ENDANGERED SPECIES ACT SECTION 7 CONSULTATION

BIOLOGICAL OPINION

on the
Revised Forest Plan for the
Flathead National Forest

TAILS Number: 06E11000-2016-F-0370 FS

Agency:

U.S. Forest Service
Flathead National Forest
Kalispell, Montana

Consultation Conducted by:

U.S. Fish and Wildlife Service
Montana Ecological Services Office
Kalispell, Montana

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Chapter I. Introduction

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A. INTRODUCTION

The U.S. Fish and Wildlife Service (Service) has prepared this biological opinion on the effects of the USDA Forest Service (USFS) revised Land and Resource Management Plan (Revised Forest Plan or Revised Plan) for the Flathead National Forest (FNF) on the listed species identified (Table I-1), in accordance with the Endangered Species Act, as amended (ESA), (16 U.S.C. 1531 et seq.). For ease of discussion throughout this document, the Flathead National Forest will be referred to as the FNF or the Forest when referencing the single administrative unit, the staff that administers the unit, or the National Forest System (NFS) lands within the unit.

The USFS submitted an aquatic and terrestrial Biological Assessment (BA) documenting that the Revised Forest Plan is likely to adversely affect three listed species: grizzly bear (*Ursus arctos horribilis*), Canada lynx (*Lynx canadensis*) and bull trout (*Salvelinus confluentus*), as well as designated critical habitat for Canada lynx and bull trout. Further, the BA determined that the Revised Forest Plan is not likely to adversely affect water howelia (*Howellia aquatilis*) and will have no effect on Spalding's Campion (*Silene spaldingii*). The BA also determined that the Revised Plan may affect, but is not likely to jeopardize wolverine (*Gulo gulo luscus*). The Final BA and letter requesting formal consultation under section 7 of the Endangered Species Act (ESA) was received by the Service on March 17, 2017. As described in this biological opinion, and based on the BA and other information collected during the consultation process, the Service has concluded that the Revised Forest Plan, as proposed, is not likely to jeopardize the continued existence of grizzly bears, Canada lynx, and bull trout, or adversely modify designated critical habitat of Canada lynx and bull trout.

This biological opinion does not provide an analysis for effects of specific actions. Rather, the effects analysis is a broad-scale examination of the types of projects and activities conducted under the Revised Forest Plan that could potentially occur in listed species habitat and result in effects on listed species. This broad-scale analysis will then be used to determine the potential for the Revised Plan direction to jeopardize the affected populations of listed species.

The FNF retains its responsibility under the ESA to consult on future projects (conducted under the Revised Forest Plan) that may affect listed species regardless of the project's consistency with the proposed action considered in this biological opinion. Future projects and their potential to adversely affect a listed species, or critical habitat, will be analyzed at the project level and a separate jeopardy/adverse modification determination will be made at that time.

This biological opinion is based on information provided in the FNF's BA (USFS 2017) for the proposed action, the draft Revised Plan (USFS 2016a) and related draft Environmental Impact Statement (EIS) (USFS 2016), personal communications with researchers and experts, and scientific literature, unpublished reports, field investigations, and other sources of information cited herein.

Table I-1. Federally designated species on the Flathead National Forest.

Common Name	Scientific Name	ESA Status	Designated Critical Habitat?
Grizzly bear	*Ursus arctos horribilis*	Threatened	No
Canada lynx	*Lynx canadensis*	Threatened	Yes, (79 FR 54782, Sept. 12, 2014)
Bull trout	*Salvelinus confluentus*	Threatened	Yes, (75 FR 63898, Oct. 18, 2010)
Spalding's champion (or "catchfly")	*Silene spaldingii*	Threatened	No
Water howellia	*Howellia aquatils*	Threatened	No
Wolverine	*Gulo gulo luscus*	Proposed	N/A
Meltwater lednian stonefly	*Lednia tumana*	Candidate	N/A
Whitebark pine	*Pinus albicaulis*	Candidate	N/A

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.
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.
Candidate - A species for which the Service has sufficient information on the biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing is precluded by other higher priority activities.
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.

B. CONSULTATION HISTORY

The history of ESA section 7 consultation on the proposed action is summarized chronologically in Table I-2. A complete record of this consultation is on file at the Service's Montana Ecological Services Office in Helena, Montana. The consultation summary below includes meetings between the FNF and Service, but some events were attended by other agencies as well. FNF-specific communications between individual FNF staff and the Service are also indicated in the table. For the purposes of the consultation process, separate BAs were prepared for terrestrial and aquatic species then combined prior to submission to the Service.

Table I-2. Summary of the consultation between the Flathead National Forest (FNF) and the USFWS Montana Ecological Services Office (Service) on its Revised Plan.

Date	Event
June 3, 2016	NOI published in Federal Register for revised Flathead National Forest plan alternatives and DEIS; alternatives and DEIS for amendment of Kootenai, Helena, Lewis and Clark, and Lolo Forest Plans to incorporate habitat management direction for the NCDE grizzly bear population.
June 20, 2016	Meeting with FNF wildlife biologists (R. Kuennen and N. Warren), fisheries biologist (P. Van Eimeren), silviculturist (H Trechsel), planning team leaders (J. Kruger and R. Carlin), and the Service consultation team (B. Conard, K. Dixon, and K. Aceituno was held to discuss consultation strategy, timelines, roles, and responsibilities.
August 2, 2016	An ESA Section 7 Consultation Agreement was finalized. The document outlined proposed timelines, agency tasks, and staffing assignments.
September 23, 2016	FNF sends draft BAs to the Service including: • A broad description of the action 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, • Environmental baseline for each threatened or endangered species and critical habitat.
November 30, 2016	FNF wildlife biologists meet with the Service's consultation team to discuss draft BA sections on grizzly bear and Canada lynx, and to discuss the development of a preferred alternative for the final Revised Plan.
December 8, 2016	FNF wildlife and fisheries biologists meet with the Service's consultation team to discuss draft BA sections pertaining to bull trout, Canada lynx, critical habitats, water howelia, and proposed (wolverine) and candidate species (meltwater lednian stonefly and whitebark pine).
January 10, 2017	FNF fisheries biologist, planning team lead and Service fish and wildlife biologist meet to discuss aquatic components of the Revised Plan.
January 25, 2017	The Service and the FNF meet to discuss proposed actions and their effects; sections on grizzly bear, Canada lynx, critical habitats, proposed and candidate species. The FNF informs the Service that they will be submitting draft BA sections in mid-February due to need for USFS regional office review.
February 21, 2017	In response to comments on prior drafts, the FNF submits another draft BA to the Service for review.
March 6, 2017	A conference call was conducted between the FNF and the Service. During

Date	Event
	the call the FNF updated the Service on new timelines for formal consultation. FNF agrees to submit final BA to the Service by mid-March, 2017. The Service agrees to discuss draft terms and conditions, conservation measures and reporting requirements in April, 2017. The Service expresses their concern that they may need 90 days (until mid-June) to complete consultation on Flathead BA due to ongoing litigation, regional USFS priorities and additional complexities with the FNF's BA.
March 17, 2017	The FNF submits the Biological Assessment for Threatened, Endangered, and Proposed Species: Revised Land and Resource Management Plan for the Flathead National Forest, and officially requests initiation of formal section 7 consultation.
March 17, 2017	The statutory 135-day formal consultation timeline begins{50 CFR 402.14 (e-g)}
June 12, 2017	The FNF submits an updated Biological Assessment to the Service. The updated Biological Assessment included newly calculated Canada lynx critical habitat acreage on the Flathead National Forest, as well as updated language that would limit the spatial extent of an individual project to three adjacent grizzly bear subunits on the Flathead National Forest.
June 19, 2017	The Service and USFS meet to discuss grizzly bear topics associated with the FNF Revised Forest Plan consultation and the NCDE Conservations Strategy Amendments consultation. The meeting was attended by the Service's consultation team and Grizzly Bear Recovery Program leaders, as well as the USFS wildlife biologists and planning team.
July 5, 2017	FNF fisheries biologist submits a revised culvert monitoring plan to the Service. The submission includes correspondence that indicates the FNF will include the culvert monitoring plan as part of the "proposed action" under the Revised Forest Plan consultation.
July 26, 2017	The Service and FNF meet to discuss consultation progress and changes that will need to be made to the Biological Assessment submitted on June 12, 2017. Changes pertained to increased day-use sites allowed by the Revised Forest Plan, and how these increases will include measures to reduce the risk of grizzly bear-human conflicts.
September 8, 2017	A meeting is held between the Service and FNF wildlife biologists and planning team members. The meeting was proposed to outline minor changes in the Biological Assessment and to discuss consultation timelines.
September 19, 2017	The FNF submits an updated Biological Assessment to the Service that includes updated calculations of Canada lynx critical habitat on the Flathead National Forest, and acreages that will be designated as certain "Management Areas" under the Revised Forest Plan.
September 20, 2017	The Service submits drafts of the Introductory and Bull Trout Chapters, and Appendices 1-5 of the BO to the FNF for inter-agency review.
September 28, 2017	The Service submits a draft of Grizzly Bear Chapter of the BO to the FNF for inter-agency review.

Date	Event
October 4, 2017	A meeting is held between the Service and FNF to address comments from inter-agency review of the draft BO.
October 12, 2017	The Service submits a draft of Canada Lynx Chapter of the BO to the FNF for inter-agency review.
October 23, 2017	The FNF and the Service meet to discuss inter-agency review comments on the Canada Lynx Chapter of the BO.

C. ORGANIZATION OF THIS BIOLOGICAL OPINION

This biological opinion includes four chapters. This is the introductory chapter, Chapter I. Chapter I of the biological opinion provides a description of the proposed action. This section describes the project area, the species in the project area, and an overview of the proposed Revised Forest Plan. The biological opinion for bull trout and bull trout critical habitat is contained in Chapter II, the biological opinion for grizzly bear is contained in Chapter III, and the biological opinion for Canada lynx and Canada lynx critical habitat is contained in Chapter IV. This biological opinion also contains appendices that include supporting material cited throughout the various chapters. The species-specific chapters (i.e., Chapters II, III, IV) provide additional descriptions of the proposed action relative to measures contained in the Revised Forest Plan to address the conservation needs of the species. Each species-specific chapter will contain its own literature cited section.

D. DESCRIPTION OF THE PROPOSED ACTION

This section describes the project area, provides background on the development of the Revised Forest Plan, describes implementation of the plan and summarizes the key elements of the Revised Plan providing forest-wide, management area, and geographic area direction on forest management.

1. Description of the Project Area

The FNF is located in the northern Rocky Mountains of Western Montana (Figure 1, USFS 2017) and is encircled by the Kootenai, Helena-Lewis and Clark, and Lolo National Forests; Glacier National Park; and Canada. The FNF administers approximately 2.4 million acres of public land in portions of Flathead, Lake, Lewis and Clark, Lincoln, Missoula, and Powell counties. The FNF Supervisor's office is located in Kalispell, Montana, and the FNF is split among five ranger districts: Swan Lake, Hungry Horse, Glacier View, Tally Lake and Spotted Bear. The FNF includes large designated wilderness areas, such as the Bob Marshall Wilderness Complex and the Mission Mountains Wilderness, in concert with other special areas such as wild and scenic river systems, the Jewel Basin Hiking Area, other undeveloped backcountry areas, lands managed for production of timber, and lands interspersed with private development provide habitat for diverse plant and animal species. Under the proposed action, the analysis area for an individual species may be larger area than the Flathead National Forest, as described in the individual species sections.

2. Species in the Project Area

As described in the Introduction, five listed species can be found within the project area: grizzly bear, Canada lynx (lynx), bull trout, Spalding's campion and water howelia. Additionally, one proposed species (wolverine) and two candidate species (meltwater lednian stonefly and whitebark pine) can also be found in the project area (Table I-3)

Table I-3. Federally designated species on the Flathead National Forest.

Common Name	Scientific Name	Status[1]	Range – Montana
Bull Trout	*Salvelinus confluentus*	Threatened; Critical Habitat	Clark Fork, Flathead, Kootenai, St Mary, and Belly river basins; cold water rivers and lakes
Grizzly Bear	*Ursus arctos horribilis*	Threatened	Resident and transient; Alpine/subalpine coniferous forest
Canada Lynx	*Lynx canadensis*	Threatened; Critical Habitat	Resident; western Montana – montane spruce/fir forests
Spalding's Campion (or "catchfly")	*Silene spaldingii*	Threatened	Upper Flathead River Fisher River drainages; Tobacco Valley – open grasslands with rough fescue or bluebunch wheatgrass
Water Howellia	*Howellia aquatilis*	Threatened	Wetlands; Swan Valley, Lake, and Missoula Counties
Wolverine	*Gulo 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
Meltwater Lednian Stonefly	*Lednia tumana*	Candidate	High-elevation meltwater glacial areas; Glacier National Park
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.

The FNF supports 12 bull trout core areas. Three of these core areas are considered "complex" core areas as defined in the bull trout Recovery Plan (USFWS 2015). The remaining core areas are considered "simple" core areas, and all are within of the Columbia River Headwaters Recovery Unit. A core area is the closest approximation of a biologically functioning unit for bull trout, meaning it has both the habitat that could supply all elements for the long-term security of bull trout and a group of one or more local bull trout populations. The FNF also contains designated critical habitat for bull trout in each of the core areas.

The FNF is within the grizzly bear North Continental Divide Ecosystem (NCDE). Over 2.1 million acres of the FNF is included in the NCDE recovery zone/primary conservation area (PCA). This is approximately 37% of the total area of the PCA.

The project area also lies within the Northern Rocky Mountain Region of the United States distinct population segment of Canada lynx. There are 109 lynx analysis units (LAUs) on the FNF totaling nearly 2.4 million acres. The FNF also lies within lynx critical habitat Unit 3.

Two species of listed plant species are found on, or near the FNF. Spaulding's catchfly occurs in close proximity to the FNF, with the closes known population occurring three miles from forest lands. Water howelia is an aquatic plant found in wetlands of the Swan Lake ranger district. There are 304 global occurrences of water howelia, with 220 occurring in Montana's Swan Valley. Of these 220, 177 occur wholly or partially on lands administered by the FNF.

3. Description of the Proposed Action

The FNF is proposing to revise its Land and Resource Management Plan (Forest Plan) based on legal requirements, changed conditions, and topics identified in the Assessment of the Flathead National Forest. Revision is needed because the 1986 Forest Plan is beyond the 10- to 15-year duration provided by the National Forest Management Act (16 U.S.C. 1606(e)(5)(A)). Like the 1986 plan, the Revised Forest Plan provides forest-wide management direction, and describes desired conditions, objectives, guidelines, standards, and suitability meant to aid in the implementation of future land management decisions. The purpose of the Revised Forest Plan is to provide for social, economic and ecological sustainability, and to allow multiple uses of the land and resources managed by the Flathead National Forest (USFS 2016a). . Additionally, the Revised Forest Plan contributes to the social and economic well-being of local communities by promoting sustainable use of renewable natural resources.

Purpose of the Proposed Action

The purpose of the Revised Forest Plan is to provide land management direction for the FNF by guiding programs, practices, uses and projects. The Revised Plan provides guidance for project and activity decision-making on the FNF for the next 15 years. This guidance includes:

- 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 Forest Service 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).

- 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)).

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

- Identification or recommendation (if any) of other designated areas (36 CFR 219.7 (c)(2)(vii).
- 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).
- Identification of the maximum quantity of timber that may be removed from the plan area (36 CFR 219.7 and 219.11 (d)(6)).
- Identification of geographic area- or management area-specific plan components (36 CFR 219.7 (c)(3)(d).
- Identification of watersheds that are a priority for maintenance or restoration (36 CFR 219.7 (c)(3)(e)(3)(f).
- Plan monitoring program (36 CFR 219.7 (c)(2)(x) and 219.12.

The Revised Forest Plan would guide natural resource management activities on the FNF and address changed conditions and direction that have occurred since the 1986 Forest Plan was prepared and amended while meeting the objectives of federal law, regulation, and policy. It is important to note that the revised forest plan does not authorize site-specific prohibitions or activities; rather, it establishes broad direction, similar to zoning in a community. Project or activity decisions will be made following appropriate procedures and site/project-specific analyses would still need to be conducted in assess compliance with federal regulations (e.g., ESA, NEPA).

