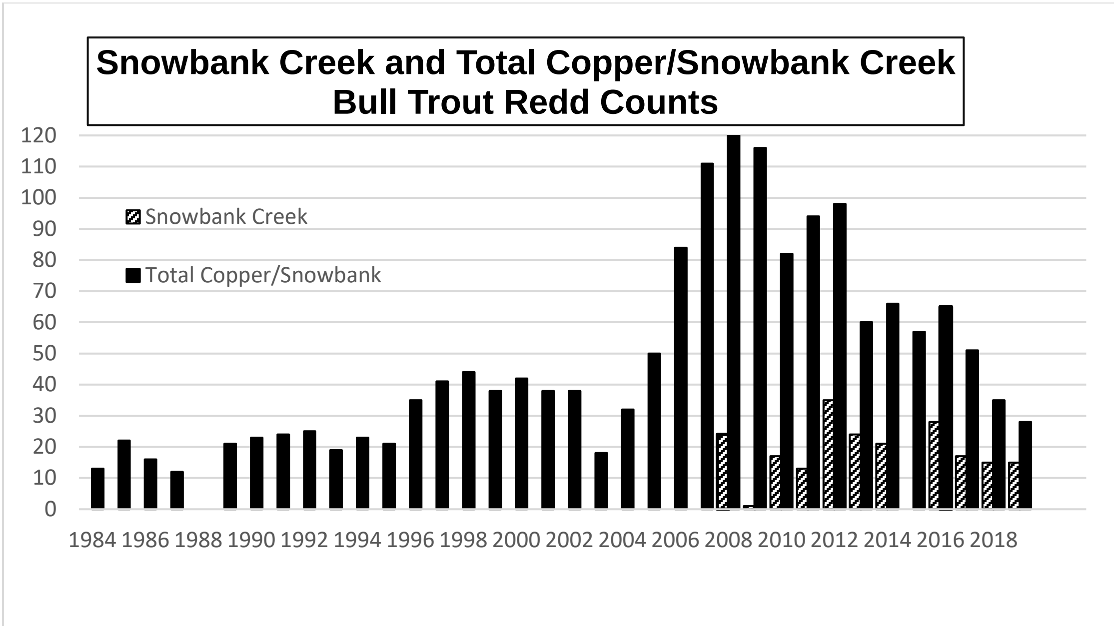

Figure 4. Bull trout redd counts in the index reaches on Copper and Snowbank creeks, 1984-2019

The highest redd count in the Copper/Snowbank Creek Complex was 120 in 2008; 35 redds were counted in 2018 and 28 in 2019 in the two streams. Stream morphology on Lower Landers Fork, due in part to past flood events, human-related channel disturbance on nonfederal lands, and depositional areas affect use by bull trout. Much of the land bordering lower Landers Fork is in private or Montana Department of Natural Resources and Conservation ownership. Low winter flow conditions on portions of Landers Fork below the confluence of Copper Creek are known to have caused post-spawn mortality when bull trout have been trapped in isolated pools that freeze in the winter. Access to upper Landers Fork by bull trout is prevented by Silver King Falls. Habitat is in good condition in the Copper Creek drainage. In recent years a partial barrier on Snowbank Creek was removed allowing fluvial fish access. A complete barrier on Cotter Creek was assessed to provide access to approximately 0.25 miles of additional marginal habitat but a functional, cost effective solution was not found given the minor role the additional habitat would provide for bull trout spawning and rearing habitat. Measures to address road sediment control on open roads has been implemented. Additional benefits have been obtained by obliterating roads as identified in Alternative 4 of the Revised Blackfoot Travel Plan Decision. Bull trout egg survival and rearing associated with sediment levels in stream substrates likely play a minor role in limiting bull trout survival. Table 12 presents the Lander's Fork local population status summary.

Implementation of decision in Blackfoot Travel Plan

A number of activities related to roads were identified as priority in the Blackfoot Nonwinter Travel Plan that are identified within the terms and conditions of this biological opinion (reasonable and prudent measure three). Within the Blackfoot Nonwinter Travel Plan area, a total of 72.2 miles of roads were treated with 26 of those miles occurring within the RHCA (Table 10). In addition, 92 stream crossing were rehabilitated which should reduce sediment inputs to streams (Table 10). An additional 45.1 miles of road were naturally reclaimed with 12.2 of those miles occurring within the RHCA (Table 11).

Table 10. Road decommissioning by treatment type and subwatershed

Subwatershed (HUC 6)	Treatment	Miles	Miles within RHCA	Stream Crossings rehabilitated	Dispersed Campsites Removed (within RHCA buffer)
Blackfoot-Anaconda	Barrier placement Entrance Oblit Full recontour Scarification/rip	1.3 0.6 21.7 0.8 **Total 24.3**	0	26	3
Lower Alice Creek	Full Recontour Scarification/rip	14.1 0.6 **Total 14.8**	9.29 0.44 **Total 9.73**	9	
Poorman Creek	Full Recontour Full Recontour/Rip Scarification/rip	22.0 0.2 1.6 **Total 23.8**	10.03 **Total 10.03**	24	1 (2 others had heritage concerns, naturally reclaimed)
Upper Alice Creek	Full Recontour Recontour/Rip	0.7 0.9 **Total 1.6**	0	7	6
Copper Creek	Full Recontour	1.7 **Total 1.7**	0.7 **Total 0.7**	20	6
Blackfoot River-Willow Creek	Full Recontour Scarification/Rip	5.8 0.2 **Total 6.0**	5.6 **Total 5.6**	6	8

Table 11. Roads naturally reclaimed by subwatershed

Subwatershed (HUC 6)	Naturally reclaimed miles	Miles within RHCA
Blackfoot-Anaconda	3.3	0.0
Lower Alice Creek	2.3	1.1
Poorman Creek	23.4	6.9
Blackfoot-Willow	2.6	0.2
Copper Creek	12.3	4.0
Upper Alice Creek	1.2	0.0
Total	**45.1**	**12.2**

Table 12. Landers Fork local population status summary

# spawning adults	Short-term (5- year) population trend	Life history, connectivity	# known spawn reaches	Non-native species, threat
70-240.	Decreasing	Fluvial, connected.	Three—two in Copper Creek and one in Snowbank Creek. No spawning reaches identified to date in Landers Fork. Some spawning likely just below Silver King Falls based on anecdotal information.	Brown trout. Low threat with a few found in lower Landers Fork by MDFWP. None currently found in Copper Creek based on sampling by MDFWP and Forest Service fishery personnel.

Significance of geographical location	Vulnerability to climate warming	Unique population attributes
High significance. This is a moderate-sized drainage and the primary spawning tributary to the Upper Blackfoot River above Nevada Creek.	Low vulnerability due to high-elevation headwaters and groundwater upwelling of cold water.	None known other than the high magnitude of recruitment provided to the Blackfoot core population.

Poorman Creek, other remnant population

Poorman Creek is not listed as a local population in the Final Recovery Plan (USFWS 2015b). Non-native brown and brook trout are present, with their influence higher in the lower reaches of Poorman Creek as compared to the upper reaches. Habitat has been fragmented by culvert barriers and past placer mining. Many of the barriers have been eliminated, but some remain on both public and private lands and need to be addressed. Sediment delivery from roads has been a factor related to the elevated sediment levels in stream spawning and rearing substrates. Agreements with the county and projects concluding in 2019 have modified road maintenance and rerouted a segment of the South Fork Poorman Creek county road. The reroute eliminated an undersized culvert and numerous fords. Recent McNeil cores in spawning areas suggests on-going efforts in the subwatershed are improving substrate conditions and hence spawning habitat.

Severe channel alterations resulting in simplified habitat, incised channels and lack of pools, primarily from past placer mining activities in several reaches are still limiting. Some metals contamination occurs from past mining on some reaches, but the degree it inhibits fish production is unknown. On private land near the mouth, dewatering has affected connectivity with the Blackfoot River and has limited access by fluvial fish in some years; efforts by non-governmental organizations are underway to increase the frequency of main stem connectivity. Within the sub-watershed, migratory bull trout access is likely limited by unknown amounts by some habitat and habitat connectivity issues, as well as adverse interactions with non-native trout. There are good opportunities for partnerships with other agencies and private individuals to benefit bull trout on both federal and nonfederal lands, as evidenced by past work and positive response by fish in the Blackfoot (Pierce, Podner and Carim 2013). Table 13 presents the Poorman Creek local population status summary.

Table 13. Poorman Creek remnant population summary

Spawning adults	Short-term (5-year) population trend	Life history, connectivity	Number of known spawn reaches	Non-native species, threat
Unknown.	Believed to be increasing.	Resident and fluvial, connected within the last 10 years.	None currently confirmed, but spawning is known to occur based on age classes present. Magnitude of spawning not confirmed	Brown trout and brook trout, moderate in the lower reaches. Brook trout moderate to high in upper reaches. Brook bull trout hybrids noted during sampling effort by MDFWP. Additional evaluations need to be conducted to better assess threat.
Significance of geographical location			**Vulnerability to climate warming**	**Unique population attributes**
High significance. This is a moderate-sized drainage and the primary Blackfoot tributary south of Highway 200 and upstream of Highway 141 still supporting a small resident bull trout population and gene transfer with migratory individuals.			Moderate vulnerability, although some tributaries to Poorman Creek have cold summer water temperatures.	Resident population reproduction even when cut off from migratory individuals in some years

Other remnant populations including Poorman, Headwaters of Nevada Creek, Arrastra Creek, Hogum, Alice Creek and others

This is a grouping of streams that do not contain designated local bull trout populations but likely either support or contribute some individuals to the Blackfoot core population. Consequently, they are considered in the “other remnant population” category, a lesser category than “local population”. Information as to how bull trout utilize these streams indicates minimal bull trout use. It is known that all four streams support some rearing bull trout, likely from fluvial fish from the Blackfoot River. Of these four streams, only Arrastra Creek indicates reproduction as suggested by the presence of age-0 fish and a resident population. Habitat alterations are present in all streams, and non-native fish species are likely factors that adversely affect bull trout as well. Barriers or partial barriers to fish movements on nonfederal lands may be important on some of the streams, with some of those barriers having been recently addressed. Table 14 provides a summary for the Sauerkraut Creek, Hogum Creek, Arrastra Creek, and Alice Creek subpopulation of bull trout.

Table 14. Group of streams summary that contribute to the Blackfoot core population

Spawning Adults	Short-term (5-year) population trend	Life history, connectivity	Number of known spawn reaches	Non-native species, threat
Unknown.	Unknown.	Fluvial. Connected in some streams and partially connected in others.	None currently confirmed on a yearly basis. However, sporadic redd searches have identified incidental redds on Alice Creek.	Brown trout and brook trout vary in density and distribution by stream and pose variable levels of risk to bull trout. See 6th level HUC assessments.

Significance of geographical location	Vulnerability to climate warming	Unique population attributes
Moderate significance when the 4 6th-level HUCs are taken as a whole. The streams are individual 6th-level HUCs and are distributed throughout the headwaters of the Blackfoot drainage (two streams north of highway 200 and two south of Highway 200), which helps reduce the risk of any single event affecting contribution of bull trout from this grouping of streams	Moderate vulnerability overall with some streams having low vulnerability and others having moderate to high vulnerability based on current water temperatures and overall elevation. The upper end of Arrastra Creek would have low vulnerability.	None.

Nevada Creek other remnant bull trout population

This is not a local population but is classified as a bull trout other remnant population based on the ability of this patch to provide bull trout spawning and rearing habitat in warming climate scenario in 2040. Migratory bull trout in the Blackfoot core population are unable to reach this patch because of the presence of Nevada Creek Reservoir and the generally poor habitat below the reservoir. In recent years, stream and riparian habitat restoration below the reservoir has been occurring. Below the Forest boundary, habitat has suffered substantial negative effects from various agricultural activities, which has resulted in substantially elevated water temperatures, elevated sediments, and poor-quality pools on various reaches below the Forest boundary and upstream from Nevada Reservoir. If bull trout exist below the Forest boundary, they are likely limited by all of these impacts and by non-native species. Most eastern tributaries of Nevada Creek that headwater on the HLC NF have minimal connectivity to main stem. Table 15 provides a summary for the Nevada Creek subpopulation of bull trout.

Table 15. Nevada Creek remnant population of bull trout status summary

Spawning adults	Short-term (5-year) population Trend	Life history, connectivity	Number of known spawn reaches	Non-native species, threat
None.	None	Possible adfluvial historically before creation of Nevada Reservoir below the Forest boundary (barriers on upper Nevada Creek were removed within the last 15 years).	No Bull trout genetic material present in surveys in 2019 (Western United States eDNA atlas)	Brook trout. Very high. Hybridization of bull trout with brook trout confirmed from samples collected and analyzed in 2010.

Significance of geographical location	Vulnerability to climate warming	Unique population attributes
High significance. Overall, Nevada Creek is a large drainage and historically likely provided substantial contribution of bull trout to the Blackfoot River prior to the presence of Nevada Creek Reservoir.	Moderate vulnerability below forest, but climate shield modeling for 2040 suggests headwaters of Nevada has a 75% probability of providing spawning and rearing habitat for bull trout if no brook trout are present.	None.

Blackfoot River core area summary

Table 16 summarizes the significance of each sub watershed to the local population, the relative importance of the habitat and the proposed conservation strategy on the HLC NF. This summary provides an overall assessment of the importance of restoration activities for the Blackfoot River Core Area within the borders of the HLC NF but does not include necessary restoration activities in watersheds where the HLC NF has no ownership that may be critical for overall restoration of the bull trout population in the core area.

Table 16. Summary of the attributes and conservation recommendations for local populations and other remnant populations for that portion of the Blackfoot River Core Area on the HLC NF

Local Population	12-digit HUC Name	Significance to Local Population.	Contribution of Habitat in Limiting Population	Conservation Strategy
Landers Fork	Copper Cr	High	Low	Active/ Conserve
	Lower Landers Fork	Low	Moderate	Passive
Poorman Creek	Poorman Cr	Moderate	Moderate	Active
Group of Streams that Contribute to Core Area*	Hogum Cr	Low	Low	Active
	Alice Cr	Low	Moderate	Passive
	Arrastra Cr	Low	Moderate	Active
	Blackfoot River-Hardscrabble Creek**		-	-
	Blackfoot River - Anaconda Creek**	-	-	-
	Blackfoot River-Lincoln**	-	-	-
	Blackfoot River- Little Moose Creek**	-	-	-
Nevada Cr Headwaters*	Nevada Cr Headwaters*	Low	Moderate	Active

* These watersheds do not contain a designated local population of bull trout. However, they are in the core area and contribute to populations or have the potential to contribute to recovery of the core area population.
** Indicates watersheds are listed here based on rule set that critical habitat gets included in CWN when present (not all CH segments in these sub-watersheds are on National Forests).

Effects of the proposed action

General effects for the area of the plan within the Interior Columbia Basin

Functioning riparian areas stabilize stream channels after natural disturbances and some occasional human disturbances by alternatively storing and routing wood and sediment. Riparian areas serve as nutrient sinks for the surrounding uplands in the watershed, improve the quality of the water leaving the watershed (Platt 1991, DeBano and Schmidt 1989a, DeBano and Schmidt 1989b), reduce the energy associated with high flow events, and provide the best conditions for bull trout and their habitats for a period of time between disturbances. From the perspective of bull trout need, all streams in an ecoregion are never in high quality conditions at the same time. Riparian areas are dynamic and are susceptible to effects from both natural and management activities but are resilient and can recover quickly when managed correctly (DeBano and Schmidt 1989a); riparian areas are also resistant to those effects if ecological processes are functioning properly.

Many activities allowed within the Upper Blackfoot and Divide GA west of the continental divide in the 2020 Forest Plan have the potential to indirectly affect bull trout and their habitats in a beneficial or negative manner. Land management activities that disturb the soil surface or require added use of already disturbed features such as road prisms have a greater potential to interact and potentially cause adverse effects. Activities that have the greatest potential to disturb soils and indirectly affect bull trout habitat include some activities associated with vegetation management, fuels management, livestock grazing, roads, and recreation. While the cause-and-effect relationships from land management activities are not linear and are often indirect, results from PIBO monitoring over the past 19 years has shown that with standards and guidelines applied consistently across the interior Columbia Basin, habitat degradation has been arrested and habitat conditions on nearly all National Forests are trending in a positive direction (Thomas et al. 2018); (Roper et al. 2019). The Roper et al. paper (2019) confined sampling to sites at similar elevations to help account for differences that could occur between heavily managed sites at the lowest elevations and reference sites that are usually found at higher elevations. As a result, the focus of this analysis was on managed sites at relatively higher elevations, rather than low elevation sites found elsewhere in the Columbia Basin, to minimize the potential for inaccurate comparisons.

With INFISH components updated and mostly carried forward in the proposed action, bull trout habitat in the plan area is expected to continue on a similar improving trend if the standards and guidelines continue to be applied as they have in the last two decades. While larger vegetation restoration projects involving extensive road reconditioning and haul are likely to contribute fine sediment to streams at crossings and in locations where the road is close to and paralleling the stream, the active delivery is relatively short term, and in most instances, a relatively small amount is delivered when compared against management that occurred prior to INFISH. With culvert replacement and BMP use occurring before and during project work, and road storage applied when projects conclude, roads likely contribute less sediment than they otherwise would have before use. Of equal and likely greater importance, the sediment caused by current road use and harvest methods can’t be compared to the types of roads being built, the amount being built, and their location prior to INFISH. The standards and guides in this plan revision are expected to continue the passive restoration occurring across much of the Interior Columbia Basin (Roper et al. 2019). Also, the identification of a CWN and objectives to reduce the interactions between roads and streams meets much of the intent of the unsigned ICEBMP that was expected to refine INFISH (U.S. Department of Agriculture 1995). Active restoration in key locations based on WCF and the CWN are expected to further contribute to improving habitat conditions in managed portions of watersheds on federal lands.

With regards to PIBO data specific to the Helena National Forest boundary evaluated at the Forest scale (since there is no bull trout or critical habitat on the Lewis and Clark National Forest portion of the combined forest), riparian and stream habitat degradation has been halted since the 1986 Helena National Forest Plan was amended by INFISH in 1995. This conclusion is validated by the PIBO data set analyzed for the plan revision in 2020 (in project file). PIBO data for managed sites indicate that habitat for the entire forest is degraded for several metrics when compared to the 46 reference sites in the ecoregion. However, neither of the substrate measures collected by PIBO (pool-tail fines and median particle size) are statistically different when compared to the reference sites within the ecoregion. At the Forest scale PIBO data shows a positive trend in wood frequency ($p=0.05$), and a negative trend in bank angle ($p=0.02$).

There are six “managed” sites in the Upper Clark Fork Sub basin (Little Blackfoot and Nevada Creek) on the Helena portion of the HLC NF. Four indicators, overall index, percent pool, wood frequency, and bank angle are considered statistically different and degraded when compared against ecoregion reference conditions. The small sample size of six managed sites provides less confidence than a larger sample size as to whether the monitored sites accurately represent conditions for the Upper Clark Fork Sub basin on

NFS lands. Trend for the 10 indicators in the upper Clark Fork are nonsignificant for 7 of 10, and statistically trending negative for three indicators, bank stability, bank angle, and median particle size.

There are 10 “managed” data collection sites in the Blackfoot subbasin on the Helena portion of the HLC NF. Of the 10 indicators, three are considered statistically degraded when compared to ecoregion reference conditions: overall index, median substrate size, and pool tail fines. Regarding trends, four of the 10 are statistically trending in a beneficial direction: observed vs expected (a metric of macroinvertebrate community integrity), bank stability, large woody debris frequency, and the undercut banks. A sample size of 10, although still smaller than ideal, is likely to represent conditions on managed landscapes in the Blackfoot Sub basin. (c. Saunders, personal communication).

When implementing land management activities guided by the proposed forest wide desired conditions, goals, objectives, standards, and guidelines the components would protect the processes that maintain bull trout and their habitats on NFS lands. Watershed, soil, riparian, and aquatic habitat conditions under the proposed action, in general, are expected to improve as a reflection of projects designed to meet desired conditions, continued passive restoration implementation of standards and guides, and restoration activities For example, forestwide desired conditions are designed to improve overall watershed condition (FW-WTR-DC-01 through 12 and FW-FAH-DC 01 through 08) and restore riparian and aquatic habitats (FW-RMZ-DC 01 and 02, FW-RMZ-STD 01 through 06, and FW-RMZ-GDL 01 through 12). Additionally, GA goals DI-FAH-GO-01 and UB-FAH-GO-01 emphasize cooperation and coordination to help recover bull trout as identified in desired conditions DI-FAH-DC and UB-FAH-DC 01 and 02.

Potential site-specific effects to bull trout would be analyzed and consulted on during individual project consultations that address site-specific management activities such as new travel management proposals, timber sales, recreational site improvements, allotment management plans, and minerals plan of operations.

Indirect effects likely to occur by program area

Vegetation management

Historically, managing vegetation on forest lands impaired water quality by routing runoff and sediment onto bottomland stream areas when conducted too close to streams or on unstable grounds above streams. Best management practices, which were called for and developed in the 1980s, can help control nonpoint source pollution (Binkley and Brown 1993). (Everest and Reeves 2007) disclosed the following regarding BMP development for the pacific-northwest in the time period up to the 1994 Northwest Forest Plan being instituted, “The BMPs were developed through the normative process that weighed, evaluated, and incorporated many types of information. However, in arriving at decisions, compromises were often made in social, political, economic, and ecological goals for riparian management. The BASI for protection of riparian and aquatic habitats was not always incorporated into forest practice rules.” This cycle was repeated several times even as successive monitoring efforts continued to document degraded stream conditions (Reeves et al. 2016a). Similar BMP challenges have faced the Columbia Basin prior to the implementation of INFISH and PACFISH.

Under the 1986 Helena Forest Plan, amended by INFISH, impacts from forest management activities were addressed by creating RHCAs that when combined with standards and guidelines, regulated the extent of upland timber harvest, applied BMPs to limit stream connectivity to the road system and landings, and required entries into RHCAs be to the benefit of the RHCA. RHCAs were established by the 1995 INFISH amendment, which was amended to the Helena Forest Plan in February 1996. According to more recent results from the State of Montana audits of BMPs, the Forest Service BMPs were effective 96.4 percent of the time in 2014 (Ziesak 2015) and 95.7 percent in 2018 (Ziesak 2018).

Forest management can disturb uplands through removal of tree canopy and the yarding of the material to a central processing facility. Site preparation also historically reduced groundcover by broadcast burning remaining vegetation to bare soil for planting and to clear remaining fuels. The practice in the 1980s and prior lowered soil carbon (i.e., organics) in the A horizon in some instances from the purposeful clearing of vegetation and removed protective groundcover (Johnson and Curtis 2001). Today, these methods have been largely replaced on the HLC NF by either mechanical piling/burning, and whole tree yarding that leaves less activity fuels in harvest units. After initial treatments just mentioned, prescribed fire has become the primary prescription to reduce accumulating hazardous fuels after treatments. The change in contemporary timber practices to whole tree yarding is preserving protective groundcover covering at least 85 percent of the treatment area, based on soil monitoring data in northwestern Montana (Milner 2015).