In addition to updating the 1986 Forest Plan, there is a need to incorporate habitat related direction from the Northern Continental Divide Ecosystem Grizzly Bear Conservation Strategy into the Flathead National Forest's plan so that the USFS will be able to demonstrate to the Service that adequate regulatory mechanisms exist to support a delisted NCDE grizzly bear population. In 2013, the Service announced the availability of a draft Grizzly Bear Conservation Strategy (GBCS) for the NCDE grizzly bear population for public review and input (USFWS 2013). The NCDE GBCS contains habitat-related management direction that pertains to the portions of national forests that are within the NCDE, including the Flathead, Kootenai, Helena-Lewis and Clark, and Lolo National Forests. Habitat conditions and management on the Flathead, Kootenai, Helena-Lewis and Clark, and Lolo National Forests have contributed importantly to the increased population size and improved status of the grizzly bear across the NCDE. Supporting the continued recovery of the grizzly bear population will depend on continued, effective management of the NCDE grizzly bear's habitat. The USFS will implement direction related to habitat management on lands in the NCDE to contribute to sustaining recovery of the grizzly bear population. When finalized, the GBCS would become the post-delisting management plan for the NCDE grizzly bears and their habitat.

Development of the Revised Forest Plan

The Revised Forest Plan was developed with guidance from the USFS 2012 planning rule (USFS 2012). 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 also include monitoring items. They provide additional definition 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.

A 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 revised 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 revised 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 revised forest plan. It should not be expected that each project or activity would contribute to all desired conditions in a plan. Instead, a project or activity will typically contribute to one, or a subset, of desired conditions.

The Revised Plan is the result of public engagement efforts dating back to 2013. During the development of the Revised Plan, a variety of scoping efforts, public informational and comment meetings, field trips, invited group presentations, and workgroup meetings were conducted. Additionally, the Revised Plan was developed with input from tribal partners, agency partners, and elected officials at various communities in and around the Forest. A detailed description of the development process is provided in the BA (USFS 2017).

Programmatic Nature of the Revised Forest Plan

The Revised Forest Plan is programmatic in scope, meaning it provides the framework for future site-specific actions but does not authorize, fund, or carry out future site-specific actions. Future project-level activities must be consistent with the direction in the Revised Plan and must undergo separate project level analyses, including National Environmental Policy Act (NEPA) planning and decision-making procedures, and Endangered Species Act (ESA) section 7 consultation if appropriate. The management direction contained in the revised 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 Areas

Every forest plan must have management areas or geographic areas or both. A forest 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 desired conditions describe what the Forest wants to achieve in specific geographic areas that are not necessarily covered by forestwide desired conditions. While all resources have been considered for forest-wide direction, plan components have been developed for geographic areas to further refine plan direction within each respective geographic area.

Designated areas or features 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).

The Revised Forest Plan designates seven management area (MAs) types across the FNF: Wilderness (Designated, Recommended, Wilderness Study Area, and Primitive); Wild and Scenic Rivers (Designated, and Eligible); Administrative/Special Areas; Research Natural Areas and Experimental Forests; Backcountry; General Forest; and Focused Recreation Areas. The 1986 Forest Plan contained a different set of management areas than what is proposed under the Revised Plan. As a result, the BA includes a cross-referenced table to link the 1986 management areas to those used in the Revised Plan (See Table 2 in the BA; USFS 2017). The seven designated MA themes are further broken down into 11 individual MAs, which are summarized in Table I-4.

Allocation to a specific MA does not mandate or direct the Forest Service to propose or implement any action; rather, the MAs provide direction on desired conditions and allowable activities and uses, including timber harvest/timber production, commercial and personal use of special forest products and firewood, the use of prescribed and natural (unplanned) fire, livestock grazing, recreation (including wheeled and over-snow motorized vehicle use), road construction and reconstruction, and minerals development (leasable and materials). Table I-4 summarizes the allowable uses by MA under the Proposed Action. The MAs are characterized as follows:

MA-1: Wilderness

- <u>MA-1a: Designated Wilderness</u>
  The FNF manages three Congressionally designated wilderness areas—the Bob Marshall, Great Bear, and Mission Mountains—as part of the National Wilderness Preservation System. These three areas contain 1,072,040 acres, which accounts for approximately 45% of the FNF. If, over the life of the Revised Plan, Congress designates any additional wilderness areas on the FNF, those areas would be allocated to this MA.

- MA-1b: Recommended Wilderness
  These areas are recommended as additions to the National Wilderness Preservation System. The Revised Plan designates 190,403 acres of recommended wilderness throughout the FNF. The wilderness characteristics and potential for each area recommended to be included in the National Wilderness Preservation System are to remain intact until Congressional action is taken. Areas of recommended wilderness under the Revised Plan are detailed later in this opinion, or in the BA.

MA-2: Wild and Scenic Rivers

- MA-2a: Designated Wild and Scenic Rivers
  These river segments and adjacent lands have been designated as part of the Wild and Scenic Rivers System under the authority granted by the Wild and Scenic Rivers Act of 1968, as amended. Currently the FNF contains 219 miles of designated wild and scenic river, all of which are on North, Middle and South Fork Flathead River. If, over the life of the Revised Plan, Congress designates any additional wild and scenic rivers on the Forest, those areas would be allocated to this MA

- MA-2b: Eligible Wild and Scenic Rivers
  This MA applies to river segments that have been identified as eligible for inclusion as part of the Wild and Scenic Rivers System under the authority granted by the Wild and Scenic Rivers Act of 1968, as amended. The Revised Plan designates 284 miles as eligible for inclusion as part of the Wild and Scenic River System. These areas are managed to protect the free-flowing nature of these rivers, and outstandingly remarkable scenic, recreational, geologic, fish, wildlife, historic, cultural, or other similar values for the benefit and enjoyment of present and future generations.

MA-3: Special or Administrative Areas

- MA-3a: Administrative Areas
  Administrative areas are facilities or infrastructure necessary to support FNF employees, equipment and activities required for administration and management of the FNF.

- MA-3b: Special Areas
  These are administratively designated areas that are managed to protect and conserve the values for which they were identified. The FNF currently has one special area, the Condon Creek Botanical Area.

MA-4: Research Natural Areas, Experimental Forest and Demonstration Forest

- MA-4a: Research Natural Areas
  These areas are established to provide for research, observation, study, and conservation

of biological diversity. Research natural areas are designated jointly with the appropriate Forest Service research station.

- MA-4b: Experimental and Demonstration Forests
  These areas are established to study ecology and silviculture of species on the FNF, as well as to study the effect of fire and other silvicultural treatments on regeneration and other forest conditions. Currently, the FNF has two such areas. The Coram Experimental Forest was established in 1933, and its management is the responsibility of the USFS' Rocky Mountain Research Station. The Miller Creek Demonstration Forest was set aside in 1989, and its management is the responsibility of the FNF.

MA-5: Backcountry

This management area consists of a relatively large area characterized by an environment that is influenced primarily by natural ecological processes (e.g., fire, natural succession, insects, disease). These areas also provide a variety of backcountry recreational opportunities, ranging from non-motorized year-round to motorized summer and over-snow areas/routes. They also include areas from the 1986 Forest Plan that have a high level of other amenity values or site conditions that would limit vegetation treatments and are unsuitable for timber production (e.g., high scenic value in elk winter range, non-forest vegetation types, riparian areas). This MA is further divided according to motorized use opportunities:

- MA-5a
  Provides opportunities for year-round non-motorized use.

- MA 5b
  Provides opportunities for year-round non-motorized use and motorized use on designated roads, trails, and in designated areas.

- MA-5c
  Provides opportunities for year-round non-motorized use and over-snow vehicle use on designated routes and in designated areas.

- MA-5d
  Provides opportunities for year-round non-motorized use and wheeled motorized use during the summer on designated routes.

MA-6: General Forest

These general forest areas would provide a wide range of uses, including habitat for wildlife, commercial and non-commercial forest products, and a variety of recreation uses. In these areas active vegetation management (e.g., prescribed fire, thinning, harvest), as well as other activities, would be used to achieve desired vegetative and wildlife conditions. This management area has been further divided into three categories designated to reflect the anticipated level of timber harvest. These designations are described below:

- MA-6a: Low
  These areas will not have regularly scheduled timber harvest. The reasons for this low intensity could range from unsuitable vegetative conditions or other resource considerations have a higher priority (e.g., grizzly bear core areas, Canada lynx foraging habitat, large game winter range).

- MA-6b: Medium
  Areas under this designation are expected to receive regularly scheduled timber harvest prescriptions. These areas still have other resource concerns or site limitations, but to a lesser degree that areas under the MA-6a designation.

- MA-6c: High
  A higher intensity of timber harvest is anticipated in these areas. Site limitations and/or other resource priorities are not expected to interfere with regularly scheduled timber harvest.

MA-7: Focused Areas

These are management areas that will provide for a variety of recreational uses and receive special attention. Typically these areas will center around a high use feature, such as large lake, reservoir, developed ski area, year-round resort, large campground, or trail systems.

Table I-4. Summary of existing management area allocations and proposed action management area allocations (single designation based upon established hierarchy) as of January 18, 2017.

Management Area	Existing Plan [b] (percent)	Revised Plan (percent)
1a Designated wilderness	1,072,040 (45%)	1,072,040 (45%)
1b Recommended wilderness	98,388 (4%)	190,403 (8%)
2a Designated wild and scenic rivers	17,605 (1%)	17,592 (1%)
2b Eligible wild and scenic rivers	0[c]	20,473 (1%)
3a Administrative areas	1,918 (< 1%)	435 (< 1%)
3b Special areas	226	1,579 (< 1%)
4a Research natural areas	9,870 (< 1%)	7,820 (< 1%)
4b Experimental and demonstration forests	6,602 (< 1%)[d]	11,544 (< 1%)
5a Backcountry non-motorized year-round	--	149,258 (6%)
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	--	50,002 (2%)
5c Backcountry: motorized over-snow vehicle use	--	107,656 (4%)
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	--	9,854 (< 1%)

Management Area	Existing Plan [b] (percent)	Revised Plan (percent)
5a-d Backcountry Total	381,685[e] (16%)	317,770 (13%)
6a General forest low	93,714 (4%)	123,693 (5%)
6b General forest medium	--	297,674 (12%)
6c General forest high	--	271,895 (11%)
General Forest medium to high	703,454 (29%)	--
6a-c General forest **Total**	797,168 (33%)	693,262 (29%)
7 Focused recreation areas	7,305 (< 1%)[f]	60,888 (3%)
Total Forest acres	2,392,807 acres (100%)	2,392,807 acres (100%)

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

b. Alternative A, the no-action alternative, is included even though it does not use the management areas shown in the draft forest plan.

c. Acres of eligible wild and scenic rivers in the existing plan are the same as in the action alternatives (see Table 5). However, they were not assigned a MA in the existing 1986 forest plan, and were not mapped for the DEIS.

d. Miller Creek Demonstration Forest (4,942 acres) was not assigned a management area in the existing 1986 plan.

e. The existing plan does not differentiate backcountry areas like the action alternatives; thus all backcountry acres are combined.

f. There is no MA in the existing 1986 forest plan equivalent to Focused Recreation Areas. These acres are the Round Meadow and Essex cross country ski areas and the mapped developed recreation sites.

Components of the Revised Forest Plan

The following are the definitions and, where necessary, a description of the context of the required plan components (36 CFR 219.7(e)).

<u>Desired condition</u>

A desired condition 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 desired condition for some resources may currently exist, but for other resources they may only be achievable over a long time period.

The Revised Plan presents three types of desired conditions:

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

2. Management area desired conditions are indications of what future conditions would typically be desired. They help clarify the general suitability of various parts of the Forest for different activities and management practices. These desired conditions clarify

what outcomes might be expected in land areas with different general suitability descriptions.

3. Geographic area desired conditions 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 desired conditions. These desired conditions allow focus on specific circumstances in specific geographic locations. The Forest is divided into six geographic areas (see Figure 1).

Objective

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 219.7(e)(1)(ii)). Objectives describe the focus of management in the plan area within the plan period. Objectives will occur over the life of the forest plan, considered to be over the first 15 years of plan implementation, unless otherwise specified. Objectives can be forest-wide or specific to management areas or geographic areas. Refer to Appendix C of the BA (USFS 2017) for possible strategies to achieve certain objectives.

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

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)). Standards can be developed for forest-wide application or be specific to a management area or geographic area.

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. 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)). A guideline can be forest-wide or specific to a management area or a geographic area.

Suitability of lands

Specific lands within the FNF are identified as suitable for various multiple uses or activities based on the desired conditions applicable to those lands. The Revised Plan identifies lands within the FNF as not suitable for uses that are not compatible with desired conditions 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)).

The identification of suitability of lands for a particular use in the forest plan indicates that the use may be appropriate but does not make a specific commitment to authorize that use. If certain lands are identified as not suitable for a use, then that use or activity may not be authorized. Prohibiting an existing or authorizing a new use requires subsequent, site-specific NEPA analysis. Generally, lands on the FNF are suitable for uses and management activities appropriate for national forests, such as outdoor recreation or timber, unless identified as not suitable. For suitability determinations, refer to Chapters 2 and 3 of the BA (USFS 2017).

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 as part of an adaptive management framework. The best available scientific information can identify indicators that address associated monitoring questions. The best available scientific information 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 Forest Service Handbook 1909.12 07.11). See chapter 5 for the monitoring program and additional information about adaptive management.

Other required plan content

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)) addressing priority watersheds, the distinctive roles and contributions of the plan area, a plan monitoring program, and proposed and possible actions.

The components of the Revised Plan described above guide future projects, activities and the monitoring program. Plan components are not commitments or final decisions approving projects or activities. Desired conditions, objectives, standards, guidelines, suitability, and monitoring questions and monitoring indicators have been given alpha-numeric identifiers for ease in referencing within the Revised Plan. The identifiers are described below:

- the level of direction (e.g., forest-wide = FW, management area = MA, or geographic area = GA; note that with management area or geographic area direction, the management area number and the geographic area acronym are also included);
- the type of direction (where DC = desired condition, OBJ = objective, STD = standard, GDL = guideline, SUIT = suitability, MON = monitoring question, IND = monitoring indicator);
- the resource (for forest-wide direction), e.g., WTR = watersheds and TE&V = terrestrial ecosystems and vegetation; and
- 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-DC-WTR-01; management area direction for desired conditions in management area 2b would be identified starting with MA-2b-DC-01, and desired conditions for the Hungry Horse geographic area would be identified starting with GA-HH-DC-01. The identifiers are included as part of the headings in chapters 2 through 4, with the unique number preceding each plan component.

If the component is based upon the Grizzly Bear Conservation Strategy (GBCS), then it will reference the Northern Continental Divide Ecosystem (NCDE) and the management zone to which it applies: recovery zone/primary conservation area, zone 1, and/or demographic connectivity area (e.g., within the NCDE primary conservation area).

Direction of the Revised Forest Plan

The following provides a summary of the Revised Forest Plan using the terms and definitions described above. A comprehensive description of the Revised Plan can be found in FNF's BA (USFS 2017). Revised Forest Plan components that are pertinent to federally listed species will be discussed in detail in later chapters.

<u>Vegetation Management, Timber Production, and Fire and Fuels Management</u>
Desired conditions for vegetation are based on maintaining and promoting forest conditions that are resilient in the face of potential future disturbances and climate change and that contribute to social and economic sustainability. Under the Revised Plan, 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 desired conditions and management direction associated with a diverse array of plant communities and species, such as aquatic and riparian areas, deciduous forests, burned forests, grasslands, shrublands and whitebark pine. Fens and other unique botanical or geological areas are given special emphasis by designation as special areas.

Timber harvest is conducted to provide for societal goods and to move the vegetation towards desired conditions. Approximately 465,200 acres (20 % of the FNF) are suitable for timber production as defined by the 2012 planning rule (USFS 2017). This total represents the acres in suitable management areas minus inclusions that are not suitable (e.g., riparian management zones). Under the Revised Plan the projected timber sale quantity for the first decade would be 27.3 million board feet per year and the projected wood sale quantity would be 6.3 million cubic feet per year.

<u>Fish and Wildlife Habitat</u>
The Revised Plan includes forest-wide desired conditions, objectives, standards, and/or guidelines to support long-term persistence of species listed as threatened, endangered, or species of conservation concern (including proposed and candidate species) and to support key

ecosystem characteristics for additional 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.

The Revised Plan includes 1,072,040 acres (45% of the FNF) in designated wilderness (management area 1a), 190,403 acres (8% of the FNF) in recommended wilderness (management area 1b), and 316,770 acres (13% of the FNF) in backcountry (management areas 5a through 5d). These designations will contribute to high levels of habitat security and connectivity over large land areas for species that are sensitive to higher levels of human disturbance (e.g., grizzly bear). These management areas also emphasize natural processes, with relatively high levels of habitat created by natural disturbances such as wildfire, insects, or disease. In all management areas across the forest, the close interrelationship of vegetation conditions and wildlife habitat is emphasized.

Revised Forest Plan components related to vegetation conditions provide key ecosystem characteristics that support wildlife habitat needs and diversity (e.g., species associated with old-growth forests, riparian habitats, deciduous trees, grass/forb/shrub habitats, dead and defective tree habitat, and habitat connectivity). Management direction is proposed to address key aquatic and riparian ecosystem characteristics and their integrity and to improve resilience in light of 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 is allowable to meet desired conditions if it is compatible with other management direction. Outside of riparian management zones, coniferous forests in management areas 4b, 6b, 6c, and some management area 7 lands are suitable for timber production and provide opportunities for active management of vegetation to move towards desired vegetation composition, structure, function, and distribution.

Access and Recreation

Existing or slightly reduced levels of motorized road access could be expected to support social and economic sustainability while addressing desired ecological conditions for soils, water, fish, and wildlife. Some additional motorized trail access could occur in grizzly bear management zone 1, outside of the Salish demographic connectivity area. The Salish demographic connectivity area is one of two demographic connectivity areas established to provide for connectivity among grizzly bear ecosystems, and will provide opportunities for female grizzly bears to establish home ranges and exist at low densities (USFWS 2013). The Salish demographic connectivity area is discussed further in the grizzly bear chapter (Chapter III) of this biological opinion. The Revised Plan would provide the opportunity for public motorized vehicle use (suitable on designated roads and trails) on about 1,653 miles of the NFS lands. Motorized over-snow vehicle use would be suitable on about 31% of the FNF, and mechanized transport (e.g., mountain bikes) would be suitable on about 47% of the FNF. Based upon public collaboration and comment as well as on site-specific ecological conditions, the areas suitable for motorized over-snow vehicle use would be shifted from some parts of the Forest to others, resulting in a small (> 0.1%) increase in the amount of Forest suitable to motorized over-snow vehicle use (discussed further in the Canada lynx chapter, Chapter IV). Areas open to motorized over-snow vehicle use during the grizzly bear den emergence time period would be limited to about 3% of modeled grizzly bear denning habitat. To reduce the risk of grizzly bear-human conflicts on FNF lands in light of increasing human use of all national forests, there would be limits on the number and capacity of new developed recreation sites (those that are designed and managed for overnight use) in the primary conservation area for grizzly bears. The primary conservation area is an area that will be managed as a source of grizzly bears in the NDCE, and the objective is continual occupancy by grizzly bears and maintenance of habitat conditions that are compatible with a stable to increasing grizzly bear population (USFWS 2013). The primary conservation area is discussed further in the grizzly bear chapter (Chapter III) of this biological opinion. Outside of the primary conservation area, the number of developed recreation sites could be increased or the capacity of existing recreation sites could be expanded to meet desired conditions for increased recreation opportunity.

Recommended Wilderness

The Revised Plan recommends eight areas (totaling about 190,418 acres) for wilderness designation (MA1b)(See BA Figure B-2). Mechanized transport and motorized use would not be suitable within recommended wilderness areas. The boundaries of recommended wilderness were drawn so that existing trails with mechanized and motorized use were not included. Below is a description of the eight areas recommended for wilderness:

- In the North Fork geographic area, there is one area recommended for wilderness: Tuchuck-Whale (79,821 acres).

- In the Swan Valley geographic area, there is one area recommended for wilderness to be added to the Mission Mountains Wilderness, Elk Creek (1,442 acres). There is one area recommended for wilderness to be added to the Bob Marshall Wilderness; Swan Front (42,534 acres).

- In the Middle Fork geographic area, there are two areas recommended for wilderness: Java-Bear Creek (1,824 acres) and Slippery Bill-Puzzle (12,393acres).

- In the Hungry Horse geographic area, there is one area recommended for wilderness: Jewel Basin (18,462 acres).

- In the South Fork geographic area, there are two areas recommended for wilderness to be added to the Bob Marshall Wilderness: Limestone-Dean Ridge (15,026 acres) and Alcove-Bunker (18,901 acres).

Available Details

For further information and details on the Revised Plan elements summarized above, see the following section of the Revised Plan:

- Forestwide, management area, and geographic area desired conditions, objectives, standards, and guidelines (see revised forest plan chapters 2 and 3);

- The suitability of lands for specific multiple uses, including those lands suitable for timber production (see revised forest plan chapter 3, suitability determinations by management areas);

- An estimate of the long-term sustained yield and projected timber sale quantity (see revised forest plan chapter 2, production of natural resources);

- The identification of priority restoration watersheds (see revised forest plan appendix E);

- Possible management actions and strategies that may occur in the plan area over the life of the plan (see revised forest plan appendix C);

- Areas proposed to be recommended to Congress for inclusion in the National Wilderness Preservation System (see revised forest plan chapter 3, management area 1b);

- The rivers identified as eligible for inclusion as part of the wild and scenic river system (see revised forest plan chapter 3, management area 2b); and

- The plan monitoring program (see revised forest plan, chapter 5), including any focal species.

4. Implementing the Proposed Action (Revised Forest Plan)

The Revised Forest Plan provides a framework and text that guides day-to-day resource management options. It is a strategic, programmatic document and does not make project-level decisions or irreversible or irretrievable commitments of resources. These decisions will be made during a more detailed, site specific analysis of any proposed future action.

Project/Activity Consistency with the Revised Forest Plan

The National Forest Management Act (NFMA) requires that all projects and activities authorized by the National Forest Service be consistent with the associated Forest Plan. A project or activity approval document must describe how the action is consistent with applicable plan components by meeting the following criteria (36 CFR 219.15(d)):

- <u>Desired Conditions and Objectives</u>: The project or activity contributes to the maintenance or attainment of one or more desired conditions, or objectives, or does not foreclose the opportunity to maintain or achieve any desired conditions, or objectives, over the long-term.

- <u>Standards</u>: The project or activity complies with applicable standards.

- Guidelines: The project or activity:

    1. Complies with applicable guidelines as set out in the plan; or

    2. Is designed in a way that is effective in achieving the purpose of the applicable guidelines.

- Suitability: A project or activity would occur in an area:

    1. That the plan identifies as suitable for that type of project or activity; or

    2. the plan is silent with respect to its suitability for that type of project or activity.

Because of the many types of projects and activities that can occur over the life of a Revised Plan, it is not likely that a project or activity can contribute to the attainment of all desired conditions. Further, it is unlikely that all desired conditions will be relevant to every activity (e.g., recreation desired conditions may not be relevant to a fuels treatment project). Most projects and activities will be developed to maintain or move conditions toward one or more of the desired conditions in the Revised Plan. Each project or activity is not expected to contribute to all desired conditions in a plan, but usually to one or a subset.

Projects or Activities Not Consistent with the Revised Forest Plan

Where a proposed project or activity would not be consistent with Revised Plan direction, the responsible official has the following options:

- To modify the proposal so that the project or activity will be consistent:

- To reject the proposal; or

- To amend the Revised Plan so that the project or activity is consistent as amended. The amendment may be limited to apply only to the project or activity, and may be adopted at the same time as the approval of the project or activity.

Monitoring Program

A monitoring program will be implemented as part of the proposed action. The monitoring program will provide monitoring questions and measures, which will assist managers in evaluating the degree to which on-the-ground actions are making progress toward desired conditions presented in the Revised Plan. Further, the monitoring program will facilitate an adaptive management approach that will serve as the basis for continual improvement. Appendix D of the Revised Forest Plan BA (USFS 2017) fully describes the monitoring program for the FNF. Among the monitoring requirements, the FNF will monitor and report to the Service information pertinent to listed species. Some of these items are presented below, but a complete description of the monitoring program is provided in Appendices 1-3:

- Status of bull trout local populations on the FNF.
- Progress toward habitat objectives in native fish streams (including bull trout). These objectives are components of the Revised Forest Plan and are detailed further in the bull trout chapter (Chapter II) of this biological opinion.
- Conditions of grizzly bear management units and subunits on the FNF. Monitored conditions will include those related to access (i.e., road densities, secure core) and developed recreation.
- Motorized route density in the Salish Demographic Connectivity Area and Zone 1.
- Any grizzly bear conflicts that occur on the FNF.
- Percentage of lynx analysis units that comply with the Northern Rockies Lynx Management Direction.
- Acres of Canada lynx habitat treated under the Northern Rockies Lynx Management Direction incidental take statement (USFWS 2017).

E. SUMMARY OF PLAN ELEMENTS FOR FEDERALLY LISTED SPECIES

Below is a summary of the management direction resulting from the Revised Plan broken down by listed species. As mentioned in the introduction, each listed species will be covered in their own chapter of this biological opinion.

1. Bull Trout and Bull Trout Critical Habitat

The Inland Native Fish Strategy (USFS 1995), which is the current aquatic conservation strategy for the Forest, was designed to provide protection for native fish. Although it allowed for restoration, INFISH primarily provided direction for protection and passive restoration measures. With that amendment, the 1986 forest plan direction reduced the risk to watersheds, soils, riparian, and aquatic resources from new and ongoing activities primarily because of the standards and guidelines that influenced management within the Riparian Habitat Conservation Areas. For some resources, standards and guidelines in the 1986 forest plan contained general direction for repairing past damage, although INFISH direction was lacking for other resources, such as timber harvest. During implementation of the 1986 forest plan, the intensity and risks associated with new and ongoing land management activities has been greatly reduced, compared to the previous several decades, and it is anticipated that vegetation treatments associated with timber production, vegetation restoration, and other future projects will be lower than historic levels, as compared to the past 20 to 25 years.

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 (C. Meredith et al., 2012); however, the one component identified as lacking in INFISH is an active restoration component. This was iterated clearly in the Service's 1998 BO for the 1986 forest plan (USFWS 1998). The absence of a clearly stated aquatic restoration goal in the existing plan was one of many items identified as needing to be changed in the plan revision process, and Revised Forest Plan direction is also intended to address the conservation recommendations in the Service's 1998 BO.

The Revised Forest Plan adds an active restoration component through desired conditions, objectives, guidelines, and standards that would supplement the retained passive components of INFISH. The Revised Forest Plan will also help move projects and activities towards the desired conditions and improve aquatic habitats, and the following elements provide additional protective measures for bull trout and their habitats. This direction will be applied across the entire landscape, although there are no objectives, standards, or guidelines specific to bull trout for individual management areas or geographic areas.

For Revised Forest Plan components related to bull trout, refer to Appendix D of the biological assessment, or Appendix 2 of this biological opinion.

2. Grizzly Bear

The 1986 Flathead National Forest plan contains management direction related to grizzly bear habitat to provide specifically for recovery of the threatened grizzly bear. In 1995, Amendment 19 (A19) of the 1986 forest plan was completed and resulted in the establishment of new management direction related to motorized use of roads and trails and security for grizzly bears. Forest plan A19 established limits on open motorized access density, total motorized access density, and security core for 54 of the 73 grizzly bear subunits across the Flathead National Forest portion of the Northern Continental Divide Ecosystem for grizzly bears (NCDE).

The grizzly bear population in the NCDE has now met or exceeded the demographic recovery goals of the recovery plan (see grizzly bear section for more details). In particular, habitat conditions and management actions on the national forests have contributed importantly to the increased population size, increased distribution, increased genetic diversity, and improved the status of the grizzly bear across the NCDE (Costello et al. 2016). Supporting continued recovery of the grizzly population will depend on the Forest Service's continued effective management of the NCDE grizzly bear habitat and implementation of the Final Grizzly Bear Conservation Strategy.

In 2013, the Service announced the availability of a draft Grizzly Bear Conservation Strategy (GBCS) for the NCDE population for public review and input. When finalized, the GBCS will become the post-delisting management plan for the NCDE grizzly bears and their habitat. Adopting this document is necessary for the Service to demonstrate the adequacy of regulatory mechanisms in order to delist this grizzly population. Incorporating this strategy in the FNF

Forest Plan would likewise demonstrate the adequacy of regulatory mechanisms on the Forest to support delisting. Thus, the FNF proposes to update its forest plan where necessary to incorporate the habitat-related desired conditions, standards, guidelines, objectives (called plan components), and monitoring items for management of National Forest System (NFS) lands to support recovery of the NCDE grizzly bear population. Once the FNF has completed consultation and issued a Record of Decision, the components included in the Revised Forest Plan would replace the 1986 Flathead National Forest plan in its entirety, including but not limited to A19, A24, the Swan Valley Grizzly Bear Conservation Agreement, and other Flathead National Forest plan direction related specifically to grizzly bears. Many components of past strategies are included in the revised forest plan and are discussed in detail in the grizzly bear section of this document (Chapter III).

The FNF planning team is also coordinating the NEPA effort to incorporate and amend habitat-related desired conditions, standards, guidelines, and monitoring items from the GBCS into the Helena-Lewis and Clark, Kootenai, and Lolo forest plans to provide consistent direction related to grizzly bear habitat management on National Forest System lands throughout the recovery zone/primary conservation area of the NCDE as well as management direction for what is identified as management zones 1, 2, and 3 in the grizzly bear conservation strategy.

Under the NCDE conservation strategy, grizzly bear management direction applies to the Primary Conservation Area (PCA; the same area as the recovery zone), as well as to zone 1 (about 4.8 million acres,), zone 2 (over 4.6 million acres), and zone 3 (over 12 million acres) (see Figure 10). See Chapter III Grizzly Bear (III-2) for definitions of these areas.

The FNF has lands in the primary conservation area and zone 1 (including the Salish demographic connectivity area). A summary of the habitat-related management direction for these zones on the FNF is as follows:

- Within the PCA, open motorized route density, total motorized route density, and secure core would be maintained at baseline levels (see the glossary in the revised forest plan) in each grizzly bear subunit. High-use non-motorized trails would no longer be counted in calculations of secure core, but the baseline would be updated to reflect this change. Temporary increases in open and total motorized route densities and temporary decreases in secure core would be allowed for projects (as defined in the glossary), as long as they comply with standards.

- Special orders for storage of food/wildlife attractants would apply across NFS lands in the primary conservation area and zone 1 (including the Salish demographic connectivity area).

- Within the primary conservation area, developed recreation sites designed and managed for overnight use would be limited to one new site or one increase in capacity in a bear management unit in a 10-year period, as described in the standard.

- In the primary conservation area, vegetation management, livestock allotments, and minerals and energy development would be managed with consideration for grizzly bear habitat and to reduce the risk of grizzly bear-human conflicts.

- In zone 1, habitat protections would focus on maintaining miles of roads open to public motorized use during the non-denning season at baseline levels. In the Salish demographic connectivity area, motorized trails would also be limited.

Key management direction for grizzly bear habitat from the NCDE conservation strategy is integrated into forest plan components throughout sections of the Revised Forest Plan. For example, management direction related to roads and motorized trails is included in the "infrastructure" section of the revised plan whereas management direction related to developed recreation sites is included in the recreation section. Appendix 3 of this biological opinion lists key plan components for the grizzly bear that meet the intent of having a consistent set of management direction on National Forest System lands in the NCDE. The FNF's Revised Forest Plan contains some additional plan components whose effects are discussed in this document.

3. Canada Lynx and Canada Lynx Critical Habitat

The 1986 Forest Plan contains direction designed to conserve and promote the recovery of Canada lynx that was incorporated into the plan in 2007 when the plan was amended to include the Northern Rockies Lynx Management Direction (NRLMD) (USFS 2007). Since 2007, new information on Canada lynx has been published, including designation of critical habitat for Canada lynx (USFWS 2009a, 2014d), an updated version of the Lynx Conservation and Assessment Strategy (ILBT, 2013), scientific research results relevant to Canada lynx in northwest Montana (see literature cited section in Chapter IV). Additionally, an updated Incidental Take Statement for the NRLMD biological opinion (USFWS 2017), and a biological opinion for the effects of the NFLMD on Canada lynx critical habitat (USFWS 2017a) have been completed.

Based upon new information, the FNF has also updated its map of modeled lynx habitat (see Appendix C of the BA more details; USFS 2017). The Forest would carry forward the lynx management direction from the current forest plan, as amended (see Appendix F of the Revised Forest Plan), except for two site-specific changes:

- A modification to NRLMD vegetation standard VEG S6 to add an exception to allow noncommercial felling of trees that may contribute to multistoried hare habitat that are growing within 200 feet of mature, genetically resistant whitebark pine (a candidate species for listing) (see FW-STD-TE&V-03). Standard VEG S5 already has an exception that allows precommercial thinning to restore whitebark pine, but VEG S6 does not provide a comparable exception.

- A modification to NRLMD human use guideline HU G11 (see FW-GDL-REC-05) stating that there should be no net increase in miles of designated motorized over-snow vehicle routes, groomed routes, or areas where motorized over-snow vehicle use would be suitable. This modification will allow the FNF to better suit winter recreation needs, and will result in a decrease of 927 acres of lynx habitat that is suitable for motorized over-snow use on the FNF.