Studies documented increased sediment erosion associated with past timber harvest practices, with the primary causes being harvest, yarding next to streams, and interactions between streams and roads (Bilby, Sullivan and Duncan 1989, Sugden and Woods 2007, Luce and Black 1999). In recent decades, researchers interested in forest management and water quality have investigated the effectiveness of management policy and law (Brown, Brown and Binkley 1993); (Rashin et al. 2006); (Cristan et al. 2016)). Current management is more effective at preventing nonpoint delivery of sediment from harvest areas through the use of water and soil conservation practices and best management practices (USDA 2012c) focused on stabilization of log skidding and landing networks where erosion is most probable. As a result, vegetation management in harvest units generally has very low erosion rates outside of harvest units. When harvest activities and yarding are kept greater than 10m away from streams, 95% of sediment created in harvest units does not travel to the stream edge (Rashin et al. 2006). After timber harvest and site preparation, regrowth of vegetation covers the soil surface with plant litter and soils armor, and potential erosion hazard becomes low (Elliot, Hall and Scheele 2000).

Peak flow increases as related to harvest were raised as a concern due to their potential to alter stream morphology and degrade water quality. The concern over changes to peak flow from timber harvest was raised when timber was harvested on a larger scale than what currently occurs. The loss of forest canopy on harvest sites can change the water balance. Studies in the Pacific Northwest have documented cases where excess water from harvest areas influenced the peak and timing of stream flows (Moore and Wondzell 2005, Stednick 1996, Keppeler and Ziemer 1990). In reviews, these cases depended largely on the extent of harvest and the climatic regime (Grant et al. 2008). The effect diminishes in time as vegetation re-establishes. The altering of streamflow can also influence stream temperature (Swanston 1991), although the principle factor in affecting stream temperature is changes to riparian cover that shades streams (Beschta et al. 1987, Gomi, Moore and Dhakal 2006, Macdonald et al. 2003).

Watershed yield studies have specifically targeted timber harvest activities that would generate a response and may not necessarily mimic current forest practices. Beschta et al. (2000) found a weak relationship between forest harvest and increased peak flows and reported "mixed messages" about the relationship between forest harvest and peak flow responses. Numerous studies documented the effects of forest canopy removal on peak flows in the Pacific Northwest (Kuras, Alila and Weiler 2012, Jones and Grant 1996, Thomas and Megahan 1998, Beschta et al. 2000, Hubbart et al. 2007, Tonina et al. 2008), but, surprisingly, very few demonstrated a direct link between water yield/peak flow changes and measured channel impacts in forested environments. In the latest review of studies in the Pacific Northwest, Grant et al. (2008) suggested that if degradation were to occur, channels most sensitive to peak flow changes are low gradient with gravel bed and sand bed substrates.

The 2020 Forest Plan would continue to limit timber harvest in RMZs through plan components. The plan clarifies the intent of INFISH standards and guides and does allow management when it follows standards and guides and protects desired conditions. If harvest treatments are proposed for the inner RMZ, they must be for the direct benefit of the riparian and stream. Machinery such as a traditional skidder is highly unlikely to occur in the inner RMZ based on BASI. Commercial sized trees in the outer RMZ could be removed, including with motorized machinery for the benefit of other resources such as silviculture and terrestrial wildlife, but treatments must not cause harm to in the inner RMZ. As a result, degradation from commercial harvest is not expected to occur under the 2020 Forest Plan.

FW-RMZ-GDL-09 minimizes effects to RMZs by limiting ground-based logging equipment, skid trails, landings, and roads. As restoration activities trend vegetation towards desired conditions, watershed health is expected to improve. FW-WTR-DC-01 and 06 emphasize the protection of water quality and habitat in general, including areas actively managed, which should result in improved water quality that will ultimately benefit bull trout.

With regards to vegetation management within RMZs, inner and outer zones are identified in the 2020 Forest Plan. For fish-bearing (category 1), perennial non-fish bearing (category 2), and intermittent steep streams with >35% side slope (Category 4a), the inner zone would be 100 feet on each side the edges of the active stream channel. In special cases, the inner RMZ widths of Category 1 and 2 streams would extend on each side of the stream from the edges of the active stream channel beyond the 100 feet distance to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, whichever is greatest. For Category 4a, the inner RMZ widths would extend on each side of the stream from the edges of the stream channel beyond the 100 feet distance to the top of the inner gorge, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, whichever is greatest. For category 4b, flat (<35% side slope) intermittent streams, both the inner and outer RMZ widths would be 50 feet. Within the inner RMZ, nonmechanical vegetation management shall only occur in order to restore or enhance aquatic and riparian-associated resources (FW-RMZ-STD-02).

Consequently, entry into the inner zone would be limited, and this is due to the critical role the inner zone provides for shade, large woody debris recruitment, bank stability, and sediment control. It is the intent of this standard to provide for riparian and aquatic processes and functions and protect them.

The outer RMZ widths for Category 1 and 2 streams have been identified in the 2020 Forest Plan to be 200, and 150 ft. There would be no outer zone for intermittent streams with >35% side slope. Guideline FW-RMZ-STD-04 is designed to allow vegetation management within the outer RMZ zone to meet desired conditions, so long as project activities in RMZs do not prevent attainment of desired conditions for wildlife and the inner RMZ. Additionally, FW-RMZ-GDL-04 directs avoidance of road and landing construction in an RMZ unless needed to cross a stream, or where a road relocation into the RMZ benefits aquatic and riparian desired conditions.

Indirect Effects Specific to Blackfoot and Upper Clark Fork Core Areas from vegetation

Areas suitable for timber production, as well as areas not suitable but where some harvest is allowed (HCOOUL) are disclosed by sub-watershed in Table 19 at the end of appendix D. At the scale of the two core areas, the acreage where timber removal is allowed is slightly less than what is allowed by the existing plan as amended by INFISH. Most changes where increases occur in suitable acres are accompanied by comparable decreases in HCOOUL acreage so that the actual acreage where trees of commercial size can be removed does not appreciably change. For example, North Trout Creek has 7 percent increase in suitable, and a 7 percent decrease in HCOOUL.

In the Upper Clark Fork sub basin, there is slight overall reduction in acres available for harvest. Changes for suitable acres are similar are much the same in the Blackfoot Sub basin, with an overall small reduction in suitable acres of less than 1%, about 2,300 acres. Unlike the upper Clark Fork core area, reduction in HCOOUL acres in the Blackfoot core area is substantial at approximately 29%, 54,000 acres. Most of the reductions take place in Lower Alice Creek, Headwaters of Nevada Creek, and Middle Landers Fork sub watersheds. Lower Alice Creek and Headwaters of Nevada Creek are both in the CWN. Reductions occur because of increases in Primitive Acres ROS designation. The designation changes for these three sub watersheds reduce the probability of short-term sediment generation from harvest treatments over the life of the next plan, but at the same time reduce opportunities for active management treatments that could make these areas more adaptable to future wildfire.

Under this revision, vegetation management allowed by this plan is not expected to change water temperature because treatments that could increase solar input are highly unlikely to occur next to waterbodies with the implementation of RMZ plan components. On rare occasions where some solar input increase could occur, it would be consulted on at the project level. Because vegetation removal next to streams is closely controlled by plan components, therefore vegetation next to streams would remain to be naturally contributed. Consequently, pools are expected to stay the same or slightly increase over time because vegetation would continue to grow back along streams that were harvested to the streambank before INFISH amended forest plans. Vegetation management by itself is not expected to increase barriers or sediment delivery to streams. Activities associated with vegetation management such as gaining access, managing roads segments, and hauling are likely to have short-term negative effects and long-term beneficial effects; associated activities are discussed under effects for roads. The trend of slowly improving integrated sub watershed conditions is expected to continue under this plan revision based on an analysis disclosed in bull trout Critical Habitat BA submitted to the USFWS (Thomas et al. 2018) and the corresponding Biological Opinion (U.S. Department of the Interior 2018).

Fuels management in the presence of warming climate and increasing fire size and severity

Fire and changing conditions on the landscape that result from a warming climate must be kept in mind when considering riparian management needs (Luce et al. 2012); (Dwire et al. 2016); (Reeves, Pickard and Johnson 2016b); (Joyce et al. in press); (Luce 2018); (Keane 2016). When considered by subregion, model runs in the Northern Region of the Forest Service show that averaged temperatures will continue to become warmer during the first half of the 21st century (Joyce et al. in press). Some locations in the region are expected to become drier and have more periods of drought; while overall precipitation is expected to range from 5 percent less to an increase of up to 25 percent, with a mean increase expected to be 6 to 8 percent (Joyce et al. in press). Climate is expected to reduce stream flows (Luce and Holden 2009), reduce the storage capacity associated with snowpack (Luce, Lopez-Burgos and Holden 2014), and shift the timing of run-off in some locations (Luce et al. 2012); (Luce 2018); (Luce et al. 2016).

Climactic warming is expected to differentially affect tree species and their distribution on the landscape, as well as some of the pathogens that act upon them (Keane 2016). There is also significant concern that climate warming effects combined with altered disturbance regimes caused by fire suppression will change ecosystems (Hessburg, Agee and Franklin 2005); (Luce et al. 2012). Finally, climate warming may create conditions heretofore not observed and cause ecosystems to shift in novel ways (Luce et al. 2012); (Reeves et al. 2016a);(Reeves et al. 2016b). These changes include how riparian areas respond to potentially novel disturbance regimes (Dwire et al. 2016); (Hessburg et al. 2015); (Reeves et al. 2016b) How land managers prepare and respond becomes ever more crucial.

The relation of fire behavior between riparian areas and adjacent uplands is influenced by a variety of factors, contributing to high spatial variation in fire effects to riparian areas. Landform features, including broad valley bottoms and headwalls, appear to act as fire refugia (Camp et al. 1997). Biophysical processes within a riparian area, such as climate regime, vegetation composition, and fuel accumulation are often distinct from upland conditions (Dwire and Kauffman 2003); (Reeves et al. 2016a, Reeves et al. 2016b). This can be especially true for understory conditions (Halofsky and Hibbs 2008). Riparian areas experiencing moderate annual climate conditions can have higher humidity and can act as a buffer against fire and therefore as a refuge for fire-sensitive species (Halofsky and Hibbs 2008). Some studies have found fire typically occurs less frequently in riparian areas (Russell and Mcbride 2001); (Dwire et al. 2016).

Depending on geologic and topographic features, riparian conditions and response to fire vary (Halofsky and Hibbs 2008). A study in mixed severity conifer stands in the Sierra Nevada found that riparian and upland conditions are similar and consequently fire effects are similar (Van de Water and North 2010). Under severe fire weather conditions and high fuel accumulation, riparian zones may become corridors for fire movement (Pettit and Naiman 2007). Fire effects occurring upstream will likely influence downstream conditions (Wipfli, Richardson and Naiman 2007), as well as future fire behavior (Pettit and Naiman 2007). Effects of high severity fire on aquatic systems will likely have short term negative effects at the reach scale but beneficial effects over time at that same scale as recolonization naturally occurs (Gresswell 1999). In fact, many riparian shrub species are successful root crown sprouters and respond favorably to fire. They are also primarily shade intolerant, so conifer removal through fire favors these riparian shrubs. Herbaceous species also respond well to fire.

At a watershed scale, fire effects for one salmonid life history phase can be negative, while in the same watershed, the fire effects will be beneficial for another life history phase (Flitcroft et al. 2016). Considering these varied conditions that occur from the stream edge to upslope and from river mouth to mountaintop, riparian response to fire is complex and heterogeneous and therefore requires considerate effort to design treatment plans that maximize benefits for both terrestrial and aquatic dependent species.

In the face of larger fires and disease outbreaks, the challenge of how to integrate management of aquatic and terrestrial resources has now confronted the agency for over a generation, including the Northern Region. (Rieman et al. 2000) spoke directly to this perception and identified opportunities for convergence, as have many others since (Rieman et al. 2010); (Hessburg et al. 2015); (Hessburg et al. 2016); (Reeves et al. 2016a); (Reeves et al. 2016b). Current habitat has been degraded in many dry and mesic forests, and treatments (such as road improvement or relocation, culvert replacement, thinning, prescribed fire and wildfire use to restore old forest structure) could create more suitable aquatic habitat in the long term. (Rieman et al. 2000) stated, “By working strategically it may be possible to establish mosaics of fuel and forest conditions that reduce the landscape risk of extremely large or simultaneous fires without intensive treatment of every subwatershed.” Further, they suggested recovery of function in some watersheds may not be possible without some human intervention.

Dry forest treatments, such as thinning fire intolerant trees, while still controversial (Williams and Baker 2012) are broadly supported by current scientific literature (Hessburg et al. 2016) and have continued to gain acceptance from the public and greater use by managers. In the Northern Region of the Forest Service, restoring mixed severity fire regimes also remains controversial and complicated for numerous reasons such as the habitat needs of ESA species like bull trout, lynx, and grizzly bear. Therefore, treating riparian areas in mixed severity forests can be especially controversial and complicated, depending on the treatment and species composition. In some locations where upslopes and riparian forests have qualitatively similar fire effects, treatments guided by scientific findings for these conditions are likely to restore ecological function of fire regimes at the landscape level (Finney et al. 2007). Position in the landscape relative to elevation, location within the stream network, and climate regime should be carefully considered based on an understanding of riparian function (Pettit and Naiman 2007); (Reeves et al. 2016a, Reeves et al. 2016b). Because the effects of restoration treatments on departed riparian habitats are not fully understood in all types of riparian habitats, focused research in an adaptive management framework will be necessary. It should be noted, however, that most riparian vegetation species do respond favorably to fire and actually decline in the absence of fire, due to canopy shading from conifers (Dwire and Kauffman 2003).

Long-term fire suppression causes forest successional processes to continue, which can increase evapotranspiration and interception, potentially resulting in less water available for wetlands. In many cases, lack of fire can lead to the encroachment of woody species (primarily shrubs) into peatland habitats, which could lead to competitive exclusion of herbaceous species. Suppression of natural fire regimes causes fuel loads to accumulate. When wildfire does occur, the intensity and severity are often higher than they would be with more natural levels of fuels. This can result in higher rates of fuel consumption and availability of ash and nutrients that can be delivered to aquatic environments. Suppression of natural fire regimes results in forests that have more leaf area. This results in higher evapotranspiration and interception levels, which leaves decreased amounts of water available for surface and subsurface flow. Lower levels of stream flow can affect aquatic species because of warmer water temperatures and changes in water chemistry. In addition, fire suppression can allow fuels to accumulate above natural levels, which can cause wildfires to burn more severely. This process can change infiltration characteristics of the soil and change hydrologic characteristics. Fire suppression activities, such as retardant use and drafting water from streams, can also adversely affect bull trout.

Use of wildland fire and prescribed fire for multiple objectives can affect flow regimes by reducing evapotranspiration, interception, and snow accumulation patterns and by increasing soil moisture and surface runoff. Prescribed fire can also reduce the evapotranspiration demands and make more water available for wetlands. Over the long term, greater than 2 to 3 years, prescribed fire is expected to improve riparian condition, if applied to meet site-specific riparian management objectives. Fire along streambanks and shorelines can result in variable amount and distribution of ground exposure. Moderate- to light-severity fires generally have little influence on riparian vegetation and ground litter removal, and subsequent surface erosion. Severe fires may remove virtually all riparian vegetation and groundcover and result in soil erosion and sedimentation to nearby water bodies and loss of important transitional habitats for aquatic-dependent species such as bull trout.

Where prescribed fire is applied and blackens the area, runoff can increase from reduced infiltration. Blackened soil areas can accelerate runoff due to soil sealing from ash that lowers the infiltration capacity of soils (Larsen et al. 2009); (Doerr et al. 2006). These conditions vary spatially and decrease over the first year as products of burning in the soil degrade (Wondzell and King 2003); (Doerr et al. 2006). Natural forest conditions have hydrophobic conditions that resist infiltration due to the drying of soils and the waxes in plant litter, but the main difference is that burned areas lack surface roughness to dissipate rain splash energy and interrupt runoff. Other factors that increase runoff from harvest and burn areas are steep slopes, low groundcover, and long slope lengths (Elliot 2013). Runoff transports loose soil particles and deposits sediment down the slope proportional to runoff energy. One reason sedimentation decreases over time is that the sediment supply decreases after bare surfaces armor, lacking a ready sediment supply. Over the past planning period, management has mitigated prescribed fire by not lighting fire within stream buffer areas and burning during cool and moist conditions, which results in low- and moderate-severity fire.

Wildfire suppression tactics can affect watershed resources through the building of fire lines and large fuel breaks and use of fire retardant, which cause soil disturbance and remove vegetation. Ground disturbance from wildfire suppression, in addition to the baring of ground caused by wildfire, can cause a net decrease in effective groundcover so that it no longer resists rainfall runoff. These activities can route sediment to streams from compacted machine paths and linear features, which channels runoff. Post fire rehabilitation attempts to mitigate these effects across the fire area. The preferred alternative would mitigate these effects by limiting fire suppression activities away from the most sensitive areas, the RMZs. The preferred alternative carries forward forest plan components to locate fire facilities including camps away from riparian areas where risk of sedimentation and degradation to water quality is highest (FW-RMZ-GDL-08). It also has language to avoid riparian and aquatic resources from suppression activities by minimizing suppression activities in RMZs (FW-RMZ-GDL-06), rehabilitation of fire lines in the RMZ (FW-RMZ-GDL-05), aerial retardant avoidance areas (FW-RMZ-GDL-10) and direction to avoid fuel storage in RMZs that could drain runoff into streams (FW-RMZ-STD-06).

Impacts to RMZs and habitat may still occur in certain circumstances when there are no other suitable locations for incident bases, camps, helibases, staging areas, etc. Delivery of chemical retardant, foam, and other additives near or on surface waters may occur when there is imminent threat to human safety and structures or when a fire may escape, causing more degradation to RMZs. Conversely, where management treatments are used to reduce wildfire hazard, positive long-term effects may be realized.

The preferred alternative would maintain existing direction for fire retardant drops relying both on resource advisors to avoid areas of high risk as well as the avoidance mapping to improve the communication of where aerial operations need to avoid dropping fire retardant (FW-RMZ-GDL-10). Avoidance areas have been mapped in response to the *Biological Opinion on Effects to Listed Species from U.S. Forest Service Aerial Application of Fire Retardants on National Forest System Lands* (USFWS 2011).

Indirect Effects Specific to Blackfoot and Upper Clark Fork core areas from fuels management

Extensive fire has occurred in the project area under the current plan, especially in the Black Foot Core area. Along with the wildfire, there have been suppression activities such as prescribed fire, developing fire camps, application of fire retardant, BAER responses, and changes in road management after wildfire events. In recent years, there has also been an increase in salvage activities where opportunities are accessible from the existing road system.

Under this plan revision, suppression activities, managed fire, and road treatments would continue. Fire suppression activities are unlikely to increase stream temperature by measurable amounts. Fireline creation and use, as well as restoring fire lines after use would be expected to cause a short-term increase in activity related sediment generation. Pools would not likely decrease from these activities, although wildfire itself could both increase and decrease pools. Suppression activities would be unlikely to create barriers. The trend of slowly improving integrated sub watershed conditions would be expected to continue under this plan revision, based on an analysis disclosed in bull trout Critical Habitat BA submitted to the USFWS (Thomas et al. 2018) and the corresponding Biological Opinion (U.S. Department of the Interior 2018).

Effects of wildfire on stream runoff, sedimentation, and nutrients are largely beyond the scope of forest planning because it is not possible to predict when and where wildfires will burn. However, monitoring of these effects has shown mostly temporary, transient effects of wildfire on water quality. In fact, fire in the western United States has been shown to be essential to maintain salmonid habitat at landscape scales.

Roads

Existing road networks affect natural landscape processes in numerous ways and high road densities have been correlated to declining populations of bull trout (Lee et al. 1997). Natural drainage patterns are affected long-term by the presence of roads. Roads intercept subsurface drainage in cut slopes, capture rainfall on hardened road surfaces, and route excess runoff into the stream channel system. Where a dense road network is well connected to the stream network, it can be an "extension" of the actual stream network and alter streamflow regimes.

Sediment from the road system can be delivered to streams by direct erosion of cut and fill slopes associated with stream crossings or by surface runoff from roads and ditches that carries sediment-laden water directly or indirectly to streams (Al-Chokhachy, Roper and Archer 2010, Al-Chokhachy et al. 2016a). In general, roads lacking surface rock near streams and those with steep grades and side slopes in proximity to streams are the greatest contributors of sediment from surface erosion. In steep terrain, roads can increase the rate of hill slope failures and soil mass wasting. Excessive fine sediment loading can lead to changes in channel morphology and water temperature increases. Vehicular traffic also contributes to sediment delivery from surface rock displacement and pulverization (depending on rock source) and rut development that captures and routes water (Al-Chokhachy et al. 2016a, Cissel et al. 2014).

Existing valley bottom roads continue to affect riparian and aquatic function by confining low gradient natural stream channel movement, floodplain access, and vegetation growth, and delivery of large wood to channels (Al-Chokhachy et al. 2016a).

Under the existing 1986 Helena Forest Plan, as amended by INFISH, activities have helped to improve soil and aquatic resource conditions through changes in road and travel management. Forest roads that are maintained on an annual basis are typically those roads that have the most administrative and visitor use. Roads that have been closed or receive limited visitor use have revegetated to some degree, naturally been reclaimed, or have been decommissioned. During the last several years, some roads that are graded have had new gravel surfacing to reduce the rate of road deterioration and subsequent erosion from road surfaces. Several roads have been moved out of riparian areas or decommissioned, and culverts were installed or removed at stream crossings that were contributing sediment directly to the aquatic ecosystem or impeding passage of aquatic organisms. Although there have been improvements to the overall road network from the decommissioning and restoration of stream crossings, some crossings would continue to affect bull trout migration into historical habitats due to improperly designed structures from past management. Maintenance, closure, and decommissioning of roads, as well as restoration efforts at crossings, are expected to continue at a similar level compared to recent replacement schedules.

Numerous changes to road management have occurred since the mid-1990s, starting with the amendment of the Helena National Forest Management Plan by 1995 INFISH in 1996. Extensive standards and guides in INFISH slowed new road construction as well as modified or eliminated practices that could harm riparian and aquatic habitat. INFISH was followed by the 2001 Roadless Rule, and the 2005 Access and Management Travel Rule. The HLC NF has reduced road miles since the early 2000s and strategically addressed roads in locations important to bull trout, such as Copper and Poorman creeks. Existing roads would be routinely improved or upgraded as determined by project-level planning efforts, including storage and relocation and obliterated based on the Divide and Blackfoot Travel Plan Decisions. New road construction would be expected to continue to be limited by grizzly bear management and recovery needs.