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CHAPTER II. BIOLOGICAL OPINION FOR BULL TROUT AND BULL TROUT CRITICAL HABITAT

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A. CONTEXT OF THE PROPOSED ACTION FOR BULL TROUT

The Flathead National Forest (FNF) determined in their biological assessment that activities conducted under the proposed action will be likely to adversely affect bull trout and designated bull trout critical habitat (USFS 2017).

This section describes the spatial context in which the Service conducts its ESA Section 7 consultation, jeopardy and adverse modification analysis; describes the relationship of the project area to bull trout occurrence; explains the relationship of the proposed action to existing management; and describes the desired condition for bull trout under the Revised Plan, as well as the guidelines and standards applied at the project level to achieve desired conditions.

This biological opinion will consider the effects of implementation of the proposed framework of the Revised Forest Plan. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species and critical habitat, and subsequent section 7 consultation when appropriate.

1. Relationship of the Project Area to Bull Trout

The proposed action (implementation of the Revised Forest Plan) would occur across the FNF. The FNF contains lands within 12 core areas of the Columbia Headwaters Recovery Unit (further discussed below). Additionally, the FNF contains designated bull trout critical habitat in four sub-units of the Clark Fork River Basin Critical Habitat Unit (also discussed further below).

2. Relationship of Proposed Action to Existing Management

Current management for bull trout on the FNF is directed by the Inland Native Fish Strategy (INFISH) (USFS 1995), which amended the 1986 Forest Plan. When first developed, INFISH was intended to provide guidance for 18 months while more detailed, watershed-specific direction could be developed. The INFISH standards and guidelines apply to all riparian habitat conservation areas (RHCAs), and to projects and activities in areas outside of RHCAs that would degrade conditions in RHCAs. The standards and guidelines address ten management issues in RHCAs and associated areas: timber management, roads management, grazing management, recreation management, minerals management, fire and fuels management, lands, general riparian area management, watershed and habitat restoration, and fisheries and wildlife restoration.

The INFISH strategy was designed to be an interim strategy to provide protection for native fish and has been the primary aquatic conservation strategy for the FNF since 1995. While it allows for restoration activities, its focus is passive restoration through protection of riparian and aquatic resources. With the INFISH amendment, Plan direction reduced the risk to watersheds, soils, riparian, and aquatic resources from new and ongoing activities (USFS 2017). Originally proposed as an interim direction, 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 2012); however, the one component identified as lacking in INFISH is an active restoration component. This was stated clearly by the Service in its 1998 Biological Opinion (USFWS 1998) for the INFISH amendment. The absence of a clearly stated aquatic restoration goal in the existing Forest Plan was one of the many items identified as a need for change in the plan revision process.

The Revised Plan adds an active restoration component through desired conditions, objectives, guidelines and standards that would supplement the retained passive components of INFISH. In an effort to improve upon INFISH direction that is over 20 years old, National Forests of the USFS are moving toward an Aquatic Riparian Conservation Strategy (ARCS) that will provide similar land management direction, but is based on more updated scientific information. The goal of the ARCS is to maintain or restore watershed conditions so that conditions in managed watersheds are moving toward, or are in concert with, conditions in reference watersheds when considered at the planning unit scale. The ARCS refines and replaces INFISH and is incorporated throughout the Revised Forest Plan in relevant resource sections.

As mention previously, INFISH was originally expected to last 18 months while an effort similar to the Northwest Forest Plan, the Interior Columbia Basin Ecosystem Management Project, was completed for the Interior Columbia River Basin. That strategy was never completed, but scientific information from that effort has been retained in the form of guidance for plan revisions occurring in areas covered by INFISH. In addition to following this guidance, the ARCS also follows direction in the 2012 USFS Planning Rule. Specifically, greater emphasis is placed on meeting improved and more refined desired conditions, and “Standards and Guidelines” that were not differentiated in PACFISH/ INFISH are separated into Standards or Guidelines in this strategy. The Revised Forest Plan will include similar guidance and adds an active restoration component through desired conditions, objectives, guidelines, and standards that would supplement the passive components of INFISH.

3. Description of the Proposed Action

The Revised Forest Plan components discussed in this chapter, and presented in Appendix 2, would be applied forest-wide as well as across the management areas and geographic areas. Management Areas have similar management characteristics and clarify the allowed uses on various parts of the Forest (see Table I-4 in Chapter I of this biological opinion). Geographic Areas (GA) have desired conditions that are specific to a locale, such as a river basin or valley. The GA desired conditions were developed to refine forest-wide management to better respond to local conditions and situations that may occur within a specific GA. The desired conditions in GAs for listed species would not exert additional effects on the species, rather, the desired condition would help the FNF achieve a forest-wide desired condition, objective, standard, or guideline for the species.

The direction contained in the Revised Forest Plan for aquatic habitats and aquatic species is to restore habitats where past management activities have affected stream channel morphology or wetland function and to maintain or improve the distribution of native aquatic and riparian dependent species and contribute to the recovery of threatened and endangered aquatic species. This is primarily achieved through the implementation of ARCS and enhanced through the delineation of “designated priority watersheds” into “restoration and conservation watersheds” under the Revised Forest Plan.

INFISH “designated priority watersheds” were intended to provide a pattern of protection across the landscape, where habitat for inland native fish would receive special attention and treatment. Priority watersheds would have the highest priority for restoration, monitoring, and watershed analysis. Priority areas in good condition would serve as anchors for the potential recovery of depressed stocks, and also would provide colonists for adjacent areas where habitat had been degraded by land management or natural events (USFS 1995). While it allowed for restoration, INFISH primarily provided direction for protection and passive restoration measures. To correct this deficiency, the Revised Forest Plan adds an active restoration component through desired conditions, objectives, guidelines and standards that would supplement the retained passive restoration measures. This is meant to be consistent with the ARCS described above.

During the development of the Revised Forest Plan, watersheds were prioritized for conservation or restoration based on biological and physical aquatic resource values. Long-term persistence of aquatic species is dependent upon restoring watershed processes that create and maintain habitats across stream networks (Rieman et al. 2000) and the use of ecologically compatible land use polices that ensure the long-term productivity of aquatic and riparian ecosystems (Thurow et al. 1997). Emphasis was placed on watersheds supporting native species, which includes bull trout and designated bull trout critical habitat, especially where there was a high likelihood for successful restoration given current methods and funding levels. These restoration watersheds are intended to provide a pattern of protection across the landscape, where habitat for inland native fish would receive special attention and treatment.

Implementation of the Revised Forest Plan will include the establishment of a Conservation Watershed Network (CWN). The CWN would identify watersheds considered native fish strongholds with appropriately functioning aquatic habitats. CWN watersheds are 10 to 12th code hydrological unit codes (HUCs) intended to protect stronghold populations of native salmonids and complement restoration efforts. Through Revised Forest Plan direction, CWN watersheds will maintain high quality habitat and functionally intact ecosystems that are contributing to and enhancing conservation and recovery of bull trout. Planning components associated with the CWN are discussed in further detail below (see Section G.1. *Effects of the Action*) and the plan components can also be found in Appendix D of the biological assessment, or Appendix 2 of this biological opinion.

The overall desired conditions for aquatic habitat and aquatic species related to bull trout under the Revised Forest Plan are discussed in further detail in this chapter of this biological opinion, and contained in the aquatic section of the BA (USFS 2017). Desired Condition FW-DC-P&C-16 in the Revised Forest Plan states that bull trout trend toward recovery through cooperation and coordination with the Service, other state and federal agencies, tribes, and interested groups. This desired condition will be achieved by using the Bull Trout Recovery Plan and Columbia Headwaters Recovery Unit Implementation Plan (USFWS 2015, 2105b) to identify threats to bull trout core areas on the FNF, and the Western Montana Bull Trout Conservation Strategy (USFS 2013) to identify actions that can be taken to address threats.

The FNF determined that including bull trout recovery as a specific desired condition in the Revised Forest Plan was the most effective way to benefit bull trout and minimize adverse effects due to ongoing management (USFS 2017). The Western Montana Bull Trout Conservation Strategy (USFS 2013) will be used to inform baseline data needs and management direction as it relates to bull trout and designated critical habitat on the Flathead National Forest. The conservation strategy was developed by the Western Montana Level 1 Team (made up of Forest Service and U.S. Fish and Wildlife Service fisheries biologists) to provide direction affected forests within Region 1 of the USFS to implement bull trout recovery actions. The strategy is inspired by the final recovery plan and as such fits with the revised plan's stated desired condition for bull trout and designated critical habitat.

B. STATUS OF THE SPECIES

This section provides information about the bull trout's life history, habitat preferences, geographic distribution, population trends, threats, and conservation needs. This includes description of the effects of past human activities and natural events that have led to the current status of the bull trout. This information provides the background for analyses in later sections of the biological opinion.

1. Listing Status

The coterminous United States population of the bull trout was listed as threatened on November 1, 1999 (USFWS 1999, 64 FR 58910). The threatened bull trout occurs in the Klamath River Basin of south-central Oregon; the Jarbidge River in Nevada; the Willamette River Basin in Oregon; Pacific Coast drainages of Washington, including Puget Sound; major rivers in Idaho, Oregon, Washington, and Montana, within the Columbia River Basin; and the St. Mary-Belly River, east of the Continental Divide in northwestern Montana (Bond 1992, Brewin and Brewin 1997, Cavender 1978, Howell and Buchanan 1992, Leary and Allendorf 1997, USFWS 1999, 64 FR 58910).

The final listing rule for the United States coterminous population of the bull trout discusses the consolidation of five distinct population segments (DPSs) into one listed taxon, the application of the jeopardy standard under section 7 of the ESA relative to this species, and established five interim recovery units (RUs) for purposes of consultation and recovery (USFWS 1999, 64 FR 58930). However, in 2010 six RUs were identified base on the best available information. The Service determined that these six RUs were needed to ensure a resilient, redundant, and representative distribution of bull trout populations throughout the range of the listed entity (USFWS 2010, 75 FR 93898). In 2015, the six RUs were formalized in the final *Recovery Plan for the Coterminous United States Population of Bull Trout (Salvelinus confluentus)* (Recovery Plan; USFWS 2015). The final RUs replace the previous five interim RUs and are used in the application of the jeopardy standard for ESA section 7 consultation procedures.

2. Reasons for Listing

Throughout its range, the bull trout is threatened by a wide variety of factors. These include: habitat degradation and fragmentation, instream flow alterations associated with water diversions, road construction and maintenance, mining, grazing, the blockage of migratory corridors by dams or other diversion structures, poor water quality; incidental angler harvest, entrainment (a process by which aquatic organisms are pulled through a diversion or other device) into diversion channels; and introduced non-native species (USFWS 1999, 64 FR 58910). Poaching and incidental mortality of bull trout during other targeted fisheries are additional threats. Since the time of coterminous listing of the species (USFWS 1999, 64 FR 58910) and designation of its critical habitat (USFWS 2005, 70 FR 56212; USFWS 2010, 75 FR 63898), a great deal of new information has been collected on the status of bull trout. The Service's Science Team Report (Whitesel et al 2004), the bull trout core areas templates (USFWS 2005a), Conservation Status Assessment (USFWS 2005b), and 5-year Reviews (USFWS 2008, 2015g) have provided additional information about threats and status. The final Recovery Plan lists many other documents and meetings that compiled information about the status of bull trout (USFWS 2015). The most recent 5-year status review (USFWS 2015g) maintains the listing status as threatened based on the information compiled in the final bull trout recovery plan (USFWS 2015) and the Recovery Unit Implementation Plans (RUIPs) (USFWS 2015a-f)

When first listed, the status of bull trout and its threats were reported by the Service at subpopulation scales. In 2002 and 2004, the draft recovery plans (USFWS 2002, 2004a, 2004b) included detailed information on threats at the recovery unit scale (i.e., similar to subbasin or regional watersheds), thus incorporating the metapopulation concept with core areas and local populations. In the 5-year Review, the Service established threats categories (i.e., dams, forest management, grazing, agricultural practices, transportation networks, mining, development and urbanization, fisheries management, small populations, limited habitat, and wildfire) (USFWS 2008, 2015g). In the final Recovery Plan, threats are described at RU scale that typically incorporates multiple watersheds. The plan also describes threats for 109 core areas, local populations, forage/migration/overwintering areas, and includes research needs areas (USFWS 2015).

3. Emerging Threats

Climate change was not addressed as a known threat when bull trout were originally listed in 1999. The 2015 Recovery Plan and RUIPs summarize the threat of climate change and acknowledge that some extant bull trout core area habitats will likely change (and may be lost) over time due to anthropogenic climate change effects. It was determined that use of best available information to identify and ensure future conservation efforts will offer the greatest long-term benefit to sustain bull trout and their required cold water habitats (USFWS 2015, USFWS 2015a-f).

Mote et al. (2014) summarized climate change effects to include rising air temperature, changes in the timing of streamflow related to changing snowmelt, increases in extreme precipitation events, lower summer stream flows, and other changes. A warming trend in the mountains of western North America is expected to decrease snowpack, hasten spring runoff, reduce summer stream flows, and increase summer water temperatures (Poff et al. 2002, Koopman et al. 2009). Lower flows as a result of smaller snowpack could reduce habitat, which might adversely affect bull trout reproduction and survival. Warmer water temperatures could lead to physiological stress and could also benefit non-native fishes that prey on or compete with bull trout. Increases in the number and size of forest fires could also result from climate change (Westerling et al. 2006) and could adversely affect watershed function by resulting in faster runoff, lower base flows during the summer and fall, and increased sedimentation rates.

Lower flows also may result in increased groundwater withdrawal for agricultural purposes and resultant reduced water availability in certain stream reaches occupied by bull trout (USFWS 2015c). Although all salmonids are likely to be affected by climate change, bull trout are particularly vulnerable given that spawning and rearing are constrained by their location in upper watersheds and the requirement for cold water temperatures (Battin et al. 2007, Rieman et al. 2007). Climate change is expected to reduce the extent of cold water habitat (Isaak et al. 2015), and increase competition with other fish species (e.g., lake trout, brown trout, brook trout, and northern pike) for resources in remaining suitable habitat. Several authors project that brook trout, a fish species that competes for resources with and predates on the bull trout, will continue increasing their range in several areas (an upward shift in elevation) due to the effects from climate change (Isaak et al. 2010, 2014, Peterson et al. 2013).

4. Life History and Population Dynamics

Distribution

The historical range of bull trout includes major river basins in the Pacific Northwest at about 41 to 60 degrees North latitude, from the southern limits in the McCloud River in northern California and the Jarbidge River in Nevada to the headwaters of the Yukon River in the Northwest Territories, Canada (Cavender 1978; Bond 1992). To the west, the bull trout's range includes Puget Sound, various coastal rivers of British Columbia, Canada, and southeast Alaska (Bond 1992). Bull trout occur in portions of the Columbia River and tributaries within the basin, including its headwaters in Montana and Canada. Bull trout also occur in the Klamath River basin of south-central Oregon. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta and Montana, and in the MacKenzie River system in Alberta and British Columbia, Canada (Cavender 1978; Brewin and Brewin 1997).

Reproductive Biology

Bull trout typically reach sexual maturity in 4 to 7 years and may live longer than 12 years. They are iteroparous (i.e., they spawn more than once in a lifetime). Repeat- and alternate-year spawning has been reported, although repeat-spawning frequency and post-spawning mortality are not well documented (Fraley and Shepard 1989; Leathe and Graham 1982; Pratt 1992; Rieman and McIntyre 1996). The iteroparous reproductive strategy (i.e., fish that spawn multiple times, and therefore require safe two-way passage upstream and downstream) of bull trout has important repercussions for the management of this species. Bull trout require passage both upstream and downstream, not only for repeat spawning but also for foraging. Most fish ladders, however, were designed specifically for anadromous semelparous salmonids (i.e., fishes that spawn once and then die, and require only one-way passage upstream). Therefore, even dams or other barriers with fish passage facilities may be a factor in isolating bull trout populations if they do not provide a safe downstream passage route. Additionally, in some core areas, bull trout that migrate to marine waters must pass both upstream and downstream through areas with net fisheries at river mouths. This can increase the likelihood of mortality to bull trout during these spawning and foraging migrations.