The 2020 Forest Plan includes plan components related to roads as they relate to soil, watershed, and aquatic resource protection or restoration. The plan includes an objective (FW-RMZ-OBJ-01) to improve 500 acres of riparian habitat which includes road obliteration or removal of road prisms. It also includes FW-FAH-OBJ-01, which is a component to improve the habitat quality and hydrologic function of at least 20 miles of aquatic habitat with a focus on streams with listed species or species of conservation concern that identifies activities including road decommissioning. FAH-OBJ-02 would stormproof 15 to 30 percent of the roads in the conservation watershed network prioritized for restoration to benefit at-risk aquatic species and municipal watersheds. FW-CWN-GDL-02 provides for roads in conservation watershed networks to be prioritized for road decommissioning, closure, relocation or other strategies to reduce sediment delivery to benefit aquatic species such as bull trout. FW-RT-OBJ-02 states: complete at least 100 miles of reconstruction or road improvement projects. Priorities shall include reducing effects on desired aquatic and riparian conditions from chronic sediment delivery or potential future road prism failures, and conservation watershed networks that have native cutthroat or bull trout habitats. FW-RT-STD-02 provides for maintaining free-flowing streams, new, replacement, and reconstructed stream crossing sites (culverts, bridges and other stream crossings) shall accommodate at least the 100-year flow, including associated bedload and debris. FW-RT-STD -04 specifically addresses non-fish bearing streams and states when installing new crossing structures on streams that have no fish, the structure shall accommodate a 1 percent probability (100-year) or higher flow, including associated bedload and debris. FW-RMZ-GDL-04 focuses on reducing the likelihood of sediment input to streams, by avoiding new road and landing construction, including temporary roads, in RMZs. All twelve FW-RT-GDL guidelines address issues to hydrologically disconnect roads and trails from streams, maintain channel stability at crossings, minimize effects on streams from road maintenance and snow plowing, provide for passage at stream crossings for all life stages of native aquatic organisms, and provide that stored roads behind gates or berms are treated to assure that they avoid future risk to aquatic resources.

The plan components (FW-SOIL-GDL-06 and 07) that provide direction for decommissioning temporary roads, skid trails, and landings would provide improved conditions. Since temporary roads were not addressed under INFISH; this represents an improvement over existing condition.

Many of these efforts are most likely to occur in areas of active restoration where opportunities present themselves through the implementation of site-specific projects. With the application of the 2020 Forest Plan direction, overall watershed conditions would be expected to improve over time as we move towards desired conditions. Current management activities to improve water quality and aquatic habitats have included reducing open roads in RHCAs, and improving, rehabilitating, or putting into storage stream crossings. This emphasis on improving or removing stream crossings for the benefit of bull trout and native fish would continue with implementation of the 2020 Forest Plan and help to remove or mitigate risk factors associated with roads and to improve watersheds and water quality.

Bull trout would benefit by the direction for the conservation watershed network, which has a desired condition to provide for functionally intact ecosystems that provide high-quality water and contribute to and enhance the conservation and recovery of threatened or endangered fish species and aquatic species of conservation concern (FW-CWN-DC-01). The objective FW-CWN-OBJ-01 proposes to repair two road/stream crossings every five years at locations where chronic sediment sources are found (i.e., up-size culverts, reduce sediment delivery to waterways from roads, realign stream constraining road segments, etc.). Most importantly, guidelines 01 and 02 continue to focus on reducing the impacts from those sections of roads most likely to have sediment and bead load effects.

Indirect Effects Specific to Blackfoot and Upper Clark Fork Core Areas from Roads Management

While plan components discussed limit road effects and lead to passive restoration over time, short term negative effects are still likely to occur. Activities associated actions like culvert replacement on existing roads may increase solar input at crossing sites. Because of the small amount of area where this could occur, stream temperature is not expected to increase by measurable amounts. Road use for haul, bmp installation, culvert replacements, road storage activities and some decommissioning activities are all expected to cause a short-term increase in sediment generation while long term sediment generated from roads is expected to decline from current levels. The amount of pools are not likely to decrease from these activities, although pool depth and pool tail substrates could change in the short term and improve in the long term. Road management activities are likely to continue to reduce the number of barriers present that affect bull trout. The trend of slowly improving integrated sub watershed conditions is expected to continue under this plan revision based on an analysis disclosed in bull trout Critical Habitat BA submitted to the USFWS (Thomas et al. 2018) and the corresponding Biological Opinion (U.S. Department of the Interior 2018).

Livestock grazing

Grazing in the west is controversial, with some recommending the practice should be removed or greatly curtailed on public land with the approaching effects of climate change (Beschta et al. 2013), while others suggest grazing is an essential tool to help reduce fine fuels on western Rangelands (Svejar, Boyd and et al. 2014). As a part of its mandate to provide goods and services and at the same time protect ecological processes, the Forest Service continually works to balance these seemingly incompatible viewpoints.

Low gradient stream reaches that support cold water fish species are of concern. Perennial vegetation on or near the water's edge (greenline) in these habitats encounters the most erosional stress during floods. Flooding is a natural disturbance process that maintains heterogeneity in riparian and in-stream structure, function, and composition (Naiman and Decamps 1997). The natural disturbance regime effects of flooding can be compounded by various land-use practices resulting in decreased riparian function. Riparian vegetation has the best opportunity to slow velocity and induce deposition of materials, stabilize banks, and recreate channel pattern, profile, and dimension appropriate for the landscape setting. Where streambank instability or changes in channel form may arise from channel widening or channel incision, vegetation along the greenline is most critical. This is particularly important for alluvial, or "self-forming" channels (Leopold, Wolman and Miller 1964). Depending on site potential, greenline, riparian, and floodplain plant communities also contribute wood and aid floodplain energy dissipation, sediment and nutrient sequestration, and aquifer recharge (Swanson, Wyman and Evans 2015).

Livestock grazing near low gradient unconfined streams can result in changes in channel morphology (Platt 1991, Belsky and Gelbard 2000). Livestock trailing and general soil displacement along stream bank areas can result in collapse of undercut bank areas and an overall increase in bank angle, loss of bank cover, and stream widening along the entire stream reach. Over long periods of time, grazing can lead to an entire channel becoming down-cut to the point that gully erosion is initiated and a new channel is formed at the bottom of the gully. This type and extent of downcutting results in an entire channel type change. Livestock trampling streambanks can increase ground exposure, surface erosion, and sedimentation. Concentrated livestock waste can cause eutrophication of lakes and ponds. Livestock grazing directly in wetlands or immediately adjacent to them can cause soil compaction, hummocking, and loss of vegetation, ultimately inhibiting subsurface water flow.

Livestock grazing takes place across much of the action area and is a substantial component of management on the Forest west of the continental divide in the Upper Blackfoot and Divide GAs. While conditions in general have improved over the course of the 1986 Helena National Forest Plan as amended, there are likely localized adverse effects from current and past management activities that may recur in successive years or for a single season. Currently, there are twelve allotments in the Blackfoot core area that total 87,709 acres (Table 17). In the Upper Clark Fork core area there are also twelve allotments; the total acreage in these allotments is 73,549 acres of NFS lands (Table 17), but seven of those allotments straddle the Continental Divide, so only 53,167 acres are actually in the Upper Clark Fork core area or the Little Blackfoot drainage. When guideline FW-GRAZ-GDL-01 is implemented, low gradient, alluvial channels should have end-of-season stubble height maintained at 10 to 15 cm (4 to 6 inches) along the greenline or an alternative use and disturbance indicator and value in current ESA consultation documents. As a result, the conditions on streams are expected to improve as the monitoring to meet vegetation height at the end of season would be expected to improve herbaceous vegetation conditions on stream banks on low gradient streams beyond what gains were made with INFISH.

Table 17. Range management allotments and their size (NFS lands only) in the Blackfoot and the Upper Clark Fork bull trout core areas on the HLC NF

Allotment	Acres	Acres west of divide
Blackfoot Core Area – Upper Blackfoot GA		
Poorman/Willow	10,056	10,056
Alice Creek	12,898	11,069
East Nevada	12,832	12,832
West Nevada	12,876	12,876
Chimney Creek	2,838	2,838
Moose Creek	7,889	7,889
Stonewall	4,486	4,486
Keep Cool Liverpool	8,565	8,565
Horsefly	5,197	5,197
E Shingle Mill	1,734	1,734
Arrastra Creek	5,750	5,750
Canyon Creek Sanborn	2,588	2,588
TOTAL	87,709	85,880
Upper Clark Fork Core Area – Portion of Divide GA west of divide		
Hat Creek	7,108	7,108
Clarks Canyon	5,837	5,837
Blossburg	7,837	4,762
Spring Gulch	1,231	1,146
Drumlummen Skelly	3,528	1,222
Spotted Dog Trout Cr	5,055	5,055
MacDonald Pass	3,317	1,446
Slate Lake	8,069	8,069
Empire	440	199
Dog Creek	1,708	1,708
Ophir-Hope	14,019	13,790
Ten Mile Priest Pass	15,400	2,825
TOTAL	73,549	53,167
Grand Total	161,258	139,047

Forestwide standards and guidelines would protect and minimize the effects of grazing on aquatic resources. The following plan components should help to reduce impacts on water quality and riparian zones: (FW-FAH-GDL-03, FW-GRAZ-DC-02, FW-GRAZ-STD-02, FW-GRAZ-GDL-01, 02, 03, 04, 05, 06 and 07, FW-WILD-SUIT-01). These plan components would reduce bank trampling and minimize livestock operations within RMZs, particularly when new or revised allotment management plans are implemented. Adaptive management and monitoring would also be key factors to achieving desired conditions. Where problems exist or develop, reducing the length and timing of the grazing season or distribution in the pasture in RMZs would allow for more residual growth of grasses and forbs that capture overland flow, prevent rills from forming, prevent erosion from delivering sediment to water bodies, and reduce bank trampling, thereby lowering turbidity and fine sediment delivery and deposition in the waterbody and associated high width to depth ratios, which can also increase water temperatures. It would also reduce potential bacteria such as *E. coli*, which has been shown to affect nutrients. As mentioned above, watershed conservation practices and updated grazing standards and guidelines designed to protect water quality and riparian areas would be included in allotment-management plans as they are revised and updated.

Indirect Effects Specific to Blackfoot and Upper Clark Fork Core Areas from Grazing

While plan components discussed limit the effects of grazing and lead to passive restoration over time, short-term negative effects are still likely to occur. Even short periods of use from livestock next to streams are expected to increase solar input at heavily grazed banks and crossing sites when shrubs, forbs and grasses are grazed to the point where root strength fails and banks could collapse into streams. Effective implementation of stubble height standards is expected to help managers and permittees to protect low gradient stream corridors where damage is more likely to occur and improve overhanging banks. Long term, component implementation will help reduce stream temperatures. Grazing effects from current use are not expected to increase short-term sediment generation while long-term sediment delivery generated from grazing is expected to slowly decline from current levels. The number of pools is not likely to decrease from grazing use, and slowly improve in the long term. Grazing activities are not expected to have any effect on barriers. The trend of slowly improving integrated sub watershed conditions is expected to continue under this plan revision based on an analysis disclosed in bull trout Critical Habitat BA submitted to the USFWS (Thomas et al. 2018) and the corresponding Biological Opinion (U.S. Department of the Interior 2018).

Recreation

General effects from recreational use, construction, and maintenance to watershed resources can include undesirable changes to (1) upland and riparian soil and vegetation conditions, causing increased erosion and runoff, decreased soil-hydrologic function, loss of vegetative cover and wood recruitment, and reduced water quality; (2) stream morphology, water quality, streamflow, and substrate; and (3) water quality from spills of fuel, oil, cleaning materials or human waste associated with equipment, and the pumping of toilets.

People using nonmotorized and motorized watercraft can “disturb” or “stress” adult and juvenile fish. Typical activities associated with nonmotorized use include floating, wading, and swimming in areas where fish are holding, rearing, or spawning. Studies conducted on the Rogue River have shown that juvenile salmon and steelhead that were passed by nonmotorized watercraft exhibited both behavioral and physiological signs of stress (Satterthwaite 1995). The energy expended by juvenile salmonids reacting to passing watercraft may result in a reduction in energy available for growth and development. A decrease in available energy stores may also reduce their effectiveness in competing for food, defending territories, or spawning.

Recreationists can trample streambanks, clear vegetation for camping along the stream’s edge, harvest trees for firewood, and build off-road vehicle trails. While some activities are allowed (hiking and fishing near water or using OHVs on authorized trails) other activities are not (harvesting green trees near streambanks, building OHV trails). Extensive authorized and disbursed recreation in total can result in the loss of vegetation within riparian areas. Loss of vegetation from shorelines, wetlands, or steep slopes can cause erosion and pollution problems (Burden and Randerson 1972, Quigley and Arbelbide 1997).

Recreational use would almost certainly increase in the coming decades. Projected increases in recreational use would be commensurate with all alternatives. Watershed conservation practices would be implemented to protect aquatic and riparian resources notwithstanding, impacts to these resources would likely increase given increased use because stream and lake environments would continue to disproportionately attract forest users.

FW-REC-DC-04 serves to mitigate the effects from recreation facilities, trails and dispersed sites located within RMZs. It would ensure that infrastructure minimizes impacts on water quality and aquatic resources. However, it is assumed that minor, localized impacts to riparian vegetation, woody debris, and water quality would still occur where recreation activities are allowed. Existing recreational facilities and actions within or affecting RMZs may need to be modified, discontinued, or relocated if they are identified as not fully meeting functional aquatic/riparian conditions and processes or improving conditions and processes. Modifying or relocating facilities may cause temporary affects to streams and riparian areas. Where facilities cannot be located outside of RMZs, effects would be minimized to the greatest extent possible but not eliminated.

Current management and future trends in recreation management are likely to include continued efforts to relocate trails and dispersed and developed recreational sites away from streams, wet areas, springs and riparian areas in order to meet the intent to protect and water quality and aquatic habitats.

Indirect Effects Specific to Blackfoot and Upper Clark Fork Core Areas From Recreation

While plan components discussed limit effects and lead to passive restoration over time, some unknown amount of short-term negative effects are still likely to occur. Unauthorized recreation use could increase solar input when access sites are built. Still, stream temperature would not be expected to increase by measurable amounts. Recreation activities next to water are expected to cause some site-specific increase in sediment generation while long-term sediment generated from recreation would not be expected to degrade habitat beyond stream reaches where activities occur. The number of pools would not likely decrease from these activities, although pool depth and pool tail substrates could change in the short term and recover long term. While unauthorized recreation activities could create a barrier at low flow, barriers are expected to be dismantled when discovered and not have long-term effect. Recreation activities are not expected to interfere with the trend of slowly improving integrated sub watershed conditions. This assumption is supported by analysis disclosed in bull trout Critical Habitat BA submitted to the USFWS (Thomas et al. 2018) and the corresponding Biological Opinion (U.S. Department of the Interior 2018).

Mining

Locatable minerals

Locatable or hard rock minerals include deposits of gold, silver, copper, etc. There are no existing large-scale mining operations on the Forest west of the Continental Divide, but there is substantial activity with recreational and small-scale mining, including suction dredging, placer and lode claims that may occur near and adjacent to bull trout habitat, particularly in areas of historic lode or placer mining activities. Unless an authorized officer determines that an activity is or will cause a significant disturbance to surface resources, a Plan of Operations is not likely to be required. Recreational activities often do not require a FS authorization in advance, however factors such as access, scale, and duration may dictate otherwise. Suction dredging is regulated by federal and state mining laws and regulations.

Montana developed guidelines for instream mining in the early 1980s to help determine how to take stream class into account during permitting decisions. These guidelines include a list of streams that provides guidance for each stream classification based on the spawning and incubation periods for fish species present. Based on these guidelines, Class 1 and 2 streams are closed, Class 3 and 4 streams are seasonally restricted, and Class 5 streams are open year-round. Guidelines for known occupied bull trout streams identify them as closed to suction dredging to preclude impacts from mining in those streams.

Large increases in mining activity are not anticipated for the future but cannot be ruled out. The 1872 Mining Law limits Forest Service authority over mining activities but allows the setting of terms and conditions to minimize impacts to NFS lands. Access to a mining operation on NFS must be reasonable as defined by law and statute. New roads, trails, or other types of access may be approved for a proposed mining operation if the proposal is incidental to mining and within the scope of the next logical phase of mining development. The preferred alternative in the 2020 Forest Plan would require actions to maintain, protect, and rehabilitate fish and wildlife habitat, and soil and water resources if plan of operation permits are approved. No difference is anticipated between the 2020 Forest Plan and the 1986 forest plan with INFISH amendments.

Arrastra Creek, Nevada Mountain, Dearborn Silverking, and Electric Peak (named Blackfoot Meadows in the DEIS) are RWAs in alternative F where management actions could have the potential to affect bull trout. Portions of these areas have been the location of historic and current mining activity. For example, as of June 2018, just in the Nevada Mountain RWA, there are over one hundred unpatented mining claims within its boundaries. There is a very high potential for future mineral prospecting, exploration, and development in this RWA and mining activities could detract from the "wilderness character" of this area. This RWA includes the Nevada Mountain area and headwaters of Washington to Nevada Creeks, north and east, including McClellan Gulch, and then easterly to upper Poorman Creek. This area, underlain by a granitic stock that has intruded into Belt series argillites and quartzites, has mineral deposits that have been prospected and mined by hard rock and placer mining methods. A potentially larger ore body at depth is suspected. These RWAs are open to mineral entry under the U.S. mining laws until such time as they are congressionally withdrawn from mineral entry subject to valid existing rights. Mining activities may still occur in designated wilderness areas if the proponent has valid existing rights.

Nonrenewable energy minerals

In 1999 the Helena NF finalized the oil and gas leasing FEIS, the final supplemental EIS, and the ROD for oil and gas leasing. The record of decision (ROD) was signed by the Forest Supervisor and the State Director of the BLM. At that time there were few acres under lease on the Helena NF. The leasing analyses and decisions followed the new regulations at 36 CFR228 Subpart E and included two components and a forest plan amendment.

Activity in the number of lease requests from industry is low in the plan area. There is no current exploration or development activity on NFS lands, and no authorized oil and gas leases exist west of the continental divide on the HLC NF, and therefore have no effect to watersheds, fish or riparian areas from any of the alternatives. A leasing decision is not part of the 2020 Forest Plan. There is an interest in oil and gas leasing on the forest and there may be a need for a future oil and gas leasing decision as oil and gas leasing is part of the acceptable uses of the HLC NF. Until a leasing decision is completed, no oil and gas exploration or development can take place. At the time of this consultation, there are no effects anticipated from this type of leasing.

Coal and other non-renewable leasable minerals

There is very little occurrence of or potential for coal and other nonrenewable leasable minerals in the forest plan area due to the intrinsic geology and the limited number of acres of acquired lands. Therefore, these types of activities are expected to have effects.

Renewable, leasable mineral, and energy resources

On the Helena NF, 737,819 acres are available for geothermal leasing. Portions of the plan area have some favorability for the occurrence of geothermal resources. There are currently no exploration or development projects for geothermal energy resources in the plan area. There are no impacts on NFS lands from geothermal exploration or development activity. The forecast for leasing and potential exploration for geothermal energy on the western portion of the HLC NF considered in the biological assessment is deemed to be low. The plan area was found to have potential for the development of wind energy due to the available resource and proximity to transmission lines. The plan area was not found to have potential for the development of solar energy (National Renewable Energy Laboratory 2005).(Brown et al. 2006). Some effects could be possible depending on access needs to develop these resources. These types of activities are outside the scope of the plan revision and would be consulted on individually should development be proposed.

Salable minerals

Salable minerals include common varieties of sand, stone, gravel, cinders, pumice, rock, clay, petrified wood and other similar materials. Such common variety mineral materials include deposits that, although they have economic value, tend to be relatively widely available and do not have a distinct and special value. These minerals are most commonly used as building stone, landscaping, and constructions materials.

The Forest Service salable mineral material policy (Forest Service Manual 2850) states that disposal of mineral material will occur only when the authorized officer determines that the disposal is not detrimental to the public interest and the benefits to be derived from proposed disposal will exceed the total cost and impacts of resource disturbance. The type, volume, and source location of in-service mineral material varies year by year and according to need. The Helena NF portion of the plan area has recurring salable minerals uses but at a low level with very few developed pits. Over the entire combined forest, the average annual in-service use is about 3,000-5,000 cubic yards combined of material of all types per year. Primary materials used include crushed aggregate, pit run and rip rap. Salable mineral resources development is largely tied to road development activities conducted by the Forest Service.

Free-use permits can be issued to any state, federal, or territorial agency, unit, or subdivision. Free-use permits can also be issued to the general public. An individual may obtain a free-use permit to collect rock, if it is not for commercial use, sale, or barter. Annually over the entire plan area about 10-20 free use mineral material permits are issued and has about 10 in-service project uses. Only hand tools can be used to collect the rock; no digging is permitted, and only the collection of loose rock is authorized.

There are no known active mineral leases on the Forest west of the Continental Divide and consequently no effect on watersheds, fish, or riparian areas. Generally, gravel pits are situated away from riparian areas and tend not to affect watersheds or riparian areas. There would be no effects on fish, watersheds, or riparian areas from any of the alternatives in the 2020 Forest Plan from free-use permits to the general public.

Indirect Effects Specific to Blackfoot and Upper Clark Fork Core Areas from Mining

Several parts of this program would have no effect because the mineral resource is not present, or present in small amounts (non-renewable and renewable energy resources, coal). Some amount of short-term negative effects is still likely to occur, especially with locatable minerals. Other laws supersede the Forest Service ability to restrict mining (1872 Mining Law). The preferred alternative in the 2020 Forest Plan would require actions to maintain, protect, and rehabilitate fish and wildlife habitat, and soil and water resources if plan of operation permits are approved. Prior to required rehabilitation, some negative effects to temperature, sediment and pools could occur This assumption is supported by analysis disclosed in bull trout Critical Habitat BA submitted to the USFWS (Thomas et al. 2018) and the corresponding Biological Opinion (U.S. Department of the Interior 2018).

Effects to bull trout

The *Recovery Plan for the Coterminous United States Population of Bull Trout* (USFWS 2015b) identified the bull trout core area as the closest approximation of a biologically functioning unit for bull trout. Because actions that are authorized by this plan revision have the potential to create both adverse and beneficial effects to individual bull trout, the final determination considers this potential in the final call.

Blackfoot and Upper Clark Fork River core areas

A wide range of uses are allowed on NFS lands in the Blackfoot and Upper Clark Fork core areas and the core areas could foreseeably be affected by activities associated with scheduled timber harvest, grazing impacts, recreation, prescribed fire, and access management which in turn may result in sedimentation, substrate embeddedness, and other direct or indirect effects from project-level activities. These effects by program area are described for five key indicators that were used in the 2013 Bull Trout Conservation Strategy for Western Montana. Those indicators are stream temperature, pools, barriers, sediment and integrated trend. Some protective measures that would help move the core areas on the HLC NF to desired conditions are restricted road development and access resulting from the Grizzly Bear Conservation Strategy, which designated the Blackfoot and Divide Travel Plans routes as the baseline for road and open road densities in these core areas. This, in combination with the identification of waters eligible for wild and scenic river designation, which provides additional protections within a ¼-mile corridor, and the CWN sub watersheds, which include all occupied sub watersheds and those deemed important for recovery of bull trout, provide additional protection for habitat and fluvial bull trout life histories. The recommended wilderness areas in addition to existing IRAs and the Scapegoat Wilderness area in the headwaters of the Landers Fork drainage limit the likelihood of adverse impacts from Forest management activities on individual bull trout.

In addition to expected beneficial effects, adverse effects to bull trout are likely to occur at specific locations where activities increase sediment, damage streambanks, and increase solar input. Plan components are expected to minimize effects and prevent alteration of habitat to no more than a site or reach scale. HCOOUL represents lands unsuitable for timber production, but where timber harvest could occur to achieve desired conditions. On those lands, the use of timber harvest should be limited to salvaging dead or dying trees, improving production of forage for livestock and wildlife, reducing hazardous fuels and/or fire risk, managing powerline rights-of-way, mitigating forest insect or diseases, moving conditions toward desired stand or landscape vegetation composition, structure, and patterns, including restoration of ecosystem functions and improving resiliency, maintaining or enhancing wildlife habitat, performing research or administrative studies, addressing issues of public safety and health, and improving recreation, infrastructure and/or scenic resource conditions, including creation of scenic vistas. Lands unsuitable for timber production where harvest may occur (HCOOUL) in the Blackfoot River drainage decrease from 35.3 percent to 28.5 percent in the thirty-two subwatersheds in the core area on HLC NF lands (Table 19), and primitive recreation opportunity spectrum lands would increase from 17.6 percent in alternative A to 26.9 percent in alternative F In all these cases, alternative F is anticipated to provide additional protections over the existing conditon (alternative A) and should help aquatic and riparian habitat to move toward desried conditions.

Effects on bull trout that could result from forest management activities are expected to result from road management and use. Harvest activities that may cause ground disturbance inside harvest units are not expected to reach the stream network through implementation of RMZ standards and guidelines as well as standards to hold roads within the primary conservation area for grizzly bears to the baseline. Restoration such as storm-proofing roads in conservation watersheds may result in additional short-term adverse effects related to sedimentation or in-stream activities. Any short-term effects would be offset by long-term improvements in habitat conditions.

Effects to critical habitat

Activities that cause adverse effects to critical habitat are evaluated to determine if they are likely to “destroy or adversely modify” critical habitat by no longer serving the intended conservation role for the species or retaining those PCEs that relate to the ability of the area to support the species.

The 2020 Forest Plan provides direction under which future management decisions are made. Because it is a programmatic decision that authorizes no specific action, no direct effects on critical habitat would occur from the proposed action. Any direct effects would occur later, during individual project implementation when site-specific decisions are made. All project-level activities would undergo their own environmental analyses and section 7 consultation. An analysis of the anticipated effect of management activities on the PCEs for bull trout is given below, followed by the expected impacts on the Blackfoot core area.

Expected effects to critical habitat under the 2020 Forest Plan would be the same in kind as those described in the USFWS Biological Opinion for Effects of Ongoing U.S. Forest Service Implementation of 26 Land Resource Management Plans, as Amended by Five Aquatic Conservation Strategies, on the Threatened Bull Trout (*Salvelinus confluentus*) and Bull Trout Critical Habitat In Oregon, Washington, Idaho, Montana (Thomas et al. 2018, U.S. Department of the Interior 2018). Effects in that BO are described by program area on pages 91 thru the middle of page 96 and are not repeated here. Forest specific information that adds to or is different than what is contained in 2018 BO is provided by program area below.

Engineering

Some adverse effects would likely occur from use on legacy roads near streams. Beneficial effects would be expected to occur from improvements to existing roads, continued culvert upsizing and storage of road when not in use. The HLC NF complied with the 2005 Access and Travel Management Rule and has been actively decommissioning roads, upsizing or storing culverts, and strategically moving road segments away from critical habitat streams where possible. These activities have been ongoing on the HLC NF since travel management planning was completed in the Divide areas in March 2016 and in the Blackfoot in January 2017. Forestwide desired conditions, objectives, standards, and guidelines in the 2020 Forest Plan that emphasize road decommissioning, regular road maintenance, removal of barriers at stream crossings, and travel plan motor vehicle use designations designed to move OHV use away from riparian areas would reduce but not eliminate these impacts.

Fire management

Fuels management, using prescribed fire and hand thinning, is expected to have little direct adverse effects on bull trout PCEs and may contribute to the reduction the potential for large scale and intense wildfires. With warming temperatures, fuel management could reduce adverse effects on bull trout habitat by lowering the potential for the uncharacteristic severity, size and intensity of wildfires (Falke et al. 2015). Fire has long been a part of the landscape occupied by the bull trout and plan components emphasize using prescribed fire and thinning within riparian areas as a tool to achieve RMZ desired conditions, and aquatic habitat objectives. High-intensity fire can change infiltration characteristics of the soil and change hydrologic characteristics in watersheds when they occur over large areas, resulting in increased erosion. Wildfire suppression has the potential to affect PCE 1 by application of fire retardant, although current guidelines require avoidance of waterways, and the 2020 Forest Plan continues these protections. The requirement for the use of minimum impact suppression techniques in riparian areas ensures protection of critical habitat during wildfire suppression. In general, fuel and fire management activities could indirectly affect the potential to impact hydrologic characteristics on the watershed scale (PCE 5 and 7). Changes in the 2020 Forest Plan that emphasize fuel treatments to reduce the risk of stand-replacing fires should result in benefits to PCEs 5 and 7 by reducing the risk of wildfires that may open stand canopies. Additionally, plan components require the use of minimum impact suppression techniques in riparian areas to protect bull trout critical habitat. Based on the effects of past and ongoing land management activities implemented by current Forest Plan direction, adherence to this direction has the potential to reduce adverse impacts to water temperature by maintaining riparian vegetation during the course of fuels management activities. Maintenance and continued improvement of bull trout critical habitat and its PCEs under the Fire Management Program is supported by PIBO monitoring. This demonstrates over the last two decades of management there has been an overall trend of improving stream conditions and that land management activities going forward under the 2020 Forest Plan are expected to be similar to past activities.

Vegetation management

Vegetation management may have temporary impacts on PCEs 7 and 8 (changes in peak and base flows with low levels of contaminants) 2020 Forest Plan standards and guidelines would minimize many effects of vegetation management by limiting damaging activities in the riparian management zone. PCE 6 (sediment) is discussed in engineering as vegetation management and removal outside of the inner RMZ is not expected to generate sediment (road use would). Under the 2020 Forest Plan, where proper implementation of desired conditions occurs, vegetation management is not expected to impact PCE 5 for appropriate water temperature. It also is not expected to impact PCE 1 (groundwater connectivity), PCE 2 (barriers to migration), PCE 3 (abundant food base), PCE 4 (complex stream channels), and PCE 9 (non-native species).

Rangeland management

Grazing in many portions of the Blackfoot core area occurs primarily along roads and in transitory range where previous timber harvest has created an open understory with herbaceous vegetation. In these areas, direct impacts to streams are less likely except in meadow areas. Avoidance of timber harvest in riparian areas was instituted with the INFISH forest plan amendment and continues with the 2020 Forest Plan, allowing for maintaining canopy cover and shading along streams. Keep Cool Liverpool, Moose Creek, Poorman/Willow, and Horsefly are active grazing allotments in the Blackfoot drainage that include designated critical habitat for bull trout. The 2020 Forest Plan, when compared to INFISH, increases the focus on those low gradient stream reaches where herbaceous vegetation forms and maintains streambanks. Implementing guideline FW-GRAZ-GDL-01 on low gradient, alluvial channels should maintain the end-of-season stubble height at 10 to 15 cm (4 to 6 inches) along the greenline or alternative use and disturbance indicators and values such as those in current ESA consultation documents, could be used if they are based on current science and monitoring data and meet the purpose of this guideline. The conditions on streams are expected to improve as the monitoring to meet vegetation height at the end of season would be expected to improve conditions on these low gradient streams.

Recreation

Recreation can affect bull trout critical habitat in numerous ways. While all waters are closed to angling for bull trout, angling for other sympatric species can affect spawning and streambank habitat. Campers can build small dams affecting stream channel morphology. Dispersed camping can result in compacted soils in wetland and riparian areas and effects to PCE 6 may occur. Additionally, recreational trail use in close proximity to streams can damage and reduce riparian vegetation; impacts to PCEs 3, 4, 6, 7 and 8 may occur. The 2020 Forest Plan is not expected to change these effects to the PCEs.

Lands and minerals

Some adverse effects to bull trout critical habitat would likely occur as a result of implementing the 2020 Forest Plan under the Land and Minerals Program. The authorization of mining or activities subject to leases, permits, or right-of-way easements are the primary issues that would be dealt with in the action area. Effects are more likely for actions where the Forest Service authorities are limited such as with the 1872 mining law. Mitigation and restoration of these adverse effects is required under 2020 Forest Plan components and it provides comparable protections to those present under existing conditions and INFISH for mining related perturbations. Surface and sub-surface mining could adversely affect PCEs 1-8 of bull trout critical habitat. In addition, the minerals program has continued to be involved in major mine remediation and restoration activities in both the Upper and Little Blackfoot drainages. PCEs would see short-term adverse effects and long-term beneficial effects under the 2020 Forest Plan.

Restoration

Critical habitat designated in Copper Creek, Landers Fork, Poorman Creek, and the main Blackfoot River should see limited short-term adverse effects occur at the project level associated with restoration activities such as stream restoration projects, road obliteration and storage, culvert removals, upgrades, maintenance and other road-related work. Watershed improvement activities would be expected to result in a temporary impact to PCEs 1 and 4 with the potential for long-term benefit to PCEs 1 through 8, depending on the specifics of the project. Ongoing watershed restoration involving road obliteration and storage and fish passage improvements in both the Divide and Blackfoot GAs are expected to provide watershed scale restoration improvements. As with all project-level decisions, separate consultation looking at design and site-specific impacts would occur prior to any future project implementation.

Cumulative effects

The cumulative effects area for bull trout is the Little Blackfoot River drainage, the Clark Fork River tributaries that headwater on the HLC NF, and the Blackfoot River drainage above the junction of Nevada Creek. Cumulative effects under the ESA include future state, tribal, local, or private actions that are reasonably certain to occur in the action area. Past actions have been included in the environmental baseline. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in the cumulative effects analysis in this biological assessment.

Non-federal land management policies are anticipated to continue affecting riparian and aquatic resources. The cumulative effects in the Little Blackfoot and Blackfoot River basins are difficult to analyze, considering the broad geographic landscape covered, the uncertainties associated with government and private actions, and ongoing changes to the region’s economy. Whether those effects would increase or decrease in the future is a matter of speculation. However, based on the growth trends and current uses, cumulative effects would be likely to increase. Nonfederal lands, including and small private landowners will continue to support a variety of uses from livestock grazing, mining, timber harvest, road building and maintenance, agricultural activities, including irrigation and water diversion, residential development and recreational fishing and hunting. Although there are substantial areas in the cumulative effects area protected by conservation easements that limit habitat perturbations, private activities will continue in the future and are expected to increase.

For the most part, the stream systems originate on-Forest in protected headwaters, eventually flow downstream onto lands owned or administered by entities other than the Forest Service in the Little Blackfoot and Blackfoot Rivers, and ultimately into the Clark Fork River. Many fish populations, whether they move off-Forest as part of their life cycle or remain entirely within a localized area on-Forest, require stream interconnectivity to survive as a viable population over time. For almost all species, genetic interchange between subpopulations is necessary to maintain healthy fish stocks, particularly at low population densities. The more wide-ranging the species or the life history pattern, the more critical interconnectivity is in order for the fish to access habitat components critical to maintain the population. Thus, activities off-Forest that disrupt fish migration corridors can have significant impacts to Forest fish populations upstream even when habitat is maintained and enhanced on the HLC NF.

Harvesting and poaching by anglers have been identified as one reason for bull trout decline (USFWS 2002). Recreational fishing would likely increase as the general residential population in western Montana increases. In addition, misidentification of bull trout has been a concern because of the similarity of appearance with brook trout. Although the harvest of bull trout is illegal, incidental catch occurs. The release mortality of bull trout has been mitigated to some extent by fishing regulations including area closures and gear restrictions, but some level of hooking mortality is unavoidable resulting from the associated stress and handling.

The potential for introduction of disease and aquatic invasive and nuisance species exists on all lands within the cumulative effects analysis/action area. The extent of influence exerted by disease or exotic species is often determined by an area's suitability. If conditions are favorable enough to promote and perpetuate them, then effects would be determined by the fishery's susceptibility and whether the changes can be accommodated through compensatory or cumulative mortality by the species. The effects of introductions could range from a devastating effect upon the entire ecosystem to negligible, based upon the species and their ability to maintain their life history.

MDFWP is the responsible agency for managing fish populations. Regulations would most likely continue to allow the angling and harvest of fish, with variations on fishing limits, seasons, and gear restrictions. Copper, Snowbank, and Landers Fork are critical to maintaining fluvial bull populations in the upper portion of the Blackfoot River core area. Headwater areas of the Little Blackfoot provide spawning and rearing habitat that could allow bull trout recovery if limiting factors below the Forest boundary are resolved. How non-native fish (brown, brook and rainbow trout) are managed within these basins will largely determine the viability of migratory bull trout populations (USFWS 2015a).

Determination of effects

The proposed action **may affect and is likely to adversely affect** bull trout and bull trout critical habitat.

Rationale for determination

Habitat for bull trout would be maintained and see some improvement as objectives are completed over the life of the new plan. Based on the restoration activities and protective measures that are provided in the 2020 Forest Plan, improving trends analyzed in PIBO monitoring data sets would be expected to continue. Stochastic events such as disease, warming climate conditions, natural disturbances, and increases in non-native species such as brown and brook trout, would continue to have population effects beyond the control of the Forest.

The proposed federal action represents a programmatic decision that would change plan components but would have no direct effects on bull trout or their habitats. Any direct or indirect effects would occur later, during project level implementation, when site-specific decisions are made based on 2020 Forest Plan direction and direct, indirect, and cumulative effects of proposed actions are evaluated. The 2020 Forest Plan provides the direction under which future management decisions would be made. All project-level activities would undergo separate site-specific environmental analyses, and section 7 consultation would occur when effects to threatened or endangered species or their habitats are anticipated.

There are likely to be improvements to bull trout and bull trout designated critical habitat from the implementation of the 2020 Forest Plan direction and natural ecological successional processes, but the environmental baseline for the activity area is not likely to change as the 2020 Forest Plan does not make any on-the-ground decisions and any changes to the environmental baseline would result from natural processes or from targeted actions designed to provide restoration of habitat and recovery of local or other remant populations. The Forest does not anticipate a downward trend in the environmental baseline for populations in core areas within the HLC NF as a result of land management activities because of the limited amount of allowable uses that could negatively affect the species and the protective measures and direction in the 2020 Forest Plan. Additionally, analysis indicates that policy changes amended into the existing Helena Forest Plan indicates that the status and trends of stream habitat conditions compared to reference conditions were generally improving on public lands in the Interior Columbia Basin (Roper et al. 2019). The more protective aspects of the 2020 Forest Plan are anticipated to maintain and may in some cases potentially increase the rate of habitat improvement.

Implementation of the 2020 Forest Plan would provide for an overall net benefit to bull trout and bull trout designated critical habitat. Although there would be no direct effects to individual bull trout or designated critical habitat resulting from the proposed action itself, indirect effects of the proposed action resulting from project-level activities have the potential for take and may affect individuals, critical habitat, or both. Activities that are allowable under the 2020 Forest Plan that occur in RMZs or within the stream channel environment may have short-term adverse effects and are likely to adversely affect bull trout and bull trout designated critical habitat.

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Appendix A: Record of Consultation with U.S. Fish and Wildlife Service

Table A1. Consultation with US Fish and Wildlife Service

Date	Consultation
Novermber 11, 2016	NOI published in Federal Register for revised Helena-Lewis and Clark National Forest plan alternatives and DEIS.
February 26, 2019	Meeting with wildlife biologists Wendy Clark, and Denise Pengeroth; botanist Justina Dumont; fisheries biologist George Liknes; USFWS consultation biologist Katrina Dixon and Jodi Bush, Field Supervisor, Montana Ecological Services Office and planning team leader Deb Entwistle and staff officer Chirre Keckler to discuss consultation strategy, timelines, roles, and responsibilities.
November 7 2019	RO reviews the draft BA
December 19, 2019	USFS sends draft aquatics BA to USFWS including: • A description of the action (preferred alternative) to be consulted on, • A description of the specific area that may be affected by the action, • The current status and habitat use of listed species in the action area, and identification of designated critical habitat within the action area, • Discussion of the methods and scientific information used.
February 4, 2020	Email from FWS to FS, BA comments
February 10, 2020	Email from FS to FWS discussing watershed condition framework, priority watershed, and conservation watershed network.
February 12, 2020	Email from FS to FWS about arranging a conference call to discuss comments.
February 13, 2020	Email from FS to FWS arranging for conference call.
February 13, 2020	Email from FS to FWS regarding topics for conference call.
February 24, 2020	Email from FS to FWS with clarifying language.
February 24, 2020	Email from FS to FWS with additional clarifying language.
February 26, 2020	Email from FS to FWS clarifying “other important populations”
March 13, 2020	USFS submits BA to USFWS.

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Appendix B. Key Plan Components

The following selection of management directions are excerpts from the 2020 Forest Plan. This is key information related to the threatened bull trout. The following table displays the plan components that are referenced in this BA. The full text of the components can be found after the table.

Table B1. Plan components referenced in bull trout assessment

Desired Conditions	Goals	Objectives	Standards	Guidelines	Suitability
Aquatic Ecosystems – Watershed (WTR)					
FW-WTR-DC-01	FW-WTR-GO-01	FW-WTR-OBJ-01	FW-WTR-STD-01	FW-WTR-GDL-01	
FW-WTR-DC-02	FW-WTR-GO-02	FW-WTR-OBJ-02	FW-WTR-STD-02	FW-WTR-GDL-02	
FW-WTR-DC-03	FW-WTR-GO-03	FW-WTR-OBJ-03	FW-WTR-STD-03		
FW-WTR-DC-04	FW-WTR-GO-04				
FW-WTR-DC-05					
FW-WTR-DC-06					
FW-WTR-DC-07					
FW-WTR-DC-08					
FW-WTR-DC-09					
FW-WTR-DC-10					
FW-WTR-DC-11					
FW-WTR-DC-12					
FW-WTR-DC-13					
Aquatic Ecosystems – Riparian Management Zones (RMZ)					
FW-RMZ-DC-01		FW-RMZ-OBJ-01	FW-RMZ-STD-01	FW-RMZ-GDL-01	FW-RMZ-SUIT-01
FW-RMZ-DC-02			FW-RMZ-STD-02	FW-RMZ-GDL-02	
			FW-RMZ-STD-03	FW-RMZ-GDL-03	
			FW-RMZ-STD-04	FW-RMZ-GDL-04	
			FW-RMZ-STD-05	FW-RMZ-GDL-05	
			FW-RMZ-STD-06	FW-RMZ-GDL-06	
				FW-RMZ-GDL-07	
				FW-RMZ-GDL-08	
				FW-RMZ-GDL-09	
				FW-RMZ-GDL-10	
				FW-RMZ-GDL-11	
				FW-RMZ-GDL-12	

Desired Conditions	Goals	Objectives	Standards	Guidelines	Suitability
Aquatic Ecosystems - Fisheries and Aquatic Habitat (FAH)					
FW-FAH-DC-01	FW-FAH-GO-01	FW-FAH-OBJ-01	FW-FAH-STD-01	FW-FAH-GDL-01	
FW-FAH-DC-02	FW-FAH-GO-02	FW-FAH-OBJ-03		FW-FAH-GDL-02	
FW-FAH-DC-03	FW-FAH-GO-03			FW-FAH-GDL-03	
FW-FAH-DC-04	FW-FAH-GO-04			FW-FAH-GDL-04	
FW-FAH-DC-05	FW-FAH-GO-05			FW-FAH-GDL-05	
FW-FAH-DC-06	FW-FAH-GO-06				
FW-FAH-DC-07					
FW-FAH-DC-08					
Aquatic Ecosystems – Conservation Watershed Network (CWN)					
FW-CWN-DC-01		FW-CWN-OBJ-01		FW-CWN-GDL-01	
		FW-CWN-OBJ-02		FW-CWN-GDL-02	
				FW-CWN-GDL-03	
Soil (SOIL)					
FW-SOIL-DC-01					
Terrestrial Vegetation (VEGT)					
FW-VEGT-DC-01				FW-VEGT-GDL-01	
				FW-VEGT-GDL-02	
Recreation Opportunities (REC)					
FW-REC-DC-04		FW-REC-OBJ-01		FW-REC-GDL-01	
				FW-REC-GDL-03	
				FW-REC-GDL-04	
				FW-REC-GDL-05	
				FW-REC-GDL-06	
Recreation Access (ACCESS)					
				FW-ACCESS-GDL-01	
Land Status and Ownership, and Land Uses – Land Uses (LAND USE)					
				FW-LAND USE-GDL-03	
				FW-LAND USE-GDL-04	
				FW-LAND USE-GDL-05	
				FW-LAND USE-GDL-06	
Infrastructure: Roads, Trails, Bridges, and Facilities (RT)					
FW-RT-DC-02		FW-RT-OBJ-01	FW-RT-STD-01	FW-RT-GDL-01	
FW-RT-DC-04		FW-RT-OBJ-02	FW-RT-STD-02	FW-RT-GDL-02	

Desired Conditions	Goals	Objectives	Standards	Guidelines	Suitability
			FW-RT-STD-03	FW-RT-GDL-03	
			FW-RT-STD-04	FW-RT-GDL-04	
				FW-RT-GDL-05	
				FW-RT-GDL-06	
				FW-RT-GDL-07	
				FW-RT-GDL-08	
				FW-RT-GDL-09	
				FW-RT-GDL-10	
				FW-RT-GDL-11	
				FW-RT-GDL-12	
Benefits to people: Public Information, Interpretation, and Education (CONNECT)					
FW-CONNECT-DC-02					
Benefits to people: Livestock Grazing (GRAZ)					
FW-GRAZ-DC-03			FW-GRAZ-STD-01	FW-GRAZ-GDL-01	
FW-GRAZ-DC-04			FW-GRAZ-STD-02	FW-GRAZ-GDL-02	
				FW-GRAZ-GDL-03	
				FW-GRAZ-GDL-04	
				FW-GRAZ-GDL-05	
				FW-GRAZ-GDL-06	
				FW-GRAZ-GDL-07	
Benefits to people: Minerals and Energy (EMIN)					
				FW-EMIN-GDL-01	
				FW-EMIN-GDL-02	
Divide GA (DI)					
DI-FAH-DC-01	DI-FAH-GO-01				
DI-FAH-DC-02					
Upper Blackfoot GA (UB)					
UB-FAH-DC-01	UB-FAH-GO-01				
UB-FAH-DC-02					

Forest Plan Desired Conditions

The intent of these desired conditions is to create a proactive commitment to the recovery of bull trout within the Helena-Lewis and Clark National Forest. These desired conditions make the commitment to implement the 2015 Bull Trout Recovery Plan. Making bull trout recovery a focus is the most effective way to benefit bull trout and minimize adverse effects due to ongoing management.

Forestwide Desired Conditions

The following desired conditions apply at the larger (e.g., watershed) scale (10 or 12 digit hydrologic unit scale), not at particular sites, e.g., stream reaches. The national hydrologic unit is the basis for defining the specific scales at which the watershed desired conditions apply. The three watershed scales most relevant to the implementation of the forest plan are sub basin (8-digit hydrologic unit), watershed (10-digit hydrologic unit), and subwatershed (12-digit hydrologic unit). Individual project assessments often use data collected at finer scales, such as the subwatershed, drainage, valley segment, site, or stream reach scale.

Watershed Desired Conditions (FW-WTR-DC)

Properly functioning watersheds provide suitable conditions for sustainable clean water, healthy stable soils, timber growth, forage, aquatic and wildlife habitats, and the ability to withstand high intensity floods. Healthy watersheds contribute to local economies in the planning area including quality lands and water for, but not limited to, hunting, fishing, timber production, irrigation and ranching. Desired conditions provide a platform for future management actions.