Bull trout typically spawn from August through November during periods of increasing flows and decreasing water temperatures. Preferred spawning habitat consists of low-gradient stream reaches with loose, clean gravel (Fraley and Shepard 1989). Redds are often constructed in stream reaches fed by springs or near other sources of cold groundwater (Goetz 1989; Pratt 1992; Rieman and McIntyre 1996). Depending on water temperature, incubation is typically 100 to 145 days (Pratt 1992). Post hatching, fry remain in the substrate, with time from egg deposition to emergence potentially surpassing 220 days. Fry normally emerge from early April through May, depending on water temperatures and increasing stream flows (Pratt 1992; Ratliff and Howell 1992).

Early life stages of fish (specifically the developing embryo) require the highest inter-gravel dissolved oxygen (IGDO) levels and are the most sensitive life stage to reduced oxygen levels. The oxygen demand of embryos depends on temperature and on stage of development, with the greatest IGDO required just prior to hatching. A literature review conducted by the Washington Department of Ecology (WDOE 2002) indicates that adverse effects of lower oxygen concentrations on embryo survival are magnified as temperatures increase above optimal (for incubation). Normal oxygen levels seen in rivers used by bull trout during spawning ranged from 8 to 12 mg/L (in the gravel), with corresponding instream levels of 10 to 11.5 mg/L (Stewart et al. 2007). In addition, IGDO concentrations, water velocities in the water column, and especially the intergravel flow rate, are interrelated variables that affect the survival of incubating embryos (ODEQ 1995). Due to their long incubation period (220+ days), bull trout are particularly sensitive to inadequate IGDO levels. An IGDO level below 8 mg/L is likely to result in mortality of eggs, embryos, and fry.

Growth varies depending upon life-history strategy. Resident adults range from 6 to 12 inches total length, and migratory adults commonly reach 24 inches or more (Goetz 1989; Pratt 1985). The largest verified bull trout is a 32-pound specimen caught in Lake Pend Oreille, Idaho in 1949 (Simpson and Wallace 1982).

Population Structure

Bull trout exhibit both resident and migratory life history strategies. Both resident and migratory forms may be found together, and either form may produce offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. The resident form tends to be smaller than the migratory form at maturity and also produces fewer eggs (Goetz 1989). Migratory bull trout spawn in tributary streams where juvenile fish rear for 1 to 4 years before migrating to either a lake (adfluvial form), river (fluvial form) (Fraley and Shepard 1989; Goetz 1989), or saltwater (anadromous form) to rear as sub-adults and to live as adults (Brenkman and Corbett 2005; McPhail and Baxter 1996; WDFW et al. 1997).

Bull trout are believed to be naturally migratory, which allows them to capitalize on temporally abundant food resources and larger downstream habitats. However, resident forms likely develop where barriers (either natural or manmade) occur or where foraging, migrating, or overwintering habitats for migratory fish are minimized (Brenkman and Corbett 2005; Goetz et al. 2004). For example, multiple life history forms (e.g., resident and fluvial) and multiple migration patterns have been noted in the Grande Ronde River (Baxter 2002). Parts of this river system have retained habitat conditions that allow free movement between spawning and rearing areas and the mainstem Snake River. Such multiple life history strategies help to maintain the stability of bull trout populations and allow persistence following environmental changes. Benefits to migratory bull trout include greater growth in the more productive waters of larger streams, lakes, and marine waters; greater fecundity resulting in increased reproductive potential; and dispersing the population across space and time so that spawning streams may be recolonized if local populations suffer a catastrophic loss (Frissell 1999; MBTSG 1998; Rieman and McIntyre 1993). In the absence of the migratory bull trout life form, isolated populations cannot be replenished when disturbances make local habitats temporarily unsuitable. Therefore, the range of the species is diminished, and the potential for a greater reproductive contribution from larger size fish with higher fecundity is lost (Rieman and McIntyre 1993).

Whitesel et al. (2004) noted that although there are multiple resources that contribute to the subject, Spruell et al. (2003) best summarized genetic information on bull trout population structure. Spruell et al. (2003) analyzed 1,847 bull trout from 65 sampling locations, four located in three coastal drainages (Klamath, Queets, and Skagit Rivers), one in the Saskatchewan River drainage (Belly River), and 60 scattered throughout the Columbia River Basin. They concluded that there is a consistent pattern among genetic studies of bull trout, regardless of whether examining allozymes, mitochondrial DNA, or most recently microsatellite loci. Typically, the genetic pattern shows relatively little genetic variation within populations, but substantial divergence among populations. Microsatellite loci analysis supports the existence of at least three major genetically differentiated groups (or evolutionary lineages) of bull trout (Spruell et al. 2003). These three groups are characterized below:

1. "Coastal", including the Deschutes River and all of the Columbia River drainage downstream, as well as most coastal streams in Washington, Oregon, and British Columbia. A compelling case also exists that the Klamath Basin represents a unique evolutionary lineage within the coastal group.

2. "Snake River", which also included the John Day, Umatilla, and Walla Walla rivers. Despite close proximity of the John Day and Deschutes Rivers, a striking level of divergence between bull trout in these two systems was observed.

3. "Upper Columbia River", which includes the entire basin in Montana and northern Idaho. A tentative assignment was made by Spruell et al. (2003) of the Saskatchewan River drainage populations (east of the continental divide), grouping them with the upper Columbia River group.

Spruell et al. (2003) noted that within the major assemblages, populations were further subdivided, primarily at the level of major river basins. Taylor et al. (1999) surveyed bull trout populations, primarily from Canada, and found a major divergence between inland and coastal populations. Costello et al. (2003) suggested the patterns reflected the existence of two glacial refugia, consistent with the conclusions of Spruell et al. (2003) and the biogeographic analysis of Haas and McPhail (2001). Both Taylor et al. (1999) and Spruell et al. (2003) concluded that the Deschutes River represented the most upstream limit of the coastal lineage in the Columbia River Basin. More recently, the Service identified additional genetic units within the coastal and interior lineages (Ardren et al. 2011). Based on a recommendation in the 5-year review of the species' status (USFWS 2008), the Service reanalyzed the 27 recovery units identified in the 2002 draft bull trout recovery plan (USFWS 2002) by utilizing, in part, information from previous genetic studies and new information from additional analysis (Ardren et al. 2011). In this examination, the Service applied relevant factors from the joint U.S. Fish and Wildlife Service and National Marine Fisheries Service Distinct Population Segment (DPS) policy (USFWS 1996) and subsequently identified six draft recovery units that contain assemblages of core areas that retain genetic and ecological integrity across the range of bull trout in the coterminous United States. These six draft recovery units were used to inform designation of critical habitat for bull trout by providing a context for deciding what habitats are essential for recovery (USFWS 2010). The six draft recovery units identified for bull trout in the coterminous United States include: Coastal, Klamath, Mid-Columbia, Columbia Headwaters, Saint Mary, and Upper Snake. These six draft recovery units were adopted, described, and identified in the final bull trout recovery plan (USFWS 2015) and RUIPs (USFWS 2015a-f).

Population Dynamics

Although bull trout are widely distributed over a large geographic area, they exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993). Increased habitat fragmentation reduces the amount of available habitat and increases isolation from other populations of the same species (Saunders et al. 1991). Burkey (1989) concluded that when species are isolated by fragmented habitats, low rates of population growth are typical in local populations and their probability of extinction is directly related to the degree of isolation and fragmentation. Without sufficient immigration, growth in local populations may be low and the population may have a higher probability of extinction (Burkey 1989; Burkey 1995).

The metapopulation concepts of conservation biology have been suggested relative to the distribution and characteristics of bull trout, although empirical evidence is relatively scant (Rieman and McIntyre 1993; Dunham and Rieman 1999; Rieman and Dunham 2000). A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994). For inland bull trout, metapopulation theory is likely most applicable at the watershed scale where habitat consists of discrete patches or collections of habitat capable of supporting local populations; local populations are for the most part independent and represent discrete reproductive units; and long-term, low-rate dispersal patterns among component populations influences the persistence of at least some of the local populations. Ideally, multiple local populations distributed throughout a watershed provide a mechanism for spreading risk because the simultaneous loss of all local populations is unlikely (Rieman and Dunham 2000). However, habitat alteration, primarily through the construction of impoundments, dams, and water diversions has fragmented habitats, eliminated migratory corridors, and in many cases isolated bull trout in the headwaters of tributaries (Rieman and Clayton 1997; Dunham and Rieman 1999; Spruell et al. 1999; Rieman and Dunham 2000).

Human-induced factors as well as natural factors affecting bull trout distribution have likely limited the expression of the metapopulation concept for bull trout to patches of habitat within the overall distribution of the species (Dunham and Rieman 1999). However, despite the theoretical fit, the relatively recent and brief time period during which bull trout investigations have taken place does not provide certainty as to whether a metapopulation dynamic is occurring (e.g., a balance between local extirpations and recolonizations) across the range of the bull trout or whether the persistence of bull trout in large or closely interconnected habitat patches (Dunham and Rieman 1999) is simply reflective of a general deterministic trend towards extinction of the species where the larger or interconnected patches are relics of historically wider distribution (Rieman and Dunham 2000). Research does, however, provide genetic evidence for the presence of a metapopulation process for bull trout, at least in the Boise River Basin of Idaho (Whiteley et al. 2003), while Whitesel et al. (2004) identified that bull trout fit the metapopulation theory in several ways.

Habitat Characteristics

The habitat requirements of bull trout are often generally expressed as the four “Cs”: cold, clean, complex, and connected habitat. Cold stream temperatures, clean water quality that is relatively free of sediment and contaminants, complex channel characteristics (including abundant large wood and undercut banks), and large patches of such habitat that are well connected by unobstructed migratory pathways are all needed to promote conservation of bull trout throughout all hierarchical levels.

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, valley form, spawning and rearing substrate, and migratory corridors (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Howell and Buchanan 1992; Pratt 1992; Rich 1996; Rieman and McIntyre 1993; Rieman and McIntyre 1995; Sedell and Everest 1991; Watson and Hillman 1997). Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide the habitat requirements necessary for bull trout to successfully spawn and rear and that these specific characteristics are not necessarily present throughout all watersheds. Because bull trout exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1993), bull trout should not be expected to simultaneously occupy all available habitats.

Migratory corridors link seasonal habitats for all bull trout life histories. The ability to migrate is important to the persistence of bull trout since migrations facilitate gene flow among local populations when individuals from different local populations interbreed or stray to non-natal streams (Rieman and McIntyre 1993). Local populations that are extirpated by catastrophic events may also become reestablished by bull trout migrants. However, it is important to note that the genetic structuring of bull trout indicates there is limited gene flow among bull trout populations, which may encourage local adaptation within individual populations, and that reestablishment of extirpated populations may take a long time (Rieman and McIntyre 1993;

Spruell et al. 1999). Migration also facilitates access to more abundant or larger prey, leading to increases in growth and reproduction. Additional benefits of migration and its relationship to foraging are discussed below under "Diet." Cold water temperatures play an important role in determining bull trout habitat quality, as these fish are primarily found in colder streams, and spawning habitats are generally characterized by temperatures that drop below 9 °C in the fall (Fraley and Shepard 1989; Pratt 1992; Rieman and McIntyre 1993).

Thermal requirements for bull trout appear to differ among life stages. Spawning areas are often associated with cold-water springs, groundwater infiltration, and the coldest streams in a given watershed (Pratt 1992; Rieman and McIntyre 1993). Optimum incubation temperatures for bull trout eggs range from 2 °C to 6 °C whereas optimum water temperatures for rearing range from about 6 °C to 10 °C (Buchanan and Gregory 1997; Goetz 1989). In Granite Creek, Idaho, Bonneau and Scarnecchia (1996) observed that juvenile bull trout selected the coldest water available in a plunge pool, 8 °C to 9 °C, within a temperature gradient of 8 °C to 15 °C. In a landscape study relating bull trout distribution to maximum water temperatures, Dunham et al. (2003) found that the probability of juvenile bull trout occurrence does not become high (i.e., greater than 0.75) until maximum temperatures decline to 11 °C to 12 °C. Although bull trout are found primarily in cold streams, occasionally these fish are found in larger, warmer river systems throughout the Columbia River basin (Buchanan and Gregory 1997; Fraley and Shepard 1989; Rieman and McIntyre 1993; Rieman and McIntyre 1995). Availability and proximity of cold water patches and food productivity can influence bull trout ability to survive in warmer rivers (Myrick et al. 2002).

All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders, and pools (Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Pratt 1992; Rich 1996; Sedell and Everest 1991; Watson and Hillman 1997). Maintaining bull trout habitat requires natural stability of stream channels and maintenance of natural flow patterns (Rieman and McIntyre 1993). Juvenile and adult bull trout frequently inhabit side channels, stream margins, and pools with suitable cover (Sexauer and James 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 from winter through spring (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993). Pratt (1992) indicated that increases in fine sediment reduce egg survival and emergence.

Diet

Bull trout are opportunistic feeders, with food habits primarily a function of size and life-history strategy. Fish growth depends on the quantity and quality of food that is eaten, and as fish grow their foraging strategy changes as their food changes, in quantity, size, or other characteristics (Quinn 2005). Resident and juvenile migratory bull trout prey on terrestrial and aquatic insects, macrozooplankton, and small fish (Boag 1987; Donald and Alger 1993; Goetz 1989). Subadult and adult migratory bull trout generally feed on various fish species (Donald and Alger 1993; Fraley and Shepard 1989; Leathe and Graham 1982). Bull trout of all sizes other than fry have been found to eat fish half their length (Beauchamp and VanTassell 2001). In near-shore marine areas of western Washington, bull trout feed on Pacific herring (*Clupea pallasi*), Pacific sand lance (*Ammodytes hexapterus*), and surf smelt (*Hypomesus pretiosus*) (Goetz et al. 2004; WDFW et al. 1997).

Bull trout migration and life history strategies are closely related to their feeding and foraging strategies, and their environment. Migration allows bull trout to access optimal foraging areas which facilitates exploitation of a wider variety of prey resources. For example, in the Skagit River system, anadromous bull trout make migrations as long as 121 miles between marine foraging areas in Puget Sound and headwater spawning grounds, foraging on salmon eggs and juvenile salmon along their migration route (WDFW et al. 1997). Anadromous bull trout also use marine waters as migration corridors to reach seasonal habitats in non-natal watersheds to forage and possibly overwinter (Brenkman and Corbett 2005; Goetz et al. 2004).

5. Conservation Status and Needs

Bull Trout Recovery Planning

The 2015 Recovery Plan for the Coterminous United States Population of Bull Trout (USFWS 2015) documented the primary strategy for recovery of bull trout in the coterminous United States. The Recovery Plan established the following approach: (1) conserve bull trout so that they are geographically widespread across representative habitats and demographically stable in six recovery units; (2) effectively manage and ameliorate the primary threats in each of six recovery units at the core area scale such that bull trout are not likely to become endangered in the foreseeable future; (3) build upon the numerous and ongoing conservation actions implemented on behalf of bull trout since their listing in 1999, and improve our understanding of how various threat factors potentially affect the species; (4) use that information to work cooperatively with our partners to design, fund, prioritize, and implement effective conservation actions in those areas that offer the greatest long-term benefit to sustain bull trout and where recovery can be achieved; and (5) apply adaptive management principles to implementing the bull trout recovery program to account for new information (USFWS 2015).

Information presented in prior draft Recovery Plans published in 2002 and 2004 (USFWS 2002, 2004, 2004a) have served to identify recovery actions across the range of the species and to provide a framework for implementing numerous recovery actions by our partner agencies, local working groups, and others with an interest in bull trout conservation. The 2015 Recovery Plan integrates new information collected since the 1999 listing regarding bull trout life history, distribution, demographics, conservation successes, etc., and integrates and updates previous bull trout recovery planning efforts across the range of the single distinct population segment (DPS) listed under the Act.

The Service has developed a recovery strategy that: (1) focuses on the identification of and effective management of known and remaining threat factors to bull trout in each core area; (2) acknowledges that some extant bull trout core area habitats will likely change (and may be lost) over time; and (3) identifies and focuses recovery actions in those areas where success is likely to meet our goal of ensuring the certainty of conservation of genetic diversity, life history features, and broad geographical representation of remaining bull trout populations so that the protections of the Act are no longer necessary (USFWS 2015).

To implement the recovery strategy, the 2015 recovery plan establishes four categories of recovery actions for each of the six Recovery Units (USFWS 2015):

1. Protect, restore, and maintain suitable habitat conditions for bull trout.

2. Minimize demographic threats to bull trout by restoring connectivity or populations where appropriate to promote diverse life history strategies and conserve genetic diversity.

3. Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.

4. Work with partners to conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks, and considering the effects of climate change

Bull trout recovery is based on a geographical hierarchical approach. Bull trout are listed as a single DPS within the five-state area of the coterminous United States. The single DPS is subdivided into six biologically-based recovery units: (1) Coastal Recovery Unit; (2) Klamath Recovery Unit; (3) Mid-Columbia Recovery Unit; (4) Upper Snake Recovery Unit; (5) Columbia Headwaters Recovery Unit; and (6) Saint Mary Recovery Unit (Figure 4, USFWS 2015). A viable recovery unit should demonstrate that the three primary principles of biodiversity have been met: representation (conserving the genetic makeup of the species); resiliency (ensuring that each population is sufficiently large to withstand stochastic events); and redundancy (ensuring a sufficient number of populations to withstand catastrophic events) (ibid.).

Each of the six recovery units contains multiple bull trout core areas, 116 total, which are non-overlapping watershed-based polygons. Each core area includes one or more local populations. Currently there are 109 occupied core areas, which comprise 611 local populations (USFWS 2015). There are also six core areas where bull trout historically occurred but are now extirpated, and one research needs area where bull trout were known to occur historically, but their current presence and use of the area are uncertain. Core areas are further described as either complex or simple core areas (ibid.). Complex core areas contain multiple bull trout local populations, are found in large watersheds, have multiple life history forms (i.e., fluvial, adfluvial, resident), and have migratory connectivity between spawning and rearing habitat (SR) and foraging, migration, and overwintering habitats (FMO). Simple core areas are those that contain one bull trout local population. These core areas are relatively small in scope, isolated from other core areas by natural barriers, and may contain unique genetic or life history adaptations.

A local population is a group of bull trout that spawn within a particular stream or portion of a stream system (USFWS 2015). A local population is considered to be the smallest group of bull trout that is known to represent an interacting reproductive unit. For water bodies where specific information is lacking, a local population may be represented by a single headwater tributary or complex of headwater tributaries. Gene flow may occur between local populations (e.g., those within a core population), but is assumed to be infrequent compared with that among individuals within a local population.

Population Units

The final Recovery Plan (USFWS 2015) designates six bull trout recovery units as described above. These units replace the 5 interim recovery units previously identified (USFWS 1999). The Service will address the conservation of these final recovery units in our section 7(a)(2) analysis for proposed Federal actions. The Recovery Plan identified threats and factors affecting the bull trout within these units. A detailed description of recovery implementation for each recovery unit is provided in separate Recovery Unit Implementation Plans (USFWS 2015a-f), which identify conservation actions and recommendations needed for each core area, forage/ migration/ overwinter (FMO) areas, historical core areas, and research needs areas. Each of the following recovery units (below) is necessary to maintain the bull trout's distribution, as well as its genetic and phenotypic diversity, all of which are important to ensure the species' resilience to changing environmental conditions.

Coastal Recovery Unit

The Coastal Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015a). The Coastal Recovery Unit is located within western Oregon and Washington, and is divided into three regions: Puget Sound, Olympic Peninsula, and the Lower Columbia River Regions. This recovery unit contains 20 core areas comprising 84 local populations and a single potential local population in the historic Clackamas River core area where bull trout had been extirpated and were reintroduced in 2011. Further, the recovery unit has four historically occupied core areas that could be re-established (USFWS 2015, 2015a). Core areas within Puget Sound and the Olympic Peninsula currently support the only anadromous local populations of bull trout. This recovery unit also contains ten shared FMO habitats which are outside core areas and allows for the continued natural population dynamics in which the core areas have evolved (USFWS 2015a). There are four core areas within the Coastal Recovery Unit that have been identified as current population strongholds: Lower Skagit, Upper Skagit, Quinault River, and Lower Deschutes River (USFWS 2015). These are the most stable and abundant bull trout populations in the recovery unit. The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, loss of functioning estuarine and near-shore marine habitats, development and related impacts (e.g., flood control, floodplain disconnection, bank armoring, channel straightening, loss of instream habitat complexity), agriculture (e.g., diking, water control structures, draining of wetlands, channelization, and the removal of riparian vegetation, livestock grazing), fish passage (e.g., dams, culverts, instream flows) residential development, urbanization, forest management practices (e.g., timber harvest and associated road building activities), connectivity impairment, mining, and the introduction of non-native species. Conservation measures or recovery actions implemented include relicensing of major hydropower facilities that have provided upstream and downstream fish passage or complete removal of dams, land acquisition to conserve bull trout habitat, floodplain restoration, culvert removal, riparian revegetation, levee setbacks, road removal, and projects to protect and restore important near-shore marine habitats.

Klamath Recovery Unit

The Klamath Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015c). The Klamath Recovery Unit is located in southern Oregon and northwestern California. The Klamath Recovery Unit is the most significantly imperiled recovery unit, having experienced considerable extirpation and geographic contraction of local populations and declining demographic condition, and natural re-colonization is constrained by dispersal barriers and presence of nonnative brook trout (USFWS 2015). This recovery unit currently contains three core areas and eight local populations (USFWS 2015, 2015c). Nine historic local populations of bull trout have become extirpated (USFWS 2015c). All three core areas have been isolated from other bull trout populations for the past 10,000 years (USFWS 2015c). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, habitat degradation and fragmentation, past and present land use practices, agricultural water diversions, nonnative species, and past fisheries management practices. Conservation measures or recovery actions implemented include removal of nonnative fish (e.g., brook trout, brown trout, and hybrids), acquiring water rights for instream flows, replacing diversion structures, installing fish screens, constructing bypass channels, installing riparian fencing, culver replacement, and habitat restoration.

Mid-Columbia Recovery Unit

The Mid-Columbia Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015d). The Mid-Columbia Recovery Unit is located within eastern Washington, eastern Oregon, and portions of central Idaho. The Mid-Columbia Recovery Unit is divided into four geographic regions: Lower Mid-Columbia, Upper Mid-Columbia, Lower Snake, and Mid-Snake Geographic Regions. This recovery unit contains 24 occupied core areas comprising 142 local populations, 2 historically occupied core areas, 1 research needs area, and 7 FMO habitats (USFWS 2015, 2015d). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, agricultural practices (e.g. irrigation, water withdrawals, livestock grazing), fish passage (e.g. dams, culverts), nonnative species, forest management practices, and mining. Conservation measures or recovery actions implemented include road removal, channel restoration, mine reclamation, improved grazing management, removal of fish barriers, and instream flow requirements.

Upper Snake Recovery Unit

The Upper Snake Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015f). The Upper Snake Recovery Unit is located in central Idaho, northern Nevada, and eastern Oregon. The Upper Snake Recovery Unit is divided into seven geographic regions: Salmon River, Boise River, Payette River, Little Lost River, Malheur River, Jarbidge River, and Weiser River. This recovery unit contains 22 core areas and 207 local populations (USFWS 2015), with almost 60 percent being present in the Salmon River Region. The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, dams, mining, forest management practices, nonnative species, and agriculture (e.g., water diversions, grazing). Conservation measures or recovery actions implemented include instream habitat restoration, instream flow requirements, screening of irrigation diversions, and riparian restoration.

Columbia Headwaters Recovery Unit

The Columbia Headwaters Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015b). The Columbia Headwaters Recovery Unit is located in western Montana, northern Idaho, and the northeastern corner of Washington. The Columbia Headwaters Recovery Unit is divided into five geographic regions: Upper Clark Fork, Lower Clark Fork, Flathead, Kootenai, and Coeur d'Alene Geographic Regions (USFWS 2015b). This recovery unit contains 35 bull trout core areas; 15 of which are complex core areas as they represent larger interconnected habitats and 20 simple core areas as they are isolated headwater lakes with single local populations. The 20 simple core areas are each represented by a single local population, many of which may have persisted for thousands of years despite small populations and isolated existence (USFWS 2015b). Fish passage improvements within the recovery unit have reconnected some previously fragmented habitats (USFWS 2015b), while others remain fragmented. Unlike the other recovery units in Washington, Idaho, and Oregon, the Columbia Headwaters Recovery Unit does not have any anadromous fish overlap. Therefore, bull trout within the Columbia Headwaters Recovery Unit do not benefit from the recovery actions for salmon (USFWS 2015b). The current condition of the bull trout in this recovery unit is attributed to the adverse effects of climate change, historic mining and legacy contamination by heavy metals, expanding populations of nonnative fish predators and competitors, modified instream flows, migratory barriers (e.g., dams), habitat fragmentation, forest practices (e.g., logging, roads), agriculture practices (e.g. irrigation, livestock grazing), and residential development. Conservation measures or recovery actions implemented include habitat improvement, fish passage, and removal of nonnative species.

Saint Mary Recovery Unit

The Saint Mary Recovery Unit Implementation Plan describes the threats to bull trout and the site-specific management actions necessary for recovery of the species within the unit (USFWS 2015e). The Saint Mary Recovery Unit is located in Montana but is heavily linked to downstream resources in southern Alberta, Canada. Most of the Saskatchewan River watershed, which the St. Mary flows into, is located in Canada. The United States portion includes headwater spawning and rearing habitat and the upper reaches of FMO habitat. This recovery unit contains four core areas, and seven local populations (USFWS 2015e) in the U.S. Headwaters. The current condition of the bull trout in this recovery unit is attributed primarily to the outdated design and operations of the Saint Mary Diversion operated by the Bureau of Reclamation (e.g., entrainment, fish passage, instream flows), and, to a lesser extent habitat impacts from development and nonnative species.

C. STATUS OF CRITICAL HABITAT

1. Legal Status

The Service published a final critical habitat designation for the coterminous United States population of bull trout on October 18, 2010 (75 FR 63898), and the rule became effective on November 17, 2010. A justification document was also developed to support the rule and is available on the Service's website (http://www.fws.gov/pacific/bulltrout). The scope of the designation involved the species' coterminous range, which includes the Jarbidge River, Klamath River, Columbia River, Coastal-Puget Sound, and Saint Mary River population segments (also considered as interim recovery units at the time of final designation).

Designated bull trout critical habitat is of two primary use types: 1) spawning and rearing (SR), and 2) foraging, migration, and overwintering (FMO). Bull trout critical habitat includes both reservoirs/lakes and stream/shoreline miles, and was broken up into 32 Critical Habitat Units (CHU) as bull trout critical habitat. The 2010 revision increased the amount of designated bull trout critical habitat by approximately 76 percent for miles of stream/shoreline and by approximately 71 percent for acres of lakes and reservoirs compared to the 2005 designation. For the Columbia River Basin 16,915.9 miles of stream and 427,044 acres of reservoirs/lakes were designated as critical habitat. The final rule also identified and designated approximately 822.5 miles of streams/shorelines and 16,701.3 acres of lakes/reservoirs of unoccupied habitat to address bull trout conservation needs in specific geographic areas in several areas not occupied at the time of listing. In contrast, no unoccupied habitat was included in the 2005 designation. These unoccupied areas were determined by the Service to be essential for restoring functioning migratory bull trout populations based on currently available scientific information. These unoccupied areas often include lower main stem river environments that can provide seasonally important migration habitat for bull trout. This type of habitat is essential in areas where bull trout habitat and population loss over time necessitates reestablishing bull trout in currently unoccupied habitat areas to achieve recovery. A break-down of designated bull trout critical habitat by state is presented below in Table II-1.

Table II-1. Stream/shoreline distance and reservoir/lake area designated as bull trout critical habitat by state.

State	Stream/Shoreline Miles	Stream/Shoreline Kilometers	Reservoir/ Lake (acres)	Reservoir/ Lake (hectares)
Idaho	8,771.6	14,116.5	170,217.5	68,884.9
Montana	3,056.5	4,918.9	221,470.7	89,626.4
Nevada	71.8	115.6	-	-
Oregon	2,835.9	4,563.9	30,255.5	12,244.0
Oregon/Idaho	107.7	173.3	-	-
Washington	3,793.3	6,104.8	66,308.1	26,834.0
Washington (marine)	753.8	1,213.2	-	-
Washington/Idaho	37.2	59.9	-	-
Washington/Oregon	301.3	484.8	-	-
Total	19,729.0	31,750.8	488,251.7	197,589.2

The final rule continues to exclude some critical habitat segments based on a careful balancing of the benefits of inclusion versus the benefits of exclusion. Critical habitat does not include: (1) waters adjacent to non-Federal lands covered by legally operative incidental take permits for habitat conservation plans (HCPs) issued under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (Act), in which bull trout is a covered species on or before the publication of this final rule; (2) waters within or adjacent to Tribal lands subject to certain commitments to conserve bull trout or a conservation program that provides aquatic resource protection and restoration through collaborative efforts, and where the Tribes indicated that inclusion would impair their relationship with the Service; or (3) waters where impacts to national security have been identified (75 FR 63898). Excluded areas are approximately 10 percent of the stream/shoreline miles and 4 percent of the lakes and reservoir acreage of designated critical habitat. Each excluded area is identified in the relevant CHU text, as identified in paragraphs (e)(8) through (e)(41) of the final rule. It is important to note that the exclusion of water bodies from designated critical habitat does not negate or diminish their importance for bull trout conservation. Because exclusions reflect the often complex pattern of land ownership, designated critical habitat is often fragmented and interspersed with excluded stream segments.

2. Conservation Role and Description of Critical Habitat

The conservation role of bull trout critical habitat is to support viable core area populations (75 FR 63943). The core areas reflect the metapopulation structure of bull trout and are the closest approximation of a biologically functioning unit for the purposes of recovery planning and risk analyses. CHUs generally encompass one or more core areas and may include FMO areas, outside of core areas, that are important to the survival and recovery of bull trout. As previously noted, 32 CHUs within the geographical area occupied by the species at the time of listing are designated under the final rule. Twenty-nine of the CHUs contain all of the physical or biological features identified in this final rule and support multiple life-history requirements. Three of the mainstem river units in the Columbia and Snake River basins contain most of the physical or biological features necessary to support the bull trout’s particular use of that habitat, other than those physical and biological features associated with Primary Constituent Elements (PCEs) 5 and 6, which relate to breeding habitat (see list below).

The primary function of individual CHUs is to maintain and support core areas, which (1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (Rieman and McIntyre 1993); (2) provide for persistence of strong local populations, in part, by providing habitat conditions that encourage movement of migratory fish (MBTSG 1998; Rieman and McIntyre 1993); (3) are large enough to incorporate genetic and phenotypic diversity, but small enough to ensure connectivity between populations (MBTSG 1998; Rieman and McIntyre 1993); and (4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (MBTSG 1998; Rieman and Allendorf 2001; Rieman and McIntyre 1993).

The Olympic Peninsula and Puget Sound CHUs are essential to the conservation of anadromous bull trout, which are unique to the Coastal-Puget Sound population segment. These CHUs contain marine near-shore and freshwater habitats, outside of core areas, that are used by bull trout from one or more core areas. These habitats, outside of core areas, contain PCEs that are critical to adult and subadult foraging, migrating, and overwintering.

In determining which areas to propose as critical habitat, the Service considered the physical and biological features that are essential to the conservation of bull trout and that may require special management considerations or protection. These features are the PCEs laid out in the appropriate quantity and spatial arrangement for conservation of the species. The PCEs for bull trout are those habitats components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering (75 FR 63898). The PCEs of designated critical habitat are:

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

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.

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

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.

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.

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.

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

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

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.

3. Current Range-Wide Condition of Critical Habitat

The condition of designated bull trout critical habitat varies across its range from poor to good. Although still relatively widely distributed across its historic range, bull trout occur at low numbers in many areas, and populations are considered depressed or declining across much of its range (67 FR 71240). This status reflects the condition of bull trout critical habitat.

The primary land and water management activities impacting the physical and biological features essential to the conservation of bull trout include timber harvest and road building, agriculture and agricultural diversions, livestock grazing, dams, mining, urbanization and residential development, and non-native species presence or introduction (75 FR 2282). There is widespread agreement in the scientific literature that many factors related to human activities have impacted bull trout and their habitat, and continue to do so. Among the many factors that contribute to degraded PCEs, those which appear to be particularly significant and have resulted in a legacy of degraded habitat conditions are as follows:

1. Fragmentation and isolation of local populations due to the proliferation of dams and water diversions that have eliminated habitat, altered water flow and temperature regimes, and impeded migratory movements (Dunham and Rieman 1999; Rieman and McIntyre 1993).

2. Degradation of spawning and rearing habitat and upper watershed areas, particularly alterations in sedimentation rates and water temperature, resulting from forest and rangeland practices and intensive development of roads (Fraley and Shepard 1989; MBTSG 1998).

3. The introduction and spread of nonnative fish species, particularly brook trout and lake trout, as a result of fish stocking and degraded habitat conditions, which compete with bull trout for limited resources and, in the case of brook trout, hybridize with bull trout (Leary et al. 1993; Rieman et al. 2006).

4. In the Coastal-Puget Sound region where anadromous bull trout occur, degradation of mainstem river FMO habitat, and the degradation and loss of marine near-shore foraging and migration habitat due to urban and residential development.