01 National Forest System subwatersheds provide the distribution, diversity, and complexity of landscape-scale features including natural disturbance regimes and the aquatic, wetland, and riparian ecosystems to which native species, populations, and communities are uniquely adapted within those watersheds. Watersheds and associated ecosystems retain their inherent resilience to respond and adjust to disturbance without long-term adverse changes to the physical or biological integrity.

02 Spatial connectivity exists within or between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, groundwater, wetlands, upslope areas, headwater tributaries, and intact habitat refugia. These network connections provide chemically and physically unobstructed routes to areas critical for fulfilling the requirements of aquatic and riparian-associated plants and animals.

03 The timing, variability, and duration of floodplain inundation is within the natural range of variation. Floodplains are accessible to water flow and sediment deposits. Over-bank floods allow floodplain development and the propagation of flood-associated riparian plant and animal species.

04 In streams and floodplains with highly altered systems, the systems are stable or moving towards stability.

05 Upland areas surrounding wetlands that have the most direct influence on wetland characteristics, as well as stream segments that flow directly into wetlands, sustain the characteristics and diversity of those wetlands. Nonforested areas in and surrounding wetlands are composed of plant and animal communities that support and contribute to wetland ecological and habitat diversity.

06 Water quality, including groundwater, meets or exceeds applicable state water quality standards and fully supports beneficial uses, downstream users, municipal water supplies, and natural resources. Flow and habitat conditions in watersheds, streams, lakes, springs, wetlands, and groundwater aquifers fully support beneficial uses, and meet the ecological needs of native species (including species of conservation concern and threatened and endangered species).

07 The Forest has no documented lands or areas that are delivering water, sediment, nutrients, and/or chemical pollutants that would result in conditions that violate the state of Montana's water quality standards or is permanently above natural or background levels.

08 The sediment regime within water bodies is within the natural range of variation. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

09 Beavers are present in wetlands and riparian areas where they benefit and enhance groundwater, surface water, floodplain and riparian habitat complexity, and resilience to changing climate conditions.

10 In-stream flows are sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, and duration of peak, high, and low flows are retained. Stream flow regimes maintain riparian ecosystems and natural channel and floodplain dimensions. Stream channels transport sediment and woody material over time while maintaining reference dimensions (for example, bankfull width, depth, entrenchment ratio, slope, sinuosity, large woody material, percent pools, residual pool depth, median particle size, and percent fines).

11 Groundwater dependent ecosystems, including peatlands, fens, wetlands, wet meadows, seeps, springs, riparian areas, groundwater-fed streams and lakes, and groundwater aquifers persist in size, seasonal and annual timing, and water table elevation within the natural range of variation in order to maintain biodiversity of flora and fauna. Wetland and groundwater dependent ecosystem vegetation communities are resilient to drought, climate change, and other stressors. Also see Threatened, Endangered, Proposed, and Candidate Plant Species and Plant Species of Conservation Concern (PLANT).

12 Cave ecosystems exhibit natural hydrologic and environmental functions.

13 All stream crossing structures afford capacity for Q100 discharge and are properly aligned with the stream channel.

Riparian Management Zones Desired Conditions (FW-RMZ-DC)

Riparian Management Zones (RMZs) are portions of watersheds where riparian-associated resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RMZs include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by 1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams, 2) providing root strength for channel stability, 3) shading the stream, and 4) protecting water quality. Another critical function of RMZs is to provide for wildlife habitat use and connectivity.

Desired conditions for RMZs have been expanded to focus on key ecological processes and functions, highlight vegetation structure and composition, and provide suitable connected wildlife habitat rather than being fish-centric under the Inland Native Fish Strategy. Vegetation management within RMZs is allowed but riparian and aquatic conditions must be maintained, restored, or enhanced. Many activities that can cause soil compaction or soil erosion are restricted or minimized. RMZs are not "no management zones" since treatment may be necessary to achieve desired conditions. However, guidance is provided for activities within RMZs.

01 RMZs reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes affecting the area. The species composition and structural diversity of native plant communities in RMZs provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration. They will supply amounts and distributions of nutrients, coarse woody debris, and fine particulate organic matter sufficient to sustain physical complexity and stability. See the table under FW-RMZ-STD for typical width of a RMZ.

02 RMZs feature key riparian processes and conditions that function consistent with local disturbance regimes, including slope stability and associated vegetative root strength, wood delivery to streams and within the RMZs, input of leaf and organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality. RMZs also provide an opportunity for riparian and terrestrial connectivity.

Fisheries and Aquatic Habitat Desired Conditions (FW-FAH-DC)

The intent of the fisheries and aquatic habitat plan components is to maintain or restore watershed conditions so that managed watersheds are moving towards or are in concert with reference watersheds when considered at a national forest scale. Changes between the 1986 plans, as amended, and the 2020 Forest Plan are captured in the components below. Current threatened and endangered species and species of conservation concern are also included in this direction.

01 Watersheds and associated aquatic ecosystems retain their inherent resilience to respond and adjust to disturbances and climatic fluctuations without long-term, adverse changes to their biological integrity. Components of this biological integrity include supporting native fish, amphibians, birds, and invertebrates, as well as productive recreational fish populations. Essential characteristics of this resilience are healthy, functioning aquatic, riparian, upland, and wetland ecosystems.

02 Instream habitat conditions for managed watersheds move in concert with or towards those in reference watersheds. Aquatic habitats are diverse, with channel characteristics and water quality reflective of the climate, geology, and natural vegetation of the area. Stream habitat features across the forest, such as large woody material, percent pools, residual pool depth, median particle size, and percent fines are within reference ranges as defined by agency monitoring.

03 Aquatic systems and riparian habitats express physical integrity, including physical integrity of shorelines, banks, and bottom configurations, within their natural range of variation.

04 Connectivity between water bodies provides for movement between habitats associated with species' life stages (for example, fish migration to spawning areas, amphibian migration between seasonal breeding, foraging, and overwintering habitats), and for processes such as recolonization of historic habitats.

05 Habitats favor native aquatic species. Impacts of nonnative fish species on native salmonids, such as hybridization, competition, replacement, and predation are minimal.

06 Aquatic ecosystems are free of invasive species such as zebra mussels, New Zealand mud snails, quagga mussels, and Eurasian milfoil. Non-native plant and amphibian species are not expanding into water bodies that support native amphibian breeding sites (for example, non-native bullfrogs, chytrid fungus, or reed canary grass are not expanding into boreal toad breeding sites).

07 Streams, lakes, and rivers provide habitats that contribute toward recovery of threatened and endangered fish species and address the habitat needs of all native aquatic species, as appropriate.

08 Increased availability of quality habitat reduces risk to the genetic diversity and population viability of aquatic threatened, endangered, or species of conservation.

Conservation Watershed Network (CWN) Desired Conditions (FW-CWN-DC)

The conservation watershed network is a specific subset of watersheds (10 or 12-digit hydrologic unit codes) where prioritization for long-term conservation and preservation of water quality, bull trout, and other native trout occur. Conservation watershed networks also include all municipal watersheds and all watersheds with 303d listed segments or total maximum daily load listed stream segments. Restoration projects would be prioritized in areas absent of non-native competition or in areas that are critical to maintain viability of native species where non-native species are present. Evaluation of management activities in conservation watershed networks will follow appropriate levels of review prior to resource management (i.e., multiscale analysis). See Table 3 in this BA. Conservation Watershed Networks have functionally intact ecosystems that provide high-quality water and contribute to and enhance the conservation and recovery of threatened or endangered fish species and aquatic species of conservation concern.

01 Conservation watershed networks have functionally intact ecosystems that provide high-quality water and contribute to and enhance the conservation and recovery of threatened or endangered fish species and aquatic species of conservation concern.

Soil Desired Conditions (FW-SOIL-DC)

01 Soil quality and productivity are not impaired and support desired conditions for terrestrial and aquatic ecosystems.

Table 3. Soil ecological functions with attributes, indicators, and desired conditions

Soil function[1]	Selected attributes	Soil quality indicator	Desired condition
Soil biology	Roots and aeration	Root growth	Root growth, both vertically and laterally, is unimpeded by compaction.
	Flora and fauna	Community composition	The soil is capable of supporting a distribution of desirable plant species by vegetative layer (trees, shrubs, herbaceous) as identified in the potential plant community (based on ecological site descriptions or equivalent). The site has not transitioned to an undesirable state.
		Canopy cover and ground cover	Soil temperature and moisture regimes are maintained in conditions to support desired plant communities.
Soil hydrology	Infiltration	Surfaces	Surface structure is as expected for the site (for example, granular, subangular blocky, single grain). Surface crusting and pore space are as expected for the site.
Nutrient cycling	Organic matter composition	Forest or rangeland floor	Forest and rangeland floor are appropriate for vegetation type and successional stage. Rangeland to be determined by field analysis and USDA-NRCS Soil Survey descriptions specific to soil type.
		Coarse woody material (greater than 3 inches)	Coarse woody material is on site in various stages of decay and size classes in amounts

Soil function[1]	Selected attributes	Soil quality indicator	Desired condition
			appropriate for habitat type. See FW-DC-VEGF-07 and FW-GDL-VEGF-05.
	Nutrient availability	Surface (A) horizon or mollic layer	“A” horizon is present, well distributed, not fragmented.
Support and stability	Stability	Surface erosion (wind, rill, or sheet)	Erosion is occurring at natural rates or not evident. Bare ground is within expected ranges base on USDA-NRCS Soil Survey descriptions for soil type.
		Site stability (mass erosion, landslide prone)	Site stability potential is unchanged or stability has been improved.

All Terrestrial Vegetation (VEGT) Desired Conditions (FW-VEGT-DC)

01 Vegetation conditions provide habitat requirements to support populations of species of conservation concern, threatened or endangered species, and other native and desired non-native species based upon the inherent capability of lands. Refer also to the Species at Risk sections of the Vegetation, Wildlife, and Aquatic Ecosystems resource sections.

Recreation Opportunities Desired Conditions (FW-REC-DC)

04 Recreation facilities, including trails and dispersed sites, and their use have minimal impacts on resources including at risk species, heritage and cultural sites, water quality, and aquatic species.

Roads and Trails (RT) Desired Conditions (FW-RT-DC)

02 Roads that are not needed to serve administrative and public needs are not present.

04 The transportation system has minimal impacts on resources including all wildlife, heritage and cultural sites, water quality, and aquatic species.

Public Information, Interpretation, and Education Desired Conditions (FW-CONNECT-DC)

02 Education programming promotes conservation, stewardship, and understanding of natural resources and ecological processes (such as watershed, fisheries, native plants, fire ecology, and wildlife) as well as cultural resources on public lands. Conservation education efforts are experiential, contemporary, and culturally and generationally relevant.

Livestock Grazing Desired Conditions (FW-GRAZ-DC)

03 Within grazing allotments, soil stability, and hydrologic and biotic integrity are maintained and are functioning in a manner that provide for resilience relative to site potential as described in ecological site descriptions or other classification.

04 Within grazing allotments, plant communities in wetlands, spring/seep ecosystems, and groundwater dependent ecosystems retain desired species composition, structure, and condition.

Geographic Area Desired Conditions (DI-FAH-DC and UB-FAH-DC)

01 Bull trout spawning, rearing, and migratory habitat is widely available and inhabited. Bull trout have access to historic habitat and appropriate life history strategies (for example, resident, fluvial, and adfluvial) are supported.

02 The bull trout population trends towards recovery and is supported through the Bull Trout Conservation Strategy, the Bull Trout Recovery Plan, and the Columbia Headwaters Recovery Unit Implementation Plan or the latest guiding documents.

Forest Plan Goals

Goals are broad statements of intent, other than desired conditions, usually related to process or interaction with the public. Goals are expressed in broad, general terms, but do not include completion dates. (36 Code of Federal Regulations 219.7(e)(2)). Goals may be appropriate to describe a state between current conditions and desired conditions but without specific amounts of indicators. Goals may also be appropriate to describe overall desired conditions of the plan area that are also dependent on conditions beyond the plan area or FS authority.

Forestwide Goals

Watershed Goals (FW-WTR-GO)

01 Under Montana Code Annotated 2015, 85-20-1301; the HLC NF works with the USDA-FS-Montana compact to attain water rights to preserve instream flows for nonconsumptive water uses to provide for channel maintenance, water quality, aquatic habitats, and riparian vegetation.

02 Federal, tribal, state and local governments cooperate to identify and secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.

03 Work cooperatively with Montana Department of Environmental Quality on development of watershed restoration plans, total maximum daily load (TMDL) plans water quality issues, monitoring, as well as wetland characterization and mapping.

04 Work cooperatively with MT Fish, Wildlife, and Parks to use beavers to manage aquatic habitat quality.

Fisheries and Aquatic Habitat Goals (FW-FAH-GO)

01 Work with Montana Fish, Wildlife, and Parks to contribute to the expansion of core populations of bull trout as outlined in the Bull Trout Conservation Strategy (or the latest guiding document).

02 Work with Montana Fish, Wildlife, and Parks to contribute to the expansion of core populations of westslope cutthroat trout as outlined in the Westslope Cutthroat Trout Conservation Strategy (or the latest guiding document).

03 The Forest Service coordinates with federal agencies, state agencies, tribes, counties, interested groups, and interested private landowners to recover threatened and endangered species.

04 The Forest Service works with federal, state, tribal, and private land managers towards an all-lands approach to management and cooperation, including efforts to mitigate threats or stressors, provide for wildlife and fish habitat connectivity, and to provide social, economic and ecological conditions that contribute to mutual objectives.

05 The Forest Service cooperates with state agencies, federal agencies, tribes and other interested stakeholders to develop actions that lead to progress towards meeting other agencies' objectives for native and desired non-native fish and wildlife species.

06 Work with appropriate agencies including Montana Fish, Wildlife, and Parks to provide information and preventive measures to the public about aquatic invasive species at water-based recreation sites. Also see Public Information, Interpretation, and Education (CONNECT).

Geographic Area Goals (DI-FAH-GO and UB-FAH-GO)

01 Bull trout population recovery is supported through the Bull Trout Conservation Strategy, the Bull Trout Recovery Plan, and the Columbia Headwaters Recovery Unit Implementation Plan or the latest guiding documents through cooperation and coordination with the USFWS, tribes, state agencies, other federal agencies, and interested groups.

Forest Plan Objectives

An objective is a concise, measurable, and time-specific statement of a desired rate of progress toward a desired condition or conditions. Objectives should be based on reasonably foreseeable budgets (36 CFR 219.9(e)(1)(ii)).

A project or activity is consistent with the objectives of the Plan if it contributes to or does not prevent the attainment of any other applicable objectives. The project documentation should identify any applicable objective(s) to which the project contributes. If there are no applicable objectives, project documentation should state that fact. It should be noted that although desired conditions can be represented by unconstrained budgets, objectives under the proposed action are based upon current or anticipated available funding. Objectives that include work west of the continental divide would benefit recovery of bull trout in the Upper Clark Fork or Blackfoot Core Areas.

Forestwide Objectives

Watershed Objectives (FW-WTR-OBJ)

01 Within at least four priority watersheds, complete essential work as defined by the Watershed Restoration Actions Plans identified in the Watershed Condition Framework.

02 Improve soil and watershed function and resiliency on at an average of 500 acres/year with an emphasis on priority watersheds under the Watershed Condition Framework and Conservation Watershed Network.

03 Plan and implement restoration activities on at least two acres of groundwater dependent ecosystems every 5 years.

Riparian Management Zones Objectives (FW-RMZ-OBJ)

01 Improve at least 500 acres of riparian habitat during the life of the forest plan. Improvement can be actions such as, but are not limited to, road obliteration, riparian planting, and reconstructing floodplains by removing road prisms or berms.

Fisheries and Aquatic Habitat Objectives (FW-FAH-OBJ)

01 Improve the habitat quality and hydrologic function of at least 20 miles of aquatic habitat during the life of the plan, focusing on streams with listed species or species of conservation concern. Activities include, but are not limited to, berm removal, large woody debris placement, road decommissioning or stormproofing, riparian planting, and channel reconstruction.

03 Reconnect at least 10 miles of habitat in streams disconnected by roads or culverts where aquatic and riparian-associated species' migratory needs are limiting distribution of those species during the life of the plan.

Conservation Watershed Network (CWN) Objectives (FW-CWN-OBJ)

01 Repair 2 road/stream crossings every five years at locations where chronic sediment sources are found (for example, up-size culverts, reduce sediment delivery to waterways from roads, realign stream constraining road segments, improve livestock stream crossings and trailing, etc.). Give precedence to priority watersheds as identified in Table 3 of this BA.

02 Stormproof at least 15% percent of the roads in the conservation watershed network prioritized for restoration to benefit threatened, endangered, proposed, and candidate aquatic species, aquatic species of conservation concern, and municipal watersheds. See appendix C for specific strategies for discussion of treatment options and for prioritization.

Recreation Opportunities Objectives (FW-REC-OBJ)

01 Rehabilitate at least 5 dispersed recreation sites (development scale 1-2) which have erosion or sanitation issues.

Roads and Trails Objectives (FW-RT-OBJ)

01 Decommission or place into storage (maintenance level 1) at least 50 miles of roads. Priorities shall include roads causing resource damage in priority watersheds and/or where roads chronically fail.

02 Complete at least 100 miles of reconstruction or road improvement projects. Priorities shall include reducing effects on: desired aquatic and riparian conditions from chronic sediment delivery or potential future road prism failures, and conservation watershed networks that have westslope cutthroat or bull trout habitats.

Forest Plan Standards

Standards: A standard is a mandatory constraint on project and activity decision making, established to help achieve or maintain the desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1) (iii)).

There are several ways to constraint projects and activities: standards, guidelines, and other sources of constraints. A standard differs from a guideline in that a standard is a strict constraint, allowing no variation, whereas a guideline allows variation if the result would be equally effective. Examples of other sources of constraints on the design of projects and activities include congressional direction, regulations, timber sale contract clauses, and special use authorization standard clauses.

Standards are used when the requirement is absolute such as to ensure projects will not prevent achievement of a desired condition, or to ensure compliance with laws such as the timber requirements of sections 6(g)(3)(E) and (F) of the NFMA to protect aesthetics, fish, recreation, soil, watershed, and wildlife (16 U.S.C. 1604(g)(3)(E) and (F)), or to protect threatened or endangered species under the Endangered Species Act of 1973 as amended (16 U.S.C. 1531-1544). Standards can be used to limit disturbances from projects and activities to animal dens, perennial streams, and wildlife habitat. Standards can also be used to protect resources by restricting authorization of specific uses in appropriate circumstances. Such uses might include firewood gathering, grazing, motor vehicle use, road construction, timber harvest, removal of sand and gravel, sanitary waste facilities, storage of fuel, and surface occupancy in riparian areas.

Forestwide Standards

Watershed Standards (FW-WTR-STD)

01 Projects that withdraw (i.e. pump) water from surface water features or groundwater must ensure that water is maintained at levels that will protect management uses and forest resources, including water quality and aquatic species and their habitat (including groundwater dependent ecosystems - fens, springs).

02 Best management practices (including both federal and the state of Montana Best Management Practices) shall be incorporated in all land use, transportation, infrastructure, and project plans as a principle mechanism for controlling nonpoint pollution sources to meet soil and watershed desired conditions and to protect beneficial uses.

03 Portable pump set-ups shall include containment provisions for fuel spills and fuel containers shall have appropriate containment provisions. Vehicles shall be parked in locations that avoid entry of spilled fuel into streams.

Riparian Management Zone Standards (FW-RMZ-STD)

01 RMZs shall be delineated as follows:

Category 1 Fish-bearing streams: RMZs consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest.

Category 2 Permanently flowing nonfish bearing streams: RMZs consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest.

Category 3 Constructed ponds and reservoirs, and wetlands greater than 1 acre: RMZs consist of the body of water or wetland and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the wetland greater than 1 acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.

Lakes and natural ponds - RMZs consist of the body of water and: the area to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable and potentially unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance, whichever is greatest.

Category 4 Seasonally flowing or intermittent streams, wetlands, seeps and springs less than 1 acre, and unstable and potentially unstable areas: This category applies to features with high variability in size and site-specific characteristics. At a minimum, the RMZs should include:

- ♦ The extent of unstable and potentially unstable areas (including earthflows).
- ♦ The stream channel and extend to the top of the inner gorge.
- ♦ The stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation, extending from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest. A site-potential tree height is the average maximum height of the tallest dominant trees for a given site class.
- ♦ Intermittent streams are defined as any nonpermanent flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria. Fish-bearing intermittent streams are distinguished from non-fish-bearing intermittent streams by the presence of any species of fish for any duration. Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers, and streams or travel routes for fish emigrating from lakes. In these instances, the guidelines for fish-bearing streams would apply to those sections of the intermittent stream used by the fish.

The RMZ is broken into two areas called the inner and outer zones (see table below). As noted in footnotes of the table, the inner RMZ width can be extended beyond the length in the table in some special cases to whatever is greatest of the following: the top of the inner gorge, the outer edges of the 100-year floodplain, to the outer edges of riparian vegetation, or to a distance equal to the height of either one or two site-potential trees. Some activities are prohibited or restricted in the inner zone, whereas more active management can occur in the outer zone. RMZs are not intended to be "no touch zones," but rather "carefully managed zones" with an increase in protections in close proximity to water resources.

Table 1. Typical widths[1] of inner and outer areas within RMZs

Stream type	Inner (ft)	Outer (ft)	Total width (ft)
Category 1 – Fish bearing stream	100[2]	200	300[1]
Category 2 – Perennial, nonfish bearing Stream	100[2]	50	150[1]
Category 3 – Natural Lakes and ponds, Constructed Ponds and Reservoirs, and wetlands greater than 1 acre	100	50	150
Category 4a – Intermittent steep (>35% side slope)	100[3]	0	100
Category 4b – Intermittent flat (<35% side slope) Disconnected intermittent MT State Class 3 and wetland <1 acre.	50	50	100

1. Widths listed are for each side of the stream, total width would be double the numbers listed.
2. Inner Riparian Management Zone widths extend on each side of the stream extending from the edges of the active stream channel either to the distance listed or to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, whichever is greatest.
3. Inner Riparian Management Zone widths extend on each side of the stream extending from the edges of the stream channel either to the distance listed or to the top of the inner gorge, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, whichever is greatest.

02 Vegetation management treatments shall only occur in the inner RMZ in order to restore or enhance aquatic and riparian-associated resources; only nonmechanical treatments shall be authorized.

03 Vegetation management may occur within the outer RMZs to meet desired conditions, so long as project activities within RMZs do not prevent attainment of desired conditions for wildlife and the inner RMZ.

04 Herbicides, pesticides, and other toxicants and chemicals shall only be applied within RMZs if needed to maintain, protect, or enhance aquatic and riparian resources or to restore native plant communities.

05 Storage and refueling sites shall be located outside of RMZs to minimize effects to aquatic resources. If refueling or storage is needed within RMZs, the locations must be approved by the FS and have an approved spill containment plan.

06 Salvage harvest shall not occur in the inner RMZ.

Fisheries and Aquatic Habitat Standards (FW-FAH-STD)

01 New stream diversions and associated ditches shall be screened to prevent capture of fish and other aquatic organisms.