5. Degradation of FMO habitat resulting from reduced prey base, roads, agriculture, development, and dams.

One objective of the final rule was to identify and protect those habitats that provide resiliency for bull trout use in the face of climate change. Over a period of decades, climate change may directly threaten the integrity of the essential physical or biological features described in PCEs 1,2, 3, 5, 7, 8, and 9. Protecting bull trout strongholds and cold water refugia from disturbance and ensuring connectivity among populations were important considerations in addressing this potential impact. Additionally, climate change may exacerbate habitat degradation impacts both physically (e.g., decreased base flows, increased water temperatures) and biologically (e.g., increased competition with non-native fishes).

D. ANALYTICAL FRAMEWORK FOR JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

This biological opinion only considers programmatic direction by the action agency that has undergone consultation. Effects to the species and/or designated critical habitat from programmatic direction that has not been consulted on are not included in the jeopardy or adverse modification determination. In situations where programmatic consultation has been completed for one but not the other, this BO provides an independent analysis for the species or designated critical habitat that does not rely on effects of the programmatic consultation to the other. For example, the adverse modification determination would be an independent analysis that does not rely on programmatic direction that has only been consulted upon for the species.

1. Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this BO relies on four components: (1) the Status of the Species, which evaluates the bull trout's range-wide condition, the factors responsible for that condition, and its survival and recovery needs; (2) the Environmental Baseline, which evaluates the condition of the bull trout in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the bull trout; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the bull trout; and (4) Cumulative Effects, which evaluates the effects on bull trout of future non-federal activities reasonably certain to occur in the action area. In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the bull trout's current status, taken together with cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the bull trout in the wild.

Recovery Units (RU) for the bull trout were defined in the final Recovery Plan for the Coterminous United States Population of [the] Bull Trout (USFWS 2015). Pursuant to Service policy, when a proposed federal action impairs or precludes the capacity of a RU from providing both the survival and recovery function assigned to it, that action may represent jeopardy to the species. When using this type of analysis, the BO describes how the proposed action affects not only the capability of the RU, but the relationship of the RU to both the survival and recovery of the listed species as a whole.

The jeopardy analysis for the bull trout in this BO considers the relationship of the action area and affected core areas (discussed below under the Status of the Species section) to the RU and the relationship of the RU to both the survival and recovery of the bull trout as a whole as the context for evaluating the significance of the effects of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Within the above context, the Service also considers how the effects of the proposed federal action and any cumulative effects impact bull trout local and core area populations in determining the aggregate effect to the RU(s). Generally, if the effects of a proposed federal action, taken together with cumulative effects, are likely to impair the viability of a core area population(s) such an effect is likely to impair the survival and recovery function assigned to a RU(s) and may represent jeopardy to the species (70 C.F.R. 56258).

2. Adverse Modification Determination

The adverse modification analysis in this BO relies on four components: (1) the Status of Critical Habitat, which evaluates the range-wide condition of designated critical habitat for the bull trout in terms of primary constituent elements (PCEs); the factors responsible for that condition and the intended recovery function of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the Effects of the Action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the PCEs and how those effects are likely to influence the recovery role of affected critical habitat units or subunits; and (4) Cumulative Effects, which evaluates the effects of future, non-Federal activities in the action area on the PCEs and how those effects are likely to influence the recovery role of affected critical habitat units.

For purposes of the adverse modification determination, the effects of the proposed Federal action on bull trout critical habitat are evaluated in the context of the range-wide condition of the critical habitat, together with any cumulative effects, to determine if the critical habitat range-wide would remain functional (or would retain the current ability for the PCEs to be functionally established in areas of currently unsuitable but capable habitat) and continue to serve its intended recovery role for bull trout. The analysis in this BO places an emphasis on using the intended range-wide recovery function of bull trout critical habitat, especially in terms of maintaining and/or restoring habitat conditions that are necessary to support viable core area populations, and the role of the action area relative to that intended function as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the adverse modification determination.

3. Scales of Analysis

The scale of analysis for a bull trout jeopardy determination from largest to smallest is as follows: Recovery Unit, Major Geographic Region, Core Area, Local Population. The scale of analysis for a bull trout critical habitat adverse modification determination from largest to smallest is as follows: Range of Bull Trout, Critical Habitat Unit (CHU), Critical Habitat Sub-Unit (CHSU), Stream Segment/Waterbody. The specific scales of analysis for jeopardy and adverse modification determinations used in this BO are presented in Tables II-4 and II-5 in Section E.3 *Species and Critical Habitat Affected*.

E. ANALYTICAL FRAMEWORK FOR DETERMINING BASELINE CONDITIONS AND EFFECTS OF THE ACTION

The following sections describe; (1) the parameters used to assess baseline conditions and effects of the action to bull trout, (2) the action area for the Revised Plan, and (3) the relationship of the action area to the hierarchical approach to bull trout recovery described in the Recovery Plan for the Coterminous United States Population of Bull Trout (USFWS 2015).

1. Baseline Conditions and Effect to Species and Habitat Indicators

To assess baseline conditions and effects to bull trout and bull trout critical habitat, the Service created "A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale" (Framework/Matrix; USFWS 1998). The Framework provides a stand-alone method to systematically assess baseline conditions and project-related effects to bull trout using four Species Indicators to assess Subpopulation Characteristics and six Habitat Pathways incorporating 19 Habitat Indicators. Habitat Indicators are generally arranged from a finer to broader scale within each Habitat Pathway. For example, under the pathway for Habitat Elements, substrate embeddedness is considered at the reach level, large woody debris, pool frequency and quality, and large pools are at the grouped reach level, off-channel habitat is for the entire stream length, and refugia is at the complete subpopulation watershed (USFWS 1998). Ratings of the species and habitat indicators are then used to derive an "Integration of Species and Habitat Conditions" rating. Individual indicators and the rating integrating habitat and subpopulation conditions are intended to help arrive at a determination of the potential effects of land management activities on bull trout.

Although the same indicators are used to assess effects to both bull trout and designated critical habitat, the analysis for jeopardy determination and adverse modification are conducted independently. The results of neither analysis affect the outcome of the other. Additionally, the magnitude and context of the indicators are used differently for addressing effects to the species and to critical habitat. For the determination of effects to the species, influences to individual indicators and their resulting effects to bull trout are assessed. To assess the physical and biological features ascribing bull trout critical habitat, assemblages of indictors indirectly describe the attributes within each PCE of critical habitat. The combined influence to these multiple indicators assesses the effects to critical habitat. Subsequently, the jeopardy determination for bull trout and the adverse modification of designated critical habitat determination are independent analysis.

Baseline conditions of individual indicators and the integrated value are rated as "functioning appropriately" (FA), "functioning at risk" (FAR), and "functioning at unacceptable risk" (FUR). Indicators rated FA provide habitats that maintain strong and significant populations, are interconnected and promote recovery of a proposed or listed species or its critical habitat to a status that will provide self-sustaining and self-regulating populations. When a habitat indicator is FAR, they provide habitats for persistence of the species but in more isolated populations and may not promote recovery of a proposed or listed species or its habitat without active or passive restoration efforts. FUR indicates the proposed or listed species continues to be absent from historical habitat, or is rare or being maintained at a low population level; although the habitat may maintain the species at this low persistence level, active restoration is needed to begin recovery of the species. Indicators and parameters describing indicator ratings can be found in Appendix 3 Table A3-1.

Baseline ratings have generally been determined for each of the four species indicators, 19 habitat indicators, and the Integration of Species and Habitat Indicators for every 6th field Hydrologic Unit Code (HUC) across the range of bull trout in Montana. Consistent with this recommended scale of analysis, watershed baseline conditions and the Conservation Strategy for Bull Trout on USFS lands in Western Montana (USFS 2013) are conducted at the 6th field sub-watershed scale.

The Framework/Matrix can also be used to determine effects of a proposed action on habitat indicators. Project effects are considered to either “maintain,” “restore,” or “degrade” habitat indicators relative to existing or baseline conditions. Effects are characterized as either “major” effects that will likely produce a change in one functional level to baseline conditions (e.g., change FAR to FA), or “minor” effects that may result in an incremental or cumulative effect but will not result in a functional change within the HUC.

2. Baseline Conditions and Effects to Primary Constituent Elements (PCEs) of Critical Habitat

Designated critical habitat for bull trout is comprised of the nine PCEs described above. PCEs encompass the physical and biological features of critical habitat that cannot be measured by a single metric. As indicated in Table II-2, assemblages of species and habitat indicators from the Framework (USFWS 1998) are used to describe the components of each PCE. Some indicators explain a greater proportion of the physical and biological components of a PCE, but there is not a one-to-one relationship between any of the indicators and the PCEs of critical habitat.

The descriptive relationships between specific indicators and components of each PCE can be found in Appendix 3 (Table A3-2). The refugia indicator is relevant to all PCEs because in order for the refugia indicator to be rated “functioning appropriately,” most - if not all - of the PCEs must be adequately represented. The PCEs are predominately based on habitat indicators rather than species indicators. Only one of the species indicators applies to the evaluation of any PCE; persistence and genetic integrity is used with two habitat indicators (temperature and refugia) to address PCE 9.

Table II-2. Relationship between Diagnostic Indicators and critical habitat PCEs

Diagnostic Indicator	PCE's of Bull Trout Critical Habitat								
	PCE 1	PCE 2	PCE 3	PCE 4	PCE 5	PCE 6	PCE 7	PCE 8	PCE 9
Species Indicators									
Subpopulation Characteristics									
Subpopulation Size	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Growth & Survival	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Life History Diversity & Isolation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Persistence & Genetic Integrity	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	X
Habitat Indicators									
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 & 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 Condition & 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									
Change in Peak/Base Flows	X	X			X		X	X	
Drainage Network Increase	X				X	X	X	X	
Watershed Conditions									
Road Density & 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	

3. Species and Critical Habitat Affected

Action Area

The action area is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action" (50 C.F.R. § 402.02). It is based upon the geographic extent of the physical, chemical, and biological effects to land, air, and waters resulting from the proposed action, including direct and indirect effects. For bull trout, 5th or 6th field HUCs are the recommended geographic scale for analysis of effects (USFWS 1998).

This biological opinion addresses the effects on bull trout related to the revision of the FNF's Forest Plan; therefore, the action area for the proposed action is the entire Forest. A total of 12 bull trout core areas are located on the FNF. Nine of these core areas are considered simple core areas (i.e., one local population per core area), and three are complex core areas (i.e., multiple local populations per core area). Eight of these core areas are located primarily on lands administered by the FNF. However, four of the core areas have less than ten percent of their land base within the FNF boundary.

The action area also includes four critical habitat sub-units. All four of the sub-units are located within the Clark Fork River Basin CHU (CHU 32). A more detailed description and discussion of each core area within the action area is presented in Tables II-6 through II-8, and in Section F. *Environmental Baseline* of this document.

Relationship of the Action Area to the Hierarchy of Bull Trout and Critical Habitat Analysis Units

The bull trout recovery plan considers a hierarchical order of demographic units ranging from local populations to the range of bull trout within the coterminous United States. This stepdown organization is important for implementing recovery, tracking consultation under section 7 of the Endangered Species Act, identifying and protecting critical habitat, and other aspects of planning and coordination. Core areas represent the closest approximation of a biologically functioning unit for bull trout, containing habitat that could supply all elements for the long-term security of bull trout and one or more local bull trout populations (USFWS 2015). Local populations are considered the smallest group of fish that are known to represent an interacting reproductive unit. Generally smaller, more adjunct resident populations of bull trout that do not meet the criteria for designation as local populations by the U.S. Fish and Wildlife Service also exist. As discussed above, the action area includes 12 bull trout core areas. These core areas are within the Flathead Lake Geographic Region, of the Columbia Headwaters Recovery Unit (Table II-3).

Table II-3. Hierarchy of bull trout demographic units of analysis. Note: (C or S) after each core area indicates if that core area is complex or simple.

Bull Trout Analysis Scale	Hierarchical Relationship
Coterminous United States (DPS)	Range of bull trout
Columbia Headwaters Recovery Unit	One of six Recovery Units in the range of the species within the coterminous United States

Flathead Lake Geographic Region	One of five Geographic Regions in the Columbia Headwaters Recovery Unit
Multiple Core Areas: Flathead Lake (C), Frozen Lake (S), Cyclone Lake (S), Upper Stillwater Lake (S), Upper Whitefish Lake (S), Whitefish Lake (S), Hungry Horse Reservoir (C), Doctor Lake (S), Big Salmon Lake (S), Swan Lake (C), Lindbergh Lake (S), Holland Lake (S)	12 of 22 Core Areas in the Flathead Geographic Region
41 Local Populations (see description below for each local population)	41of 55 local populations within the 12 Core Areas presented above

The action area also contains lakes/reservoirs and stream segments from four critical habitat sub-units (CHSU): Flathead Lake North Fork Flathead River, Flathead Lake Middle Fork Flathead River, Flathead Lake South Fork Flathead River, and Swan River and Lakes. All four of the CHSUs are part of the Clark Fork River Basin Critical Habitat Unit (Unit 31; Table II-4).

Table II-4. Hierarchy of bull trout critical habitat units of analysis.

Bull Trout Critical Habitat Scale	Hierarchical Relationship
Coterminous United States (DPS)	Range of bull trout
Clark Fork River Basin Critical Habitat Unit	One of 32 Critical Habitat Units in the range of bull trout within the coterminous United States
Flathead Lake North Fork Flathead River, Flathead Lake Middle Fork Flathead River, Flathead Lake South Fork Flathead River, and Swan River and Lakes Critical Habitat Sub-Units	Four of 12 Critical Habitat Sub-Units within the Clark Fork River Basin Critical Habitat Unit
Multiple stream segments/water bodies (see description below for more detail)	Many stream segments/water bodies designated as critical habitat within the four Critical Habitat Sub-Units presented above.

F. ENVIRONMENTAL BASELINE

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Environmental baseline is defined as "…the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process." (50 CFR 402.02)

Environmental baseline conditions for bull trout in this BO were assessed using information in the BA (USFS 2017), Bull Trout Core Area Templates (USFWS 2005a), the Columbia Headwaters Recovery Unit Implementation Plan (USFWS 2015b) and the Conservation Strategy for Bull Trout on USFS lands in Western Montana (USFS 2013).

1. Status of Bull Trout in the Action Area

The status of bull trout in the action area is described below by core area. Information on status is derived from the BA (USFS 2017), the Conservation Strategy for Bull Trout on USFS Lands in Western Montana (USFS 2013), and the bull trout core area assessments and 5-year reviews (USFWS 2005a, 2005b, 2015g).

Flathead Lake Core Area

The Flathead Lake Core Area is considered one of the largest, most complex, and best-documented bull trout core areas in the upper Columbia River watershed. The Flathead Lake Core includes all of Flathead Lake, the North Fork Flathead River, Middle Fork Flathead River, and South Fork Flathead River (up to Hungry Horse Dam). In addition to the mainstem rivers, the Flathead Lake Core Area also includes all tributaries within these described areas. The South Fork Flathead River above Hungry Horse Dam forms the separate Hungry Horse Core Area and will be discussed separately in this BO. The Whitefish and Stillwater River systems makeup separate core areas. These core areas are insignificant contributors of bull trout to the Flathead Lake Core Area, largely due to low population densities and decreased distribution within the core area.

The bull trout population in the Flathead Lake Core Area is greatly reduced relative to historic levels. Estimates range from 10 percent to 50 percent of the historical population. It is estimated that approximately 1,600 spawning adult bull trout inhabit Flathead Lake (USFS 2013). This value was derived from redd counts, and only represents bull trout that are mature enough to spawn. The absolute number of bull trout in the Flathead Lake Core Area is likely twice that number given that many non-spawning individuals are not accounted for in redd-based population estimates.

The distribution of populations throughout the core area is likely similar to historic patterns as. local populations are still relatively widespread in about 22 tributaries and occur in all historically occupied systems (occurrence is based largely on the presence of cold water). Life history expression is probably also similar to historic conditions, as most populations are dominated by the adfluvial life history form (USFS 2013).

Bull trout populations in the Flathead Lake Core Area were likely first exposed to significant human-caused impacts in the late 1800s. Prior to this time, bull trout were fished for by native Salish and Pend d'Oreille peoples and maintained relatively robust and widespread populations throughout the Flathead Lake Core Area (USFS 2013). Beginning in the late 1800s, European settlement in the area increased, which brought more fishing pressure and intensive land uses that directly affected bull trout and their habitats. Logging by private landowners in the Flathead Valley, soon followed by timber harvesting by the Forest Service in the early 1900s, was directly and indirectly responsible for extensive changes in habitat (ibid.). Further, the main-stem Flathead River upstream of Flathead Lake was subjected to intensive log removal and channel clearing to facilitate steamboat traffic upstream from Flathead Lake (ibid.).