Roads and Trails Standards (FW-RT-STD)

01 During dust abatement applications on roads, chemicals shall not be applied directly to watercourses, water bodies (for example, ponds and lakes), nor wetlands.

02 To maintain free-flowing streams, new, replacement, and reconstructed stream crossing sites (culverts, bridges and other stream crossings) shall accommodate at least the 100-year flow, including associated bedload and debris.

03 For new road construction and reconstruction of existing road segments within or adjacent to RMZs, fill material shall not be side-cast.

04 When installing new crossing structures on streams that have no fish, the structures shall accommodate a 1 percent probability (100-year) or higher flow, including associated bedload and debris. If site-specific conditions preclude that design, size the structure to the largest size the location will accommodate and provides for bankfull width.

Livestock Grazing Standards (FW-GRAZ-STD)

01 New or revised allotment management plans shall provide site-specific management prescriptions to meet or move toward applicable desired conditions.

02 Annual livestock use indicators within inner RMZs shall be set during the allotment management planning process at levels that move towards or maintain desired rangeland vegetation, riparian function, and wildlife habitat specific to the ecological site (or equivalent classification). Indicator values shall be adapted over time based on long-term monitoring and evaluation of conditions and trends.

Forest Plan Guidelines

Guidelines: A guideline is a constraint on project and activity decision making that allows for departure from its terms, so long as the purpose of the guideline is met (§ 219.15(d)(3)). Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iv)). As with desired conditions, guidelines can be forestwide or specific to a GA. Guidelines serve the same purpose as standards but they differ from standards in that they provide flexibility in defining compliance, while standards are absolute constraints.

Forestwide Guidelines

Watershed Guidelines (FW-WTR-GDL)

01 When conducting management activities, in order to support aquatic habitat quality and resiliency, beaver complexes should be enhanced or maintained.

02 Special use permits related to water uses should include provisions to ensure that water quality and beneficial uses are fully protected.

Riparian Management Zone Guidelines (FW-RMZ-GDL)

01 Trees felled inside RMZs should be left onsite to achieve aquatic and riparian desired conditions.

02 To maintain stream channel stability and aquatic habitat, large woody debris should not be cut and/or removed from stream channels unless it threatens critical infrastructure, such as mid-channel bridge piers or fire control breaks.

03 To avoid disturbing or compacting soil or damaging vegetation, management activities should be excluded within a minimum of 100 feet of peatlands, fens, and other groundwater dependent ecosystems.

04 To reduce the likelihood of sediment input to streams, new road and landing construction should be avoided, including temporary roads, in RMZs except where:

- ♦ necessary for stream crossings, or
- ♦ a road relocation contributes to attainment of aquatic and riparian desired conditions, or
- ♦ Forest Service authorities are limited by law or regulation.

05 To minimize sediment delivery and adverse effects to stream channels, construction of machine fireline in RMZs should be avoided, except where needed to cross streams. Following wildfire and prescribed fire operations, fire lines should be rehabilitated to limit the creation of new stream channels.

06 To reduce the likelihood of sediment input to streams and reduce adverse effects to stream channels and riparian areas, when conducting fire operations, the use of heavy equipment within RMZs should be minimized.

07 New sand and gravel borrow pit development or gravel mining should not occur within RMZs to minimize ground disturbance and sediment inputs.

08 To reduce the likelihood of sediment input to streams and reduce adverse effects to stream channels and riparian areas, temporary fire facilities (for example, incident bases, camps, wheelbases, staging areas, helispots, and other centers) for incident activities should be located outside RMZs. When no practical alternative exists, all appropriate measures to maintain, restore, or enhance aquatic and riparian dependent resources should be used.

09 New landings, designated skid trails, staging, and decking should be located outside RMZs to minimize effects to riparian and aquatic resources. If landings are needed inside of RMZs, the disturbance area footprint should be minimized, and the activities should be located outside the active floodplain.

10 Aerial application of chemical retardant, foam, or other fire chemicals and petroleum should be avoided in mapped aerial retardant avoidance areas (refer to latest regional avoidance map) in order to minimize impacts to the RMZ and aquatic resources.

11 To reduce the likelihood of sediment input to streams and reduce adverse effects to stream channels and riparian areas, clearcut harvest should not occur in RMZs.

12 To reduce the likelihood of sediment input to streams and reduce adverse effects to stream channels and riparian areas, all management activities in RMZs should protect key riparian features and processes, including maintenance of stream bank stability, input of organic matter, temperature regimes, water quality, and aquatic and terrestrial habitat connectivity.

Fisheries and Aquatic Habitat Guidelines (FW-FAH-GDL)

01 Prior to use in a water body or when moving between watersheds, equipment (including boats, rafts, drafting equipment, water tenders, and helicopter buckets) should be inspected and cleaned to reduce the potential for the introduction of aquatic invasive species, including aquatic pathogens.

02 When drafting water from streams, pumps should be screened to prevent capture of fish. During the spawning season for native fish, pumping sites should be located away from spawning gravels.

03 New and revised livestock management plans should be designed to maintain or improve water quality by minimizing impacts caused by livestock grazing in RMZs within active livestock allotments. Also see Benefits to People, Livestock Grazing (GRAZ).

04 Construction activities within the ordinary high-water mark that may result in adverse effects to native or desirable nonnative aquatic species, or have the potential to directly deliver sediment to their habitats, should be limited to times outside of spawning and incubation seasons. Specific time periods should be coordinated through the permitting process with Montana Fish, Wildlife, and Parks.

05 Human created migration barriers to aquatic species should not be created unless they are needed to prevent invasions by nonnative species.

Conservation Watershed Network Guidelines (FW-CWN-GDL)

01 For subwatersheds included in the conservation watershed network, net increases in stream crossings and road lengths should be avoided in RMZs, unless the net increase would improve ecological function in aquatic ecosystems. The net increase is measured from beginning to end of each project.

02 Roads in conservation watershed networks should be prioritized for road decommissioning, closure, relocation or other strategies to reduce sediment delivery to benefit aquatic species (for example, bull trout). See appendix C for specific strategies for discussion of treatment options and for prioritization.

03 During project planning, conservation watershed networks should be the highest priority for restoration actions for the aquatic environment.

All Terrestrial Vegetation Guidelines (FW-VEGT-GDL)

01 Removal of native vegetation during nonvegetation management activities (for example, road maintenance) should be limited to the extent needed to achieve the project purpose and need.

02 Livestock grazing practices should be modified as necessary to ensure that revegetation and/or reforestation is successful after management activities or natural disturbances, as defined in site-specific prescriptions.

Recreation Opportunities Guidelines (FW-REC-GDL)

01 Management of developed recreation facilities should be responsive to environmental changes such as but not limited to changes in water flows, snow levels, snow elevation, fish and wildlife habitats, vegetative conditions, and seasonal recreation use.

03 To maintain quality and quantity of water flows to, within, or between groundwater dependent ecosystems, groundwater use facilities at recreation and administrative sites should not: a) be developed in RMZs (unless no alternatives exist); b) measurably lower river flows, lake levels, or flows to wetlands or springs (for example change springs from perennial to intermittent, or eliminate springs altogether); and/or c) discharge pollutants directly to groundwater.

04 To reduce potential impact to fishery resources, avoid placing new facilities or infrastructure within expected long-term channel migration zone. Where new activities inherently must occur in RMZs (for example road stream crossings, boat ramps, docks, and interpretive trails), locate them to minimize impacts on riparian associated resource conditions.

05 Where existing recreation facilities are located within RMZs and degrading aquatic or riparian resources, consider removing or relocating such facilities outside of RMZs or use other means practicable to reduce effects. In RMZs, areas where developed recreation facilities have been removed should be rehabilitated to a natural state.

06 To protect resources, new and reconstructed solid and sanitary waste facilities should not be located within inner RMZs.

Recreation Access Guidelines (FW-ACCESS-GDL)

01 To protect natural and cultural resources, projects and other management activities should be designed to prevent the creation and/or use of unauthorized recreation routes, and to rehabilitate existing ones to the extent practicable.

Land Uses Guidelines (FW-LAND USE-GDL)

03 When authorizing new lands special uses or reauthorizing existing uses, pre-approved clauses that contain terms and conditions to avoid or minimize adverse effects to resources should be included.

04 If adverse effects to inland native fish, species of conservation concern, impaired water bodies, or stream habitat conditions are unavoidable, land use authorizations should require actions that result in re-establishment, restoration, mitigation, or improvement of conditions and processes to ensure that projects that degrade conditions also include measures to incrementally improve conditions. At the time of reauthorization, existing authorizations should be adjusted to mitigate adverse effects to fish, water, and riparian resources as practicable.

05 New hydropower support facilities should be located outside of riparian management zones (RMZs) to reduce effects to fish, water, and riparian resources. Support facilities include any facilities or improvements (e.g., workshops, housing, switchyards, staging areas, transmission lines) not directly integral to its operation or necessary for the implementation of prescribed protection, mitigation, or enhancement measures.

06 If existing support facilities are located within the RMZs, at time of permit reissuance, pre-approved clauses that contain terms and conditions to reduce impacts on aquatic and riparian resources should be included. Also consider moving support facilities outside of RMZs or further from water bodies where feasible.

Roads and Trails Guidelines (FW-RT-GDL)

01 Newly constructed or reconstructed roads, temporary roads, skid trails, and trails should be hydrologically disconnected from delivering water, sediment, and pollutants to water bodies (except at designated stream crossings) to maintain the hydrologic integrity of watersheds.

02 When placing physical barriers such as berms on travel routes such as roads, skid trails, temporary roads, and trails, drainage features should be sufficient to avoid future risks to aquatic resources (for example, remove culverts from stream crossings).

03 To maintain channel stability and reduce sediment delivery to watercourses, trails, fords, and other stream crossings should be hardened to protect stream beds, banks, and approaches during construction or reconstruction.

04 To reduce the risk to aquatic resources when decommissioning roads, making roads impassable, or putting roads into intermittent stored service (i.e. storing roads for longer than 1 year), roads should be left in a hydrologically stable condition (for example, drainage off roads should route away from water resources and landslide prone areas and towards stable areas of the forest floor to provide filtering and infiltration).

05 To maintain and/or improve watershed ecosystem integrity and reduce road-related mass wasting and sediment delivery to watercourses, new and relocated roads, trails (including skid trails and temporary roads), and other linear features should not be constructed on lands with high mass wasting potential.

06 For maintenance activities such as road blading and snow plowing on existing roads, sidecasting should be minimized, particularly into or adjacent to water bodies. Care should be taken when plowing snow so as not to include road soil. Breaks should be designed in the snow berms to direct water off the road.

07 Wetlands and unstable areas should be avoided when reconstructing existing roads or constructing new roads and landings. Impacts should be minimized where avoidance is not practical.

08 When constructing, reconstructing, or maintaining roads, sediment delivery to streams should be minimized. Road drainage should be routed away from potentially unstable channels, fills, and hillslopes.

09 Transportation infrastructure should be designed to maintain natural hydrologic flow paths to the extent practical (for example, streams should have crossing structures and not be routed down ditches).

10 In fish bearing streams, construction, reconstruction, or replacement of stream crossings should provide and maintain passage for all life stages of native aquatic organisms unless barriers should be created or maintained to prevent spread or invasion of nonnative species in alignment with fish management agencies. These crossings should also allow for passage for other riparian dependent species through the establishment of banks inside/beneath the crossing structure.

11 To maintain free-flowing streams, new, replacement, and reconstructed stream crossing sites (culverts, bridges and other stream crossings) should be constructed to prevent diversion of stream flow out of the channels in the event the crossing is plugged or has a flow greater than the crossing was designed.

12 Roads not needed in the long term should be decommissioned to benefit fish and wildlife habitat (prioritizing native fish habitat), enhance the desired recreation opportunity spectrum settings and opportunities, and/or create a more cost-efficient transportation system.

Livestock Grazing Guidelines (FW-GRAZ-GDL)

01 To maintain or improve riparian and aquatic conditions and achieve riparian desired conditions over time through adaptive management, new grazing authorizations and reauthorizations that contain low gradient, alluvial channels should require that end-of-season stubble height be 10 to 15 cm (4 to 6 inches) along the greenline. However, application of the stubble height numeric value range should only be applied where it is appropriate to reflect existing and natural conditions for the specific geo-climactic, hydrologic, and vegetative conditions where it is being applied. Alternative use and disturbance indicators and values, including those in current ESA consultation documents, may be used if they are based on current science and monitoring data and meet the purpose of this guideline. Long-term monitoring and evaluation should be used to adapt this numeric range and/or the use of other indicators.

02 To ensure grazing is sustainable and contributes to other resource desired conditions, forage use by livestock should maintain or enhance the desired structure and diversity of plant communities on grasslands, shrub lands, and forests and should maintain or restore healthy riparian conditions as defined in the allotment management plan.

03 New or revised allotment management plans should design grazing practices (such as stocking rate, duration, timing), and/or physical structures to reduce negative effects to riparian areas or riparian dependent at risk species.

04 Allotment management plans should incorporate adaptive management to move towards desired conditions for vegetation and riparian resources, considering both the needs and impacts of domestic livestock and wildlife.

05 When updating or managing existing facilities that are located within RMZs, facilities should be minimized or relocated to other areas. Livestock management activities (trailing, bedding, watering, salting, loading, and other handling or management efforts) should be avoided in RMZs to reduce effects to riparian resources and aquatic biota. Also see FW-RMZ section for additional information.

06 Livestock watering facilities should be constructed or maintained to provide for forage use that will maintain or enhance structure and diversity of plant communities on suitable rangelands, but avoid impacts to soil and water resources.

07 To attract livestock out of riparian areas, salt and/or supplements should be placed at least one-quarter (1/4) mile away.

Geology, Energy and Minerals Guidelines (FW-EMIN-GDL)

01 To minimize adverse effects to aquatic and riparian resources, new authorizations and reauthorizations for mineral development and operations should avoid RMZs to the extent practicable. If the RMZ cannot be avoided, then ensure operators take all practicable measures to maintain, protect, and rehabilitate fish and wildlife habitat that may be affected by the operations. Required bonding should consider (in the estimation of bond amount) the cost of stabilizing, rehabilitating, and reclaiming the area of operations.

02 To minimize adverse effects to aquatic and riparian resources, new authorizations and reauthorizations for mineral development and operations should avoid adverse effects to aquatic and riparian resources. This should include requirements that operators take all practicable measures to maintain, protect, and rehabilitate water quality, and habitat for fish and wildlife and other riparian associated resources which may be affected by the operations.

Suitability of Lands

Specific lands within the Forest will be identified as suitable (SUIT) for various multiple uses or activities based on the desired conditions applicable to those lands. The plan will also identify lands within the Forest as not suitable for uses that are not compatible with desired conditions for those lands. The suitability of lands need not be identified for every use or activity (36 Code of Federal Regulations 219.7 (e)(1)(v)). Suitability identifications may be made after consideration of historic uses and of issues that have arisen in the planning process.

Identifying suitability of lands for a use in the forest plan indicates that the use may be appropriate, but does not make a specific commitment to authorize that use. Final suitability determinations for specific authorizations occur at the project or activity level decision making process. Generally, the lands on the Forest are suitable for all uses and management activities appropriate for national forests, such as outdoor recreation, range, or timber, unless identified as not suitable. Every plan must identify those lands that are not suitable for timber production (§ 219.11). (36 Code of Federal Regulations 219.7(e)(1)(v)). For forestwide suitability determinations, please see chapter 2 and for GA specific suitability determinations, see chapter 3 of the Forest Plan.

Forestwide Suitability of Lands

Riparian Management Zone Suitability (FW-RMZ-SUIT)

01 RMZs are not suitable for timber production, but harvest for other multiple use values is allowed as appropriate under the RMZ plan components.

Aquatic Ecosystem Monitoring

The following table displays the forestwide monitoring elements for watershed (WTR), fisheries and aquatic habitat (FAH), riparian management zones (RMZs, and conservation watershed networks (CWNs). This comes from appendix B of the 2020 Forest Plan.

Table 18. Plan components, monitoring questions and indicators for aquatic ecosystems

Selected plan components	Monitoring question	Indicator(s) and measure(s)
FW-WTR-DC-03; FW-WTR-DC-04; FW-WTR-DC-08; FW-WTR-DC-10; FW-FAH-DC-02; FW-FAH-DC-03; FW-RMZ-DC-01	MON-WTR-01 What is the trend in instream physical characteristics for managed watersheds as compared to unmanaged?	Instream physical habitat • Woody debris, bank angle, pooltail fines, percent pool and residual pool depth, pebble count data (D50)
FW-WTR-DC-05; FW-WTR-DC-11; FW-WTR-STD-02; FW-WTR-STD-03	MON-WTR-02 What BMPs are implemented in wetlands in order to not impede the sustainability of wetland characteristics and diversity?	BMP implementation for projects with wetlands • Number and types of BMPs implemented • Quality at which the BMP are implemented
FW-WTR-DC-06; FW-WTR-DC-07; FW-WTR-DC-08	MON-WTR-03 What is the status of 303 and 305 State listed streams?	State listed stream segments forestwide and by conservation watershed network • Number and locations stream reaches on 303 and 305 list • Acres, miles, and types of actions that improve the reasons for which the stream reach was listed • MT State assessment of Beneficial Uses status (fully supporting, not fully supporting, threatened) for each listed stream segment
FW-CWN-GDL-02; FW-CWN-GDL-03 FW-WTR-OBJ-01; FW-WTR-OBJ-02	MON-WTR-04 Are watershed restoration projects occurring in priority watersheds?	Watershed restoration projects • Number, type, and location of projects in priority watersheds (Conservation Watershed Framework and priority watersheds as identified in the Watershed Condition Framework) • Number, type, and location of projects NOT in priority watersheds (Conservation Watershed Framework and priority watersheds as identified in the Watershed Condition Framework)
FW-CWN-DC-01; FW-FAH-OBJ-01; FW-FAH-OBJ-02	MON-WTR-05 What stream habitat improvement actions have occurred?	Stream habitat improvements • Miles, types, and locations of stream habitat improvements
FW-CWN-GDL-01; FW-CWN-GDL-02 FW-CWN-OBJ-01: FW-CWN-OBJ-02	MON-WTR-06 What road and access improvements have been completed in Conservation Watershed Network areas?	Road management in conservation watershed networks • Number, types, miles or road management actions/decisions in watershed conservation network
FW-FAH-GDL-04; FW-CWN-GDL-03	MON-WTR-06	Water quality maintained or improved forestwide and by conservation watershed network

Selected plan components	Monitoring question	Indicator(s) and measure(s)
	Are new and revised livestock management plans designed to maintain water quality?	• Miles of intermittent and perennial streams moving towards desired condition • Number of improved management strategies expected to move RMZs towards desired conditions
FW-FAH-DC-01; FW-FAH-DC-04 FW-FAH-DC-05; FW-FAH-DC-08	MON-FAH-01 What is the status of westslope cutthroat trout?	Presence and abundance of genetically pure westslope cutthroat trout populations • Number of fish per mile, or miles of occupied stream reaches • Locations of populations
FW-RT-STD-02; FW-RT-STD-03; FW-RT-STD-04; FW-BRDG-DC-01	MON-FAH-02 Are culverts and bridges on fish-bearing streams being constructed/upgraded/removed to allow aquatic organism passage?	Infrastructure for aquatics systems • Number of culverts and bridges on fish-bearing streams that comply with standards • Number of culverts and bridges on fish-bearing streams that DO NOT comply with standards.
FW-RMZ-DC-01; FW-RMZ-DC-02; FW-RMZ-OBJ-01	MON-RMZ-01 How many acres of riparian management zones have been improved?	Acres of riparian management areas improved through activities including but not limited to: • Road obliteration • Riparian planting • Reconstruction of flood plains through removal of roads or berms

Appendix C. Primary Constituent Elements for Bull Trout Critical Habitat and Critical Habitat Map

This appendix describes how the matrix of pathway indicators for the species relates to a crosswalk evaluation of each primary constituent elements (PCE) for bull trout designated critical habitat. Table C1 displays the crosswalk relationship. Figure C1 identifies designated critical habitat for bull trout in Unit 31, sub unit Blackfoot River.

1. **Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.**

The analysis of *floodplain connectivity* considers the hydrologic linkage of off-channel areas with the main channel and overbank-flow maintenance of wetland function and riparian vegetation and succession. Floodplain and riparian areas provide hydrologic connectivity for springs, seeps, groundwater upwelling and wetlands and contribute to the maintenance of the water table. The *sediment* and *substrate embeddedness* indicators describe the level of fine sediment in the gravel which affects hyporheic flow. Fine sediment fills interstitial spaces making the movement of water through the substrate less efficient. The *chemical contamination/nutrients* and *temperature* indicators evaluate the water quality of groundwater. The *off-channel habitat* indicator suggests how much off-channel habitat is available, and generally off-channels are connected to adjacent channels via subsurface water. The *change in peak/base flows* indicator considers whether or not peak flow, base flow, and flow timing are comparable to an undisturbed watershed of similar size, geology, and geography. Peak flows, base flows, and flow timing are directly related to subsurface water connectivity and the degree to which soil compaction has decreased infiltration and increased surface runoff. The *drainage network increase* and *road density and location* indicators assess the influence of the road and trail networks on subsurface water connectivity. If there is an increase in drainage network and roads are located in riparian areas, it is likely that subsurface water is being intercepted before it reaches a stream. If groundwater is being intercepted then it is likely that water quality is being degraded through increased temperatures, fine sediment, and possibly chemical contamination. *Streambank condition* addresses groundwater influence through an assessment of stability. The *disturbance history* indicator evaluates disturbance across the watershed and provides a picture of how management may be affecting hydrology. The *riparian conservation areas* indicator determines whether riparian areas are intact and providing connectivity. If riparian areas are intact it is much more likely that springs, seeps, and groundwater sources are able to positively affect water quality and quantity.

2. **Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.**

The *physical barriers* indicator provides the most direct assessment of this PCE. Analysis of this indicator includes consideration of whether man-made barriers within the watershed allow upstream and downstream passage of all life stages at all flows. However, some indicators further evaluate physical impediments and others evaluate the biological or water quality impediments that may be present. The *temperature, sediment, substrate embeddedness,* and *chemical contamination/nutrients* indicators assess whether other barriers may be created, at least seasonally, by conditions such as high temperatures, high concentrations of sediment, or contaminants. The *average wetted width/maximum depth ratio* indicator can help identify situations in which water depth for adult passage may be a problem. A very high average wetted width/maximum depth value may indicate a situation where low flows, when adults migrate, are so spread out that water depth is insufficient to pass adults. The *change in peak/base flows* indicator can help determine if change in base flows have been sufficient to prevent adult passage during the spawning migration. The *persistence and genetic integrity* indicator addresses biological impediments by evaluating negative interactions (e.g., predation, hybridization, and competition) with other species.

3. **An abundant food base, including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.**

None of the indicators directly address this PCE, but a number of them address it indirectly. The *sediment* and *substrate embeddedness* indicators document the extent to which substrate interstitial spaces are filled with fine sediment. Interstitial spaces provide important habitat for aquatic macroinvertebrates, sculpin, and other substrate-oriented prey which are important food sources for bull trout. The *chemical contamination/nutrients* indicator evaluates the level to which a stream is contaminated by chemicals or has a high level of nutrients. Chemicals and nutrients greatly affect the type and diversity of aquatic invertebrate communities present in a water body. The *large woody debris* and *pool frequency and quality* indicators assess habitat complexity. High stream habitat complexity is associated with diverse and abundant macroinvertebrate and fish prey. The *off-channel habitat* and *floodplain connectivity* indicators document the presence of off-channels which are generally more productive than main channels. Off channel areas are important sources of forage, particularly for juveniles. The *streambank condition* and *riparian conservation areas* indicators both shed light on the very basis of the food base of a stream. Vegetation along streambanks and in riparian areas provide important habitat for terrestrial macroinvertebrates that can fall into the water as well as sources of nutrient inputs that support aquatic invertebrate production.

4. **Complex river, stream, lake, reservoir, and marine shoreline aquatic environments and processes that establish and maintain these aquatic environments, with features such as large wood, side channels, pools, undercut banks and unembedded substrates, to provide a variety of depths, gradients, velocities, and structure.**

Several indicators address this PCE directly. The *sediment* and *substrate embeddedness* indicators provide insight into how complex substrates are within a stream by documenting percent fines and embeddedness. As percent fines and embeddedness increase, substrate complexity decreases. The *large woody debris* indicator provides an excellent picture of habitat complexity. The indicator rates the stream based on the amount of in-channel large woody debris. Habitat complexity increases as large wood increases. The *pool frequency and quality* and *large pools* indicators address habitat complexity by rating the stream based on the frequency of pools and their quality. Habitat complexity increases as the number of pools and their quality increase. The *off-channel habitat* indicator directly addresses complexity associated with side channels. The indicator is rated based on the amount of off-channel habitat, cover associated with off-channels, and flow energy levels. *Average wetted width/maximum depth ratio* is an indicator of channel shape and pool quality. Low ratios suggest deeper, higher quality pools. The *streambank condition* and *riparian conservation areas* indicators both shed light on the complexity of river and stream shorelines. Vegetation along streambanks and in riparian areas provides important habitat complexity and channel roughness. The *streambank condition* indicator also provides information about the capacity of an area to produce undercut banks, which can be a very important habitat feature for bull trout. The *floodplain connectivity* indicator addresses complexity added by side channels and the ability of floodwaters to spread across the floodplain to dissipate energy and provide access to high-flow refugia for fish. The *road density and location* indicator addresses complexity by identifying if roads are located in valley bottoms. Roads located in valley bottoms reduce complexity by eliminating vegetation and replacing complex habitats with riprap or fill, and often confine the floodplain. The *disturbance regime* indicator documents the frequency, duration, and size of environmental disturbance within the watershed. If scour events, debris torrents, or catastrophic fires are frequent, long in duration, and large, then habitat complexity would be greatly reduced.

5. **Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; streamflow; and local groundwater influence.**

The *temperature* indicator addresses this PCE directly. The indicator rates streams according to how well temperatures meet bull trout requirements. Other matrix indicators address temperature indirectly. The *off-channel habitat* and *floodplain connectivity* indicators address how well stream channels are hydrologically connected to off-channel areas. Floodplains and off-channels are important to maintaining the water table and providing connectivity to the channel for springs, seeps, and groundwater sources which contribute cool water to channels. The *average wetted width/maximum depth ratio* indicator also corresponds to temperature. Low width to depth ratios indicate that channels are narrow and deep with little surface area to absorb heat. The *streambank condition* indicator documents bank stability. If the streambanks are stabilized by vegetation rather than substrate then it is likely that the vegetation provides shade which helps prevent increases in temperature. The *change in peak/base flows* indicator evaluates flows and flow timing characteristics relative to what would be expected in an undisturbed watershed. If base flow has been reduced, it is likely that water temperature during base flow has increased since the amount of water to heat has decreased. The *road density and location* and *drainage network increase* indicators documents where roads are located. If roads are located adjacent to a stream then shade is reduced and temperature is likely increased. Roads also intercept groundwater and can reduce this cooling influence, as well as discharge typically warmer stormwater. The *disturbance history* indicator describes how much of the watershed has been altered by vegetation management and therefore indicates how much shade has been removed. The *riparian conservation areas* indicator addresses stream shade which keeps stream temperatures cool. The presence of *large pools* may provide thermal refugia when temperatures are high.

6. **In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates, is characteristic of these conditions. The size and amounts of fine sediment suitable to bull trout will likely vary from system to system.**

The *sediment* and *substrate embeddedness* indicators directly address this PCE. These indicators evaluate the percent fines within spawning areas and the percent embeddedness within rearing areas. The *streambank condition* and *riparian conservation areas* indicators indirectly address this PCE by documenting the presence or lack of potential fine sediment sources. If streambanks are stable and riparian conservation areas are intact then there is a low risk of introducing fine sediment from bank erosion. Also, the *floodplain connectivity* indicator indirectly addresses this PCE. If the stream channel is connected to its floodplain, then there is less risk of bank erosion during high flows because stream energy is reduced as water spreads across the floodplain. The *increase in drainage network* and *road density and location* indicators assess the effects of roads on the channel network and hydrology. If the drainage network has significantly increased as a result of human-caused disturbance or road density is high within a watershed and roads are located adjacent to streams, then it is likely that in-channel fine sediment levels will be elevated above natural levels. The *disturbance regime* indicator documents the nature of environmental disturbance within the watershed. If the disturbance regime includes frequent and unpredictable scour events, debris torrents, and catastrophic fire, then it is likely that fine sediment levels will be elevated above background levels. A consideration for all indicators directly or indirectly influencing this PCE is that it is desirable to achieve an appropriate balance of stable areas to provide undercut banks and eroding areas that are sources for recruiting new spawning gravels. Too little sediment in a stream can also be detrimental.

7. **A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.**

The *change in peak/base flows* indicator addresses this PCE directly by documenting the condition of the watershed hydrograph relative to an undisturbed watershed of similar size, geology, and geography. There are several indicators that address this PCE indirectly. The *streambank condition* indicator documents bank stability. If the streambanks are stabilized by vegetation rather than substrate then it is likely that the streambank can store water during moist periods and releases that water during dry periods which contributes to water quality and quantity. The *floodplain connectivity* indicator is relevant to water storage within the floodplain which directly affects base flow. Floodplains are important to maintaining the water table and providing connectivity to the channel for springs, seeps, and groundwater sources which contribute to water quality and quantity. The *increase in drainage network* and *road density and location* indicators assess the influence of the road and trail networks on hydrology. If there is an increase in drainage network and roads are located in riparian areas, it is likely is being intercepted and quickly routed to a stream which can increase peak flow. The *disturbance history* indicator evaluates disturbance across the watershed and provides a picture of how management may be affecting hydrology; for example, it may suggest the degree to which soil compaction has decreased infiltration and increased surface runoff. The *riparian conservation areas* indicator determines whether riparian areas are intact, functioning, and providing connectivity. If riparian areas are intact it is much more likely that springs, seeps, and groundwater sources are able to positively affect water quality and quantity.

8. **Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.**

This PCE is closely related to PCE 7, with PCE 8 adding a water quality component (i.e., there is a high level of overlap in indicators that apply to both PCEs 7 and 8). The *temperature* and *chemical contamination/nutrients* indicators directly address water quality by comparing water temperatures to bull trout water temperature requirements and documenting 303(d) designated stream reaches. Several other indicators indirectly address this PCE by evaluating the risk of fine sediment being introduced that would result in decreased water quality through increased turbidity. The *streambank condition* and *riparian conservation areas* indicators indirectly address this PCE by documenting the presence or lack of potential fine sediment sources. If streambanks are stable and riparian conservation areas are intact then there is a low risk of introducing fine sediment from bank erosion. Also, the *floodplain connectivity* indicator indirectly addresses this PCE. If the stream channel is connected to its floodplain, then there is less risk of bank erosion during high flows because stream energy is reduced as water spreads across the floodplain. *Average wetted width/maximum depth ratio* is an indication of water volume, which indirectly indicates water temperature, (i.e., low ratios indicate deeper water, which in turn indicates possible high-flow refugia). This indicator in conjunction with *change in peak/base flows* is an indicator of potential water quality and quantity deficiencies, particularly during low flow periods. The *increase in drainage network* and *road density and location* indicators assess the effects of roads on the channel network and hydrology. If the drainage network has significantly increased as a result of human-caused disturbance or road density is high within a watershed and roads are located adjacent to streams, then it is likely that suspended fine sediment levels will be elevated above natural levels. If roads are located adjacent to a stream then shade is reduced and temperature is likely increased. Roads also intercept groundwater and can reduce this cooling influence, as well as discharge typically warmer stormwater. The *disturbance regime* indicator documents the nature of environmental disturbance within the watershed. If the disturbance regime includes frequent and unpredictable scour events, debris torrents, and catastrophic fire, then it is likely that turbidity levels will be elevated above background levels.

9. **Sufficiently low levels of occurrence of nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass); interbreeding (e.g., brook trout); or competing (e.g., brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.**

The only indicator that directly addresses this PCE is the *persistence and genetic integrity* indicator. This indicator addresses the likelihood of predation, hybridization, or displacement of bull trout by competitive species. The *temperature* indicator can provide indirect insights about whether conditions are conducive to supporting “warm water” species.

Table C1. Matrix Pathway Indicators relevant to each of the Primary Constituent Elements (PCE) of bull trout designated critical habitat

Diagnostic Pathway Indicator	PCE 1 Springs, seeps, groundwater	PCE 2 Migration habitats	PCE 3 Abundant food base	PCE 4 Complex habitats	PCE 5 Water temperature	PCE 6 Substrate features	PCE 7 Natural hydrograph	PCE 8 Water quality/ quantity	PCE 9 Nonnative predators & competitors
Water Quality									
Temperature	x	x			x			x	x
Sediment	x	x	x	x		x			
Chemical Contaminants & Nutrients	x	x	x					x	
Habitat Access									
Physical Barriers		x							
Habitat Elements									
Substrate Embeddedness	x	x	x	x		x			
Large Woody Debris			x	x					
Pool Frequency and Quality			x	x					
Large Pools				x	x				
Off-Channel Habitat	x		x	x	x				
Refugia	x	x	x	x	x	x	x	x	x
Channel Conditions & Dynamics									
Wetted Width/Depth Ratio		x		x	x			x	
Streambank Condition	x		x	x	x	x	x	x	
Floodplain Connectivity	x		x	x	x	x	x	x	
Flow/Hydrology									
Changes in Peak/Base Flows	x	x			x		x	x	
Drainage Network Increase	x				x	x	x	x	
Watershed Conditions									
Road Density and Location	x			x	x	x	x	x	
Disturbance History	x				x		x		
Riparian Conservation Areas	x		x	x	x	x	x	x	
Disturbance Regime				x		x		x	

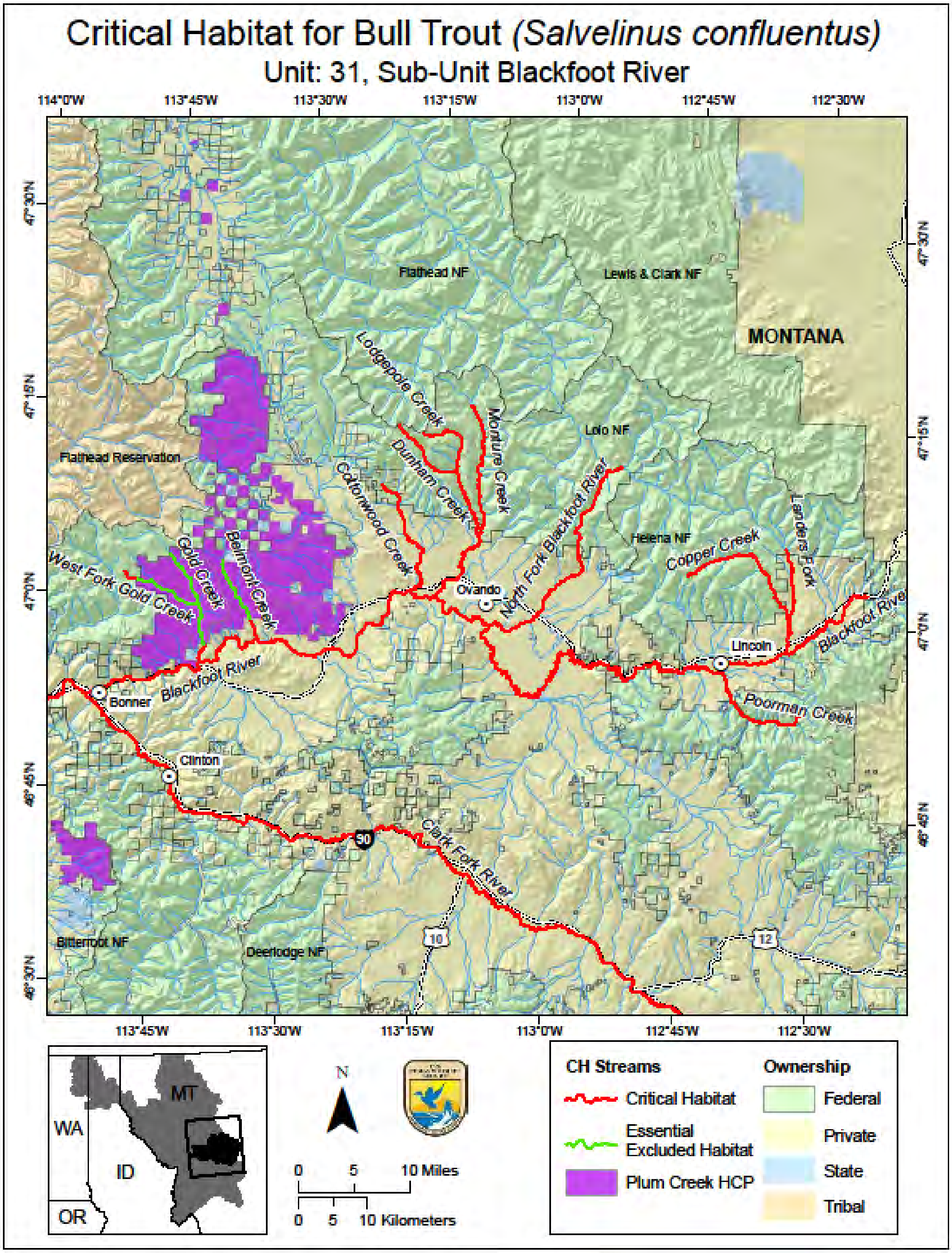

Figure C1. Designated critical habitat for bull trout in Unit 31, sub-unit Blackfoot River

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Appendix D. Bull Trout Baselines

The Western Montana Bull Trout Conservation Strategy (USDA-USFWS 2013) will be used to inform baseline data needs and management direction as it relates to bull trout and designated critical habitat on the Helena – Lewis and Clark National Forest. The conservation strategy was developed by the Western Montana Level 1 Team to provide direction for affected forests to implement bull trout recovery actions. The strategy is a component of the final recovery plan and as such fits with the revised plan's stated desired condition for bull trout and designated critical habitat.

The bull trout baselines are updated using the 2017 Post-Fire GIS runs and information from the Bull Trout Conservation Strategy.

Acronyms

FA	functioning acceptable
FAR	functioning at risk
FUR	functioning at unacceptable risk
HUC	hydrologic unit code
MWMT	maximum weekly maximum temperature
NA	not applicable
OPPS	opportunities

NOTE: *Charts below without accompanying text were not included in BTCS 2013 and do not have text descriptions. Calls reported in charts come from baseline data runs.*

Upper Clark Fork Core Area

Individual HUC6 sub watersheds (other remnant population) attributes and strategies, based on above factors:

HUC6 (name and #): Larabee Gulch-Little Blackfoot River, 170102010502							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FAR	NA				
Barriers	FAR	FA	NA				
Pools	FUR	FAR	NA				
Sediment	FUR	FAR	NA				
Integrated	FUR	FAR	NA				

HUC6 (name and #): Ontario Creek, 170102010501							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	-	-	-	-	-
Barriers	FA	FA	-	-	-	-	-
Pools	FUR	FA	-	-	-	-	-
Sediment	FUR	FA	-	-	-	-	-
Integrated	FUR	FA	-	-	-	-	-

HUC6 (name and #): Hat Creek-Little Blackfoot River, 170102010507							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA	-	-	-	-	-
Barriers	FA	FA	-	-	-	-	-
Pools	FUR	FA	-	-	-	-	-
Sediment	FUR	FA	-	-	-	-	-
Integrated	FUR	FA	-	-	-	-	-

Blackfoot Core Area

Local Population: Landers Fork (including Copper Creek)

HUC6 (name and #); (Copper Creek – 170102030103)							
Strategy (Active Restoration, Passive Restoration, Conserve): mostly Conserve							
% Forest Service Ownership in HUC: 97%							
Functional Significance to Local Population: High, spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA		-	-	-	-
Barriers	FUR	FA		-	-	-	-
Pools	FAR	FA		-	-	-	-
Sediment	FAR	FAR		-	-	-	-
Integrated	FUR	FA	-	-	-	-	-

Temperature: GIS rating – FAR. Extensive field sampling indicates the rating should be FA rather than FAR. Temperatures are near optimum for bull trout in Copper Creek. Average temperature for July or August was found to be less than 51 F (Pierce, Podner and McFee 2002)while in other years it has been found to average as low as 46 and 48 F (Pierce and Schmetterling 1999, Pierce, Peters and Swanberg 1997).

Barriers: GIS rating - FUR. Barrier rating should be FAR rather than FUR as currently assigned. All barriers have been removed in the drainage with the exception of a partial barrier on Snowbank Creek and a culvert barrier on Cotter Creek which only has an estimated 400 feet of useable habitat upstream of the culvert. The culvert on Snowbank Creek already passes numerous fluvial bull trout based on redd counts upstream of the culvert in 2008 and 2010. As of 2010 Red Creek up to the barrier falls and Cotter Creek up to the barrier culvert have not been evaluated for use by spawning bull trout.

Pools: GIS rating - FAR. Pools following the fire in 2003 have increased dramatically due to recruitment of fire killed trees. The rating for this parameter should now be FA as number of pools per mile is in excess of 60 based on walk through survey during redd counts conducted every year since the fire in 2003.

Sediment: GIS rating - FUR. Sediment should be rated as FAR rather than FUR. The sediment levels in spawning gravels are not substantially elevated in Copper Creek based on McNeil core samples collected between 1986 and 2003 where average sediment levels varied between 24% and 34%. Average sediment levels are only slightly elevated over what is found in relatively unmanaged streams of similar geology (28-30% on the average).

Most important activities to improve bull trout populations:
Top priorities for this HUC include removing the remaining culvert (partial barrier) on Snowbank Creek or replacing it with a structure that provides unimpeded passage. Additionally, continue with road improvements and maintenance on FS Road 330 to decrease sediment delivery from roads. There is one important sediment contributing location on FS Road #330 that needs to be relocated. Also obliterate

other sediment contributing roads in the drainage after travel planning has been completed and roads available to be closed are identified. Note: Following the 2003 Snow Talon Fire a culvert providing for 100 year flow events was installed on Cotter Creek with the intent of installing a bolt in baffle system for upstream spawning fish passage once the system stabilized. The bolt in baffle system has not yet been installed. The decision at the time was that it was not worth installing a bridge as there is an estimated 400 to 500 feet of habitat upstream until a natural barrier is encountered. Additional discussion with MDFWP should be undertaken to determine if the above rationale is still acceptable or whether complete passage (such as provided with a bridge) should be provided at the site. Some additional survey work should be accomplished to determine if there is any use by spawning bull trout of Red Creek (up to the barrier falls) or Cotter Creek (up to the barrier culvert).

HUC6 (name and #): Lower Landers Fork - 170102030104							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive on Forest – Active management below the Forest on private lands							
% Forest Service Ownership in HUC: 36%							
Functional Significance to Local Pop: Currently low significance due to the strength of the population in Copper Creek and limited amount of use believed to occur in Landers Fork based on relative abundance of bull trout found to be using Landers Fork.							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	-	-	-	-	-
Barriers	FA	FA	-	-	-	-	-
Pools	FAR	FUR	-	-	-	-	-
Sediment	FA	FA	-	-	-	-	-
Integrated	FA	FA	-	-	-	-	-

Temperature: GIS rating – FA. This rating seems appropriate given findings from MDFWP that average monthly temperatures for July and August are less than 52 F. Hillman and Chapman (1996) also had similar findings in 1996.

Barriers: GIS rating – FA. There are no man caused barriers on Landers Fork. Natural barriers exist at Silver King Falls and in some years summer flows can be limiting due to the flow going subsurface downstream of the confluence of Copper Creek

Pools: GIS rating – FA. This is not accurate on Landers Fork (private land and the only portion of the HUC supporting bull trout). Pool structure in Landers Fork below Silver King Falls has been reduced by flood events and stream channelization as assessed by MDFWP (Pierce et al. 2002) and some cursory walk through surveys by Forest Service fishery personnel. The rating should be FUR.

Sediment: GIS rating – FA. Limited McNeil core data from below Silver King Falls had fine sediment levels averaging in the upper 20s which supports the FA call given that unmanaged streams on the Helena Forest have sediment levels averaging between 28 to 30%.

Most important activities to improve bull trout populations:

For Landers Fork the primary opportunity for habitat improvement to benefit bull trout is associated with improved stream channel morphology on nonfederal lands as has been suggested by MDFWP (Pierce et al. 2002). Another longer-term improvement would be to improve the bridge crossing where FS Road 330 (county jurisdiction) crosses Landers Fork with the intent to reduce risk for large contributions of sediment should the bridge washout or the stream reroute itself around the bridge. This bridge span is too narrow for the floodplain width and encroaches on the stream channel to the degree that substantial bedload deposition is occurring upstream. The bedload deposition appears to be leading toward channel migration which could eventually lead to new channel formation and large contributions of sediment downstream at some point in the future. One additional consideration would be to expand bull trout distribution by introducing them above Silver King Falls. There should be reasonable chance for success in establishing a resident population.

Other Remnant Populations

HUC6 (name and #): Poorman Creek-170102030302							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 92%							
Functional Significance to Local Population: Moderate, is not part of the Landers/Copper Local Population but is bull trout critical habitat and likely contributes fish to the core population.							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FAR	-	-	-	-	-
Barriers	FUR	FA	-	-	-	-	-
Pools	FAR	FAR	-	-	-	-	-
Sediment	FUR	FAR	-	-	-	-	-
Integrated	FUR	FAR	-	-	-	-	-

Barriers: GIS rating – FUR. This is an accurate assessment as there are still several barriers and partial barriers to fish movements on both federal and nonfederal lands.

Pools: GIS rating – FUR. This is accurate with numerous reaches of the stream, both federal and nonfederal lands, having been placer mined with low levels of quality pools. Partial walk through surveys by Forest Service fishery personnel in the mid-1990s found substantial reaches negatively affected by channelization and mining.

Sediment: GIS rating **-** FUR. GIS assessment is believed to be an overestimate based on fine sediment (less than 6.4 mm diameter) found in McNeil core samples from spawning gravels. Fine sediment level averages have varied between 24 and 39% between 1985 and 2006 with an overall average from all years of 33.1%. A call of FAR is probably more appropriate based on all information currently available.

HUC6 (name and #): Blackfoot River - Lincoln- 170102030308							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 20%							
Functional Significance to Local Population:							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FAR	-	-	-	-	-
Barriers	FA	FA	-	-	-	-	-
Pools	FUR	FAR	-	-	-	-	-
Sediment	FUR	FAR	-	-	-	-	-
Integrated	FUR	FAR	-	-	-	-	-

HUC6 (name and #) Arrastra Creek - 170102030309							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 58%							
Functional Significance to Local Population: Low Is not part of the Landers/Copper Local Population but is considered a bull trout Emphasis Watershed.							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	-	-	-	-	-
Barriers	FAR	FA	-	-	-	-	-
Pools	FA	FA	-	-	-	-	-
Sediment	FAR	FAR	-	-	-	-	-
Integrated	FAR	FAR	-	-	-	-	-

Temperature: GIS rating – FAR. Temperature data from Pierce et al 2002 found average August temperatures of 52.3 F in the lower part of the drainage which falls in the FA range.

Barrier: GIS rating – FAR. This is an accurate assessment on Forest as the only manmade barrier present that affects bull trout distribution is the culvert barrier on the North Fork of Arrastra Creek. The North Fork appears to be used only by native trout, but bull trout have been observed at the confluence of the North Fork with the main stem of Arrastra Creek. There is another culvert which is a complete barrier to bull trout on Arrastra Creek where FS Road 4106 crosses, but there is a natural barrier within 150 feet upstream of the culvert barrier. Discussions with Lolo Forest fishery personnel indicate that there is an additional culvert barrier on non-federal lands below the Forest that would be beneficial to remove.

Pools: GIS rating of FAR is accurate overall, but pools on FS lands are abundant (FA as measured by RI/R4 Forest Service survey methods in the early 1990s) while below the Forest pools are very limited

(FUR) on over one mile of stream. There are good opportunities for partnership efforts on nonfederal lands.

Sediment: GIS rating – FAR. This rating is borderline FA. Average fine sediment levels from McNeil core samples varied on a yearly basis from 22.4% to 33.3 % values for years from 1988 to 2005. Average levels for mostly unmanaged streams on the Helena Forest had average sediment levels in the 28-30% range.
The Arrastra drainage is in good condition within the Forest. There is a natural barrier just upstream of a culvert barrier on Arrastra Creek where FS Road #4106 crosses the stream. This presents the potential to attempt to establish a resident bull trout population in the currently fishless section upstream from a natural barrier above the road crossing of FS Road #4106. Additionally, there is a culvert barrier on the North Fork of Arrastra Creek. It is unknown if bull trout will benefit from removal of this barrier. The primary benefit to bull trout in this HUC could be derived from nonnative fish control in the lower reaches below the Forest, correcting any flow issues that may be present due to irrigation, removing a potential culvert barrier on nonfederal lands, improving pool conditions on non-federal lands, and adjusting grazing practices on both BLM and nonfederal lands.

Confidence in your assessment (H, M, L): H

HUC6 (name and #) Blackfoot River-Little Moose Creek - 170102030310							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 58%							
Functional Significance to Local Population: Low Is not part of the Landers/Copper Local Population but is considered a bull trout Emphasis Watershed.							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA	-	-	-	-	-
Barriers	FA	FA	-	-	-	-	-
Pools	FUR	FA	-	-	-	-	-
Sediment	FAR	FAR	-	-	-	-	-
Integrated	FUR	FAR	-	-	-	-	-

HUC6 (name and #) Hogum Creek - 170102030205							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 90%							
Functional Significance to Local Population: Low, Is not part of the Landers/Copper Local Population but is considered a bull trout Emphasis Watershed and likely provides some limited contribution of bull trout to the Blackfoot core population							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FAR	-	-	-	-	-
Barriers	FAR	FA	-		-	-	-
Pools	FUR	FAR	-	-	-	-	-
Sediment	FUR	FAR	-	-	-	-	-
Integrated		FAR		-	-	-	-

Temperature: GIS rating – FA. No data to discount GIS call.

Barrier: GIS rating – FAR. The existing culvert on Hogum Creek within the Forest is not a barrier to fish movements based on site specific field evaluations and documented in the Regional database.

There is one barrier present in the drainage at the culvert crossing on Black Diamond Creek. Because it is unlikely that bull trout use Black Diamond Creek (it is a very small stream and no bull trout have been found in it to date), the FAR rating is appropriate.

Pools: GIS rating - FAR. This rating underestimated the number of pools. Field evaluations by Forest Service fishery personnel have found the number of pools at 126 to 149 per mile. With this level of pool habitat the baseline rating for pools should be FA.

Sediment: GIS rating – FUR. The FUR GIS assessment is an overestimate of sedimentation. A baseline call of FAR is more appropriate. Substrate core samples from McNeil Core samples found somewhat elevated levels of fine sediment (average of 33%) in stream gravels. The average on the HNF for mostly unmanaged streams is 28 to 30%). The Helena Forest considers one standard deviation over the average to be of concern but not excessive. The 33% level falls within one standard deviation.

In general Hogum Creek has good habitat and has been found to support very low numbers of bull trout in the lower reaches (mostly below the Forest) with the limited sampling conducted. Bull trout would benefit from some nonnative fish control (removal of brook trout) in the lower reaches where bull trout are most likely to be found. Some sediment control at culvert crossings would be of some benefit, but as mentioned above sediment levels are not excessive. Some additional efforts to determine if there is any use of the drainage for spawning by fluvial bull trout are needed.

Confidence in your assessment (H,M,L): H

HUC6 (name and #) Lower Alice Creek - 170102030204							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive for habitat							
% Forest Service Ownership in HUC: 60%							
Functional Significance to Local Pop: Low, Is not part of the Landers/Copper Local Population but is considered a bull trout Emphasis Watershed							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FAR	-	-	-	-	-
Barriers	FA	FA	-	-	-	-	-
Pools	FUR	FAR	-	-	-	-	-
Sediment	FUR	FAR	-	-	-	-	-
Integrated	FUR	FAR	-	-	-	-	-

Temperature: GIS rating – FAR. Sampling on Forest by MDFWP shows water temperatures averaging in the mid to upper 50s in summer on the Forest during July and August. Sampling by the state found maximum summer temperature of 57 F in July and August. Below the forest temperatures are more elevated with summer temperatures ranging from low 50s to 65 Degrees F in some locations. The GIS rating of FAR is appropriate.

Barrier: GIS rating – FA. There are no barriers on the mainstem of Alice Creek. The small tributaries known to support native trout do not have manmade barriers but do go dry at times in the lower reaches, which presents a barrier to fish movements. A culvert barrier on Hardscrabble Creek was removed in 2009. Barrier culverts are believed to be present on Bartlett Creek or former

Plum Creek lands which the Forest Service now owns. Bull trout have not been found to use Bartlett Creek, but a rating of FAR is more appropriate than FA at the present time.

Pools: GIS rating – FAR. Field evaluations indicate that loss of beaver in some reaches has affected pools. State habitat evaluations suggested that habitat was in relatively good condition. Not enough information to suggest changing rating to FA.

Sediment: GIS rating – FA. The FA GIS assessment is not accurate. Substrate core samples from McNeil Core samples found levels of fine sediment averaging 33% in stream gravels in 1988 while samples in 2005 fine sediment levels averaged 26%. With levels of fine sediment from core samples in mostly unmanaged drainages found to average between 28-30% the levels in this stream appear to be slightly elevated and a baseline call of FAR is more appropriate

Alice Creek was documented as supporting bull trout on nonfederal reaches at various times over the last 20 years. Bull trout have not been found on federal lands. In 1937 there are anecdotal statements that Dolly Varden were abundant, but location where fish were observed was not specified. Only one instance in recent years has documented bull trout spawning in Alice Creek and that was on nonfederal lands below the forest in 1993. One of the most beneficial steps may be to coordinate with Fish, Wildlife and Parks personnel and consider management that reduces numbers and distribution of non-native trout if it would benefit bull trout recovery in the stream. In addition, riparian areas on private land have been cleared, and re-vegetating these areas would also likely improve conditions for bull trout. Habitat manipulations on Forest are not likely to benefit bull trout in a meaningful way at this point in time with the exception of upgrading crossings on Bartlett Creek.

Confidence in your assessment (H, M, L): M

HUC6 (name and #) Blackfoot River-Hardscrabble Creek - 170102030206							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive for habitat							
% Forest Service Ownership in HUC: 60%							
Functional Significance to Local Pop: Low, Is not part of the Landers/Copper Local Population but is considered a bull trout Emphasis Watershed							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FAR	-	-	-	-	-
Barriers	FA	FA	-	-	-	-	-
Pools	FUR	FAR	-	-	-	-	-
Sediment	FUR	FAR	-	-	-	-	-
Integrated	FUR	FAR	-	-	-	-	-

HUC6 (name and #) Blackfoot River-Anaconda Creek - 170102030202							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive for habitat							
% Forest Service Ownership in HUC: 60%							
Functional Significance to Local Pop: Low, is not part of the Landers/Copper Local Population but is considered a bull trout Emphasis Watershed							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FAR	-	-	-	-	-
Barriers	FA	FA	-	-	-	-	-
Pools	FUR	FAR	-	-	-	-	-
Sediment	FUR	FAR	-	-	-	-	-
Integrated	FUR	FAR		-	-	-	-

HUC6 (name and #) Nevada Creek Headwaters - 170102030401							
Strategy (Active Restoration, Passive Restoration Active							
% Forest Service Ownership in HUC: 71%							
Functional Significance to Local Pop – Low, Is not part of any Local Population but is considered as an “other important bull trout population”							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FAR	-	-	-	-	-
Barriers	FA	FA	-	-	-	-	-
Pools	FAR	FA	-	-	-	-	-
Sediment	FUR	FAR	-	-	-	-	-
Integrated	FUR	FAR	-	-	-	-	-

Temperature: GIS rating – FUR. Field sampling on Forest shows average maximum temperatures in the mid to upper 50s in summer for Nevada Creek on the Forest. Temperatures of 46 degrees F have been found in Gleason Creek while Huckleberry Creek was found to have summer temperatures of 49 degrees F. Temperatures in Nevada Creek upstream of Gleason Creek in July and August by MDFWP were found to average less than 54 F. This suggests a rating of FAR is more appropriate than FUR.

Barriers: GIS rating - FA. A rating of FAR is more appropriate. There remains a partial barrier to fish movements that could affect bull trout (Gleason Creek culvert). Bull Trout have been found in Gleason Creek immediately below the culvert crossing, but not above the culvert. Providing complete fish passage at Gleason Creek could benefit bull trout slightly, but may also provide access for the brook trout population to the detriment of native trout upstream of the culvert crossing.

Pools: GIS rating – FAR. Past mining has resulted in substantial reductions in the number and quality of pools in the reaches below Huckleberry Creek. A number of log structures to improve pool habitat were installed in the 1990s. Numbers of pools per mile have not been quantified and the GIS rating is assumed reasonable.

Sediment: GIS rating - FUR. A FAR rating may be more appropriate especially in consideration of the streams actually used the most by bull trout. Substrate core samples from McNeil Core samples from Nevada Creek in four different years averaged 28, 26, 41, and 32% for an average of about 32%. Huckleberry and Gleason Creeks had fine sediments by depth of 36 and 37% respectively. With the average level of fine sediments from unmanaged drainages found to average between 28 to 30% and fine sediments from managed drainages averaging 30 to 32% for the Helena Forest the levels in the Nevada Creek itself are not projected as FUR. The levels in Huckleberry and Gleason Creek are bordering on what is considered FUR Cool. It may benefit bull trout (if present) in the Nevada Creek headwaters if USFS and MDFWP cooperated to consider management that reduces numbers and distribution of non-native trout if it would benefit bull trout recovery in the reach. It is already too late to prevent hybridism as hybrid bull trout have been documented (through genetic analysis) as present in 2010. Habitat manipulations such as pool improvements on Forest may not benefit bull trout substantially at this point in time and could actually benefit brook trout more than bull trout. The barrier removal on Gleason Creek could benefit bull trout but may benefit brook trout as well. Lastly ensuring livestock grazing within the allotment meets bank disturbance direction as well as ensuring no grazing occurs above the drift fence would provide some level of benefit to bull trout due to lower sediment contribution, as would erosion control on roads within the Huckleberry Creek drainage.

Table 19. A comparison between the existing forest plan and the preferred alternative, alternative F, for lands suitable for timber production, lands unsuitable for timber production where harvest may occur (HCOOUL), and primitive recreation opportunity spectrum (ROS) lands in each 12 digit subwatershed west of the continental divide on the HLC and the percentage it represents of each subwatershed.

Subwatershed 12 digit code	HUC 12 Name	HUC 12 Total Acres	Alt A Suitable Timber Acres	Alt A Suitable Timber Acres (% of Total)	Alt F Suitable Timber Acres	Alt F Suitable Timber Acres (% of Total)	Alt A HCOOUL Acres	Alt A HCOOUL Acres (% of Total)	Alt F HCOOUL Acres	Alt F HCOOUL Acres (% of Total)	Alt A ROS Primitive Acres	Alt A ROS Primitive Acres (% of Total)	Alt F ROS Primitive Acres	Alt F ROS Primitive Acres (% f Total)
170102010501	Ontario Creek	12,800.67	3,375.24	26.4	2,505.23	19.6	7,504.41	58.6	6,889.68	53.8	1,730.10	13.5	3,209.89	25.1
170102010502	Larabee Gulch-Little Blackfoot River	18,162.32	0.00	0.0	0.00	0.0	3,089.43	17.0	3,053.66	16.8	14,911.87	82.1	15,016.34	82.7
170102010503	Telegraph Creek	12,227.32	6,555.16	53.6	5,269.76	43.1	3,622.64	29.6	4,908.03	40.1		0.0		0.0
170102010504	Mike Renig Gulch	7,331.68	1,357.03	18.5	542.00	7.4	1,692.88	23.1	2,507.91	34.2		0.0		0.0
170102010505	Upper Dog Creek	20,365.06	4,850.59	23.8	6,950.47	34.1	6,187.06	30.4	4,070.82	20.0		0.0		0.0
170102010506	Lower Dog Creek	16,625.03	1,550.50	9.3	584.50	3.5	1,518.42	9.1	2,484.41	14.9		0.0		0.0
170102010507	Hat Creek-Little Blackfoot River	13,522.43	2,842.66	21.0	3,383.28	25.0	6,405.20	47.4	5,636.29	41.7		0.0		0.0
170102010601	North Trout Creek	10,529.34	973.37	9.2	1,725.03	16.4	2,327.26	22.1	1,575.59	15.0		0.0		0.0
170102010602	Snowshoe Creek	11,609.20	2,085.84	18.0	1,891.44	16.3	1,463.53	12.6	1,657.93	14.3		0.0		0.0
170102010603	Elliston Creek-Little Blackfoot River	20,188.49	3,382.52	16.8	2,652.68	13.1	1,419.90	7.0	2,149.74	10.6		0.0		0.0
170102010604	Carpenter Creek	16,815.37	2,568.71	15.3	738.02	4.4	3,134.46	18.6	4,525.82	26.9		0.0	439.32	2.6
170102010605	Trout Creek	11,005.89	1,699.76	15.4	1,954.74	17.8	1,292.18	11.7	1,037.19	9.4		0.0		0.0
170102010606	South Fork Spotted Dog Creek	8,313.72	126.00	1.5	0.00	0.0	97.15	1.2	223.15	2.7		0.0		0.0
170102010607	Upper Spotted Dog Creek	8,709.24	1,940.35	22.3	1,757.74	20.2	3,112.90	35.7	3,295.51	37.8		0.0		0.0
170102010609	Sixmile Creek	19,100.19	0.00	0.0	0.00	0.0	319.63	1.7		0.0		0.0	319.63	1.7
170102010610	Threemile Creek	14,309.83	30.53	0.2	0.00	0.0	4,626.06	32.3	669.00	4.7		0.0	3,987.59	27.9
170102010706	Cottonwood Creek	26,468.90	0.00	0.0	0.00	0.0	34.41	0.1	32.96	0.1	6.76	0.0	8.22	0.0
170102010707	Town of Deer Lodge-Clark Fork	43,150.90	0.02	0.0	0.00	0.0	286.51	0.7	286.53	0.7		0.0		0.0
Upper Clark Fork (Little Blackfoot) Subtotal		**291,235.57**	**33,338.28**	**11.4**	**29,954.90**	**10.3**	**48,134.00**	**16.5**	**45,004.23**	**15.5**	**16,648.74**	**5.7**	**22,980.98**	**7.9**
170102030101	Upper Landers Fork	18,675.88	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	18,672.14	100.0	18,672.14	100.0

Subwatershed 12 digit code	HUC 12 Name	HUC 12 Total Acres	Alt A Suitable Timber Acres	Alt A Suitable Timber Acres (% of Total)	Alt F Suitable Timber Acres	Alt F Suitable Timber Acres (% of Total)	Alt A HCOOUL Acres	Alt A HCOOUL Acres (% of Total)	Alt F HCOOUL Acres	Alt F HCOOUL Acres (% of Total)	Alt A ROS Primitive Acres	Alt A ROS Primitive Acres (% of Total)	Alt F ROS Primitive Acres	Alt F ROS Primitive Acres (% f Total)
170102030102	Middle Landers Fork	23,776.29	0.00	0.0	0.00	0.0	4,953.36	20.8	0.00	0.0	18,821.56	79.2	23,776.29	100.0
170102030103	Copper Creek	26,005.34	4,258.00	16.4	718.88	2.8	14,208.08	54.6	15,124.70	58.2	6,711.59	25.8	7,851.84	30.2
170102030104	Lower Landers Fork	15,662.42	438.03	2.8	127.01	0.8	4,055.48	25.9	1,340.38	8.6	1,062.56	6.8	4,104.28	26.2
170102030201	Sandbar Creek-Willow Creek	12,409.55	1,175.89	9.5	934.97	7.5	7,317.91	59.0	7,558.83	60.9		0.0		0.0
170102030202	Anaconda Creek-Blackfoot River	17,153.78	635.20	3.7	3,339.70	19.5	12,845.20	74.9	10,140.70	59.1		0.0		0.0
170102030203	Upper Alice Creek	12,560.65	0.00	0.0	20.55	0.2	11,499.68	91.6	5,072.20	40.4	0.44	0.0	10,273.23	81.8
170102030204	Lower Alice Creek	11,697.28	0.00	0.0	1,111.50	9.5	7,435.03	63.6	3,602.56	30.8		0.0	2,723.26	23.3
170102030205	Hogum Creek	7,630.31	2,095.60	27.5	1,390.62	18.2	4,752.61	62.3	5,457.59	71.5		0.0		0.0
170102030206	Hardscrabble Creek-Blackfoot River	12,474.00	206.90	1.7	74.45	0.6	3,140.44	25.2	3,272.88	26.2		0.0		0.0
170102030301	Humbug Creek	11,399.09	1,139.13	10.0	1,134.74	10.0	4,196.47	36.8	4,200.86	36.9		0.0		0.0
170102030302	Poorman Creek	25,783.12	4,402.33	17.1	5,412.30	21.0	19,005.99	73.7	17,979.55	69.7	218.73	0.8	235.20	0.9
170102030303	Beaver Creek	11,616.67	2,273.02	19.6	2,112.36	18.2	6,582.80	56.7	6,743.46	58.0		0.0	1,917.52	16.5
170102030304	Keep Cool Creek	22,834.06	2,587.65	11.3	2,418.54	10.6	10,848.19	47.5	11,017.30	48.2		0.0		0.0
170102030305	Lincoln Gulch	7,551.60	2,708.19	35.9	1,601.82	21.2	2,902.57	38.4	4,008.95	53.1		0.0		0.0
170102030306	Willow Creek	12,097.82	2,738.71	22.6	2,720.98	22.5	3,139.76	26.0	3,157.49	26.1		0.0		0.0
170102030307	Sauerkraut Creek	8,523.56	966.86	11.3	748.24	8.8	3,969.72	46.6	4,188.35	49.1		0.0		0.0
170102030308	Town of Lincoln-Blackfoot River	15,450.91	147.14	1.0	162.49	1.1	2,955.71	19.1	2,940.36	19.0		0.0		0.0
170102030309	Arrastra Creek	15,084.31	1,043.81	6.9	671.17	4.4	7,617.88	50.5	7,990.58	53.0	6.12	0.0	3,388.23	22.5
170102030310	Moose Creek-Blackfoot River	20,035.79	1,340.78	6.7	1,681.86	8.4	7,643.96	38.2	7,302.87	36.4		0.0		0.0
170102030401	Headwaters Nevada Creek	25,255.03	1,187.05	4.7	468.26	1.9	16,650.21	65.9	1,991.15	7.9		0.0	15,377.84	60.9
170102030403	Washington Creek	8,013.40	0.00	0.0	0.00	0.0	4,945.10	61.7	3,413.51	42.6		0.0	1,531.59	19.1
170102030404	Jefferson Creek	6,799.02	609.47	9.0	1,051.29	15.5	2,052.85	30.2	1,611.03	23.7		0.0		0.0
170102030405	Buffalo Gulch	9,159.95	3,260.33	35.6	2,312.39	25.2	1,581.03	17.3	2,528.96	27.6		0.0		0.0
170102030407	Middle Nevada Creek	18,047.27	1,762.50	9.8	1,556.86	8.6	2,350.81	13.0	2,556.45	14.2		0.0		0.0

Subwatershed 12 digit code	HUC 12 Name	HUC 12 Total Acres	Alt A Suitable Timber Acres	Alt A Suitable Timber Acres (% of Total)	Alt F Suitable Timber Acres	Alt F Suitable Timber Acres (% of Total)	Alt A HCOOUL Acres	Alt A HCOOUL Acres (% of Total)	Alt F HCOOUL Acres	Alt F HCOOUL Acres (% of Total)	Alt A ROS Primitive Acres	Alt A ROS Primitive Acres (% of Total)	Alt F ROS Primitive Acres	Alt F ROS Primitive Acres (% f Total)
170102030415	Lower Nevada Creek	31,369.75	1,909.65	6.1	2,029.71	6.5	2,463.68	7.9	2,343.62	7.5		0.0		0.0
170102030601	Meadow Creek	11,876.98	0.00	0.0	0.00	0.0	29.37	0.2	29.60	0.2	11,846.80	99.7	11,874.48	100.0
170102030602	Mineral Creek	9,491.73	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	9,482.85	99.9	9,482.85	99.9
170102030603	East Fork North Fork Blackfoot River	20,685.00	0.00	0.0	0.00	0.0	0.22	0.0	0.23	0.0	19,734.58	95.4	19,734.58	95.4
170102030702	North Fork Blackfoot River-Jakey Creek	10,441.21	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	1.05	0.0	1.05	0.0
170102030703	Rock Creek	25,412.45	839.85	3.3	765.51	3.0	2,790.53	11.0	2,864.90	11.3	37.87	0.1	1,836.04	7.2
170102030704	Ward Creek	8,094.07	187.85	2.3	2.84	0.0	2,132.33	26.3	2,317.34	28.6		0.0		0.0
Blackfoot River Subtotal		**493,068.31**	**37,913.92**	**7.7**	**34,569.03**	**7.0**	**174,066.98**	**35.3**	**140,756.43**	**28.5**	**86,596.28**	**17.6**	**132,780.41**	**26.9**
GRAND TOTAL		**784,303.88**	**71,252.20**	**9.1**	**64,523.93**	**8.2**	**222,200.98**	**28.3**	**185,760.65**	**23.7**	**103,245.02**	**13.2**	**155,761.39**	**19.9**

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