In the 1950s-1960s, another era of extensive logging in the Flathead River Core Area watersheds began. These practices included the construction of extensive road networks to access timber. These resulted in increased sediment delivery to streams and a proliferation of small-scale fish barriers at road/stream crossings throughout the Flathead Lake Core Area. In addition to directly affecting bull trout habitat, these roads also facilitated increased fishing and harvest or poaching of spawning bull trout in many tributaries. These impacts occurred on FNF lands, as well as state forest lands and other private lands throughout most of the Flathead Lake Core Area.

Currently, non-native fish species represent the primary threat to bull trout in the Flathead Lake Core Area (USFWS 2015e). The early 1900's saw a series of introductions in Flathead Lake that had impacts to bull trout (USFS 2013). Yellow perch, brook trout, lake trout, Yellowstone cutthroat trout, rainbow trout, and kokanee were all stocked in the Flathead Lake system between 1910 and 1916. Brook trout are often cited as contributing to the decline of native fish (MBTSG 1998). The nature of negative interactions between bull trout and brook trout is thought to include competition, predation, and hybridization. The result of species interaction is suspected to be detrimental to bull trout given the apparent overlapping niches of these two species (Leary et al. 1993). Kanda et al. (2002) found that hybridization tends to occur between male brook trout and female bull trout indicating a greater reproductive wasted effort for bull trout than brook trout. Rich et al. (2003) suggested that bull trout may resist brook trout invasion in streams with high habitat complexity and "strong" neighboring bull trout populations.

Perhaps the single greatest threat to bull trout in the Flathead Lake Core Area is the invasion and proliferation of lake trout (USFWS 2015b). From the time of their introduction, lake trout likely had negative effects on bull trout through direct predation and competition for similar food resources in Flathead Lake. However, it was not until the introduction of Mysis shrimp into Flathead Valley lakes in 1967 that the negative interaction between lake trout and bull trout was fully realized (USFWS 2015b). The establishment of Mysis shrimp in Flathead Lake provided juvenile lake trout with a consistent prey base in their deep water habitats. This deep water prey base was not available prior to Mysis introduction and allowed the lake trout population in Flathead Lake to surge. Spencer et al. (1991) concluded that the benefit Mysis shrimp introduction has on lake trout was responsible for the collapse of a formerly strong population of kokanee salmon through direct predation by lake trout. Further, it has been determined that predation, competition, or other forms of negative interaction with lake trout is the factor most responsible for the currently depressed condition of bull trout in this core area (MFWP-CSKT 2000, Fredenberg 2008).

In the mid-1990s greater angling restrictions were instituted on bull trout harvest in the Flathead Lake Core Area. There is currently no harvest of bull trout allowed in the Flathead Lake Core Area, but some incidental mortality is associated with the heavy angling pressure for lake trout in

Flathead Lake and heavy angler use on the Flathead River system, and there is also some limited mortality associated with gillnetting lake trout in the lake.

Many of the past direct habitat impacts associated with logging and road construction have been reduced or eliminated. In addition, much of the habitat where bull trout spawn and rear is protected by a variety of land designations (e.g., Wilderness, Wild and Scenic River). On FNF lands where bull trout exist, there has been minimal development of new roads for timber sales and a strong emphasis on road decommissioning and application of BMPs, in large part due to grizzly bear concerns.

Though Hungry Horse Dam on the South Fork Flathead River isolated a substantial portion (approximately 38 percent) of the spawning and rearing habitat in the core area, the integrity and connectivity of the remaining habitat in the North and Middle Fork Flathead River drainages of this core area is high. The Flathead Lake Core Area is a large core area, with some natural barriers in headwaters and occasional temporary barriers resulting from beaver dams or other natural activities. However, there are no known human-caused barriers on bull trout spawning and rearing streams, and bull trout from Flathead Lake have been documented to travel as far as 150 miles upstream to spawn in headwaters of the North Fork and Middle Fork, as well as into Canada.

Despite the recent improving trend in bull trout habitat, some concerns remain due to the potential for long-term increases in water temperatures, future effects of rain-on-snow precipitation patterns, and potential future land management in the headwaters. Recently, additional emphasis has been placed on identifying and evaluating important bull trout habitat in the British Columbia headwaters of the Flathead, given threats of expanded coal, oil, and gas exploration and development and timber extraction.

An extensive redd count monitoring program was developed and implemented by MFWP beginning in 1980. Based on data collected from eight index tributary streams in the North Fork and Middle Fork of the Flathead River (collectively representing about 45 percent of the known spawning in the basin), bull trout index redd counts ranged from about 300-600 in the 1980s (averaging 392), then dropped drastically in the early 1990s to a range of 83-243 in the seven years prior to listing (averaging 137 between 1991 and 1997). From 1998 through 2017, index redd counts ranged from 130 to 251 redds, averaging 195 (MFWP pers comm.). Some counts were considered minimum counts due to poor conditions during portions of the survey. Based on these counts, the recent trend appears relatively stable at a level roughly half of that in the 1980s.

Flathead River Basin-wide counts were made sporadically in 11 of survey years, representing "all 31 stream sections known to be used by Flathead Lake spawners" (MFWP, pers. comm.). The Basin-wide total has ranged from lows of 236 (1997) and 291 (1992) to highs of 1,156 (1982) and 850 (1986). The Basin-wide count in 2012 was 500, approaching the average count of 578 for the 11 Basin-wide counts conducted since 1980.

Currently, the primary threats to bull trout in the Flathead Lake Core Area are non-native species and fisheries management (USFWS 2015b). In the 1980's, non-native lake trout expanded in the

Flathead Lake and mainstem Flathead River FMO habitat. We discussed this expansion in detail above.

Flathead Lake Core Area Summary

There are 13 local populations within the Flathead Lake Core Area on the FNF. Eight of these local populations are considered "index reaches" in MFWP's redd monitoring program. The index reaches are Trail Creek, Whale Creek, Coal Creek, Big Creek, Morrison Creek, Lodgepole Creek (tributary to Morrison Creek), Granite Creek, and Ole Creek. Although adfluvial bull trout do spawn in other tributaries, these eight streams support the larger adfluvial spawning runs, and redd numbers within them appear to represent about 45 percent of the total adfluvial spawning that occurs in the Flathead Lake Core Area Basin.

Park Creek and Nyack Creek are not included in this discussion because over 95 percent of the land base is in Glacier National Park. Frozen Lake is a simple core area. Cyclone Lake, Upper Stillwater Lake, Upper Whitefish Lake, and Whitefish Lake (also simple core areas) are not discussed here because 90 percent or more of the land base is under state ownership. As a result, direction provided in the Revised Forest Plan would not pertain to these simple core areas because the FNF does not administer lands within, or upstream of these watersheds.

Table II-5 summarizes relevant information from each of the local populations of the Flathead Lake Core Area that occur on FNF lands. This summary is adopted from the bull trout conservation strategy (USFS 2013) and provides an overall assessment of the importance of restoration activities for the entire Flathead Lake Core Area within the borders of the FNF. It does not include necessary restoration activities in watersheds where the FS has no ownership that may be critical for overall restoration of the bull trout population in the core area.

All of the local bull trout populations are also part of the Conservation Watershed Network. The intent is to identify habitat networks of existing strongholds with robust populations and high quality habitat that will support expansion and recolonization to adjacent watersheds. These areas should conserve key processes likely to influence the persistence of populations or metapopulations.

Table II-5. Summary of important local population attributes and conservation recommendations for the Flathead Lake Core Area (USFS 2013).

Local Population	Relative Importance to Core Area	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Trail Creek	High	Upper Trail Creek	Low	Low	Conserve
		Lower Trail Creek	High	Low	Conserve
Whale Creek	High	Upper Whale Cr	Low	Low	Conserve
		Shorty Creek	High	Low	Conserve
		Lower Whale Creek	High	Low	Conserve
Red Meadow Creek	High	Red Meadow Creek	Low	Low	Conserve

Coal Creek	High	Upper Coal Creek	Low	Low	Conserve
		South Fork Upper Coal Creek	High	Low	Conserve
Big Creek	High	Hallowat Creek	High	Moderate	Active
		Upper Big Creek	High	Moderate	Active
		Lower Big Creek	Moderate	Low	Active
Strawberry Creek	High	Strawberry Creek	High	Low	Conserve
Bowl Creek	High	Bowl Creek	High	Low	Conserve
Clack Creek	High	Clack Creek	High	Low	Conserve
Schafer Creek	High	Schafer Creek	High	Low	Conserve
		Dolly Varden Creek	High	Low	Conserve
Morrison Creek	High	Morrison Creek	High	Low	Conserve
Granite Creek	High	Granite Creek	High	Low	Conserve
Long Creek	High	Long Creek	High	Low	Conserve
Bear Creek	Medium	Bear Creek	High	Low	Conserve
Frozen Lake*	Low	Frozen Creek	High	Low	Passive

[a] **Active restoration** is management intervention systematically focused on improving a degraded habitat condition or dysfunctional watershed processes such that the improved habitat can be maintained via restored processes and removal of impairments; **passive restoration** is a restoration process more typified by simply reducing or eliminating the sources of degradation that may allow recovery over time. **conservation** is a strategy intended to maintain one or more existing local populations, habitats, and processes that, compared to other areas in the Core, are functioning well enough to provide a foundation from which other populations can anchor to and reconnect with as active improvements occur in other Core Area locations.

Hungry Horse Reservoir Core Area

The Hungry Horse Reservoir Core Area includes all of Hungry Horse Reservoir and the South Fork Flathead River and all tributaries upstream of the dam. Hungry Horse Dam, completed in 1953, isolates the South Fork Flathead River drainage from its former connectivity with the remaining Flathead Lake system, isolating about 38 percent of the spawning and rearing habitat that would otherwise occur in the Flathead Lake Core Area (Zubik and Fraley 1987). The Hungry Horse Reservoir Core Area bull trout population originated from adfluvial Flathead Lake stocks that were trapped upstream of Hungry Horse Dam. There is no evidence of resident fish occurrence in this core area.

In 1998, the status and trend of bull trout in the Hungry Horse Reservoir Core Area was considered “strong” and “stable” based on information available at the time of listing (USFWS 1998). This was the only Montana core area designated with that combination of attributes and is in sharp contrast to most core areas in western Montana, where current bull trout densities are typically well below historic levels. Since 1998, the population has continued to remain stable and even increase, suggesting that the status and trend designations were accurate. The distribution of bull trout populations throughout this core area is probably similar to historic patterns, as is life form expression (dominated by adfluvial adults). This is a large core area with some natural barriers in headwaters and occasional temporary barriers resulting from beaver dams or other natural activities. There are no known human-caused barriers on bull trout spawning and rearing streams. In recent years, the reservoir has been held at more stable levels (as opposed to drawdowns of up to 200 feet in the early 1990s), further improving connectivity with reservoir tributaries and the upstream watershed. Hungry Horse Dam (564 feet high) is a complete barrier to all upstream and most downstream movement of bull trout. Entrainment of bull trout through the dam probably occurs at low levels but has not been an issue, likely due to the depth and configuration of penstock withdrawal. The South Fork Flathead River upstream of Hungry Horse Dam is a *de facto* native fish refugium, and the barrier the dam presents to upstream movement of non-native species (e.g., lake trout) is currently considered an asset to bull trout recovery.

Hungry Horse Reservoir and the South Fork of the Flathead is the largest bull trout habitat in northwest Montana with a predominantly native fish species assemblage. MFWP has recognized the importance of this and is implementing measures to systematically remove non-native salmonids in the limited headwater lake basins where they occur (as a result of historical stocking programs with rainbow trout and Yellowstone cutthroat trout). The entire upper watershed of the Hungry Horse Reservoir Core Area is within the Bob Marshall Wilderness.

Historic bull trout redd counts are not available. The number, size, and age composition of bull trout that were trapped upstream of the dam at closure in 1953 are unknown. It is likely that numbers were lowest immediately following the construction of the dam and filling of the reservoir and then quickly rebounded with the new habitat and food resources afforded by the reservoir. The population likely expanded for a period of several years through the 1960s (USFS 2013). However, heavy angling, logging on non-wilderness lands surrounding the reservoir, and extreme reservoir drawdowns are surmised to have caused the bull trout population to decline during the 1970s and 1980s. In 1993, due to pending Endangered Species Act action, angling for bull trout was restricted. This facilitated a long-term increase in the population that has sustained itself despite limited angling opportunity and the harvest that was reinitiated beginning in 2004.

Current bull trout densities in the Hungry Horse Core Area appear to be relatively stable or increasing at about 2,500 to 3,000 adults, based on MFWP redd count data from 1993 to present. Because the Hungry Horse Reservoir Core Area was formed by a reservoir that inundated a portion of the previous migratory corridor for fish from Flathead Lake, there was no established previous record of natural carrying capacity for this portion of the system in isolation. Rather, this core area incorporated about 38 percent of the spawning and rearing habitat for the Flathead Lake Core Area (Zubik and Fraley 1987). The loss statement for the Hungry Horse Dam mitigation program concluded that the dam construction eliminated between 1,840 and 2,089 adult bull trout from the Flathead Lake population (Zubik and Fraley 1987). Based on that analysis, we can conclude that the adult bull trout population occupying this core area (estimated at 2,500-3,000 fish) is similar in size to the natural carrying capacity of the area when it was still attached to Flathead Lake. However, it must be noted that although Hungry Horse Reservoir is a large, deep, cold body of water that provides generally excellent foraging, migrating, and overwintering habitat for subadult and adult bull trout, it is not nearly as productive as the natural habitat of Flathead Lake. As a consequence, adult adfluvial bull trout in Hungry Horse

Reservoir are typically not as large as the Flathead Lake fish and their condition factors are not as high.

In contrast to many core areas in western Montana, habitat in the Hungry Horse Reservoir Core Area is large, connected, and secure. In addition, the population has the added benefit of having a large reservoir rearing area, providing habitat that is relatively buffered from environmental extremes and supports adequate natural food resources for a robust bull trout population. A 1985 analysis of 125 stomachs of bull trout from Hungry Horse Reservoir found that native fish made up 99.7 percent of the diet, by weight (May et al. 1988), dominated numerically by northern pikeminnow (39 percent), mountain whitefish (28 percent), suckers (26 percent), and westslope cutthroat trout (7 percent). Currently, the greatest threats are angling (legal or illegal) and reservoir operations (USFWS 2008).

The recreational bull trout fishery on Hungry Horse Reservoir has continued since 2004 and is being closely monitored (Hensler and Benson 2007, Rosenthal 2009, 2010, Rosenthal and Hensler 2008). Angler catch and harvest (in parentheses) of bull trout from Hungry Horse Reservoir has been estimated as follows: 2004-05 catch = 355 (48); 2005-06 catch = 2,154 (58); 2006-07 catch = 623 (56); 2007-08 catch = 533 (57); 2008-09 catch = 621 (74); 2009-10 catch = 832 (97). In addition, anglers participating in the catch-and-release fishery authorized in the upper end of the reservoir and in the South Fork Flathead River into the Bob Marshall Wilderness were estimated to have caught 173 bull trout in 2004, 531 bull trout in 2005, 380 bull trout in 2006, roughly 320 bull trout in 2007, 405 bull trout in 2008, and 370 bull trout in 2009. In total, nearly 13,000 angler days of recreation in the combined reservoir and river fisheries has occurred over the 6-year period, and nearly 7,300 bull trout have been caught, of which 390 (roughly 5 percent) were harvested. The fishery is closely monitored and is not assumed to be a high threat because of the ability to adjust regulations quickly if needed.

Operations of the Federal Columbia River Power System in the past have led to extreme variability in the pool of Hungry Horse Reservoir, at times being drawn down over 200 feet from full. Although drawdowns of that magnitude have been eliminated in recent years, the State of Montana continues to express concern over the effect of water level fluctuation on native fish and recreation. Despite these variable pools, we are not aware of any data indicating bull trout populations have shown any measurable negative response.

In 2003, a series of major fires burned large portions of the bull trout habitat in the South Fork of the Flathead River drainage, which are the headwaters of this core area. In recent years, logging activities have been minimal with the exception of some post-fire salvage. Rain-on-snow events heavily impacted west-side reservoir tributaries in 2003 and again in 2006, with large debris flows and several culvert and bridge blowouts. Despite this, or perhaps related to these flushing flows, bull trout spawning numbers in several of these streams (e.g., Wounded Buck and Wheeler Creeks) increased through the period 2006-2008 (MFWP redd count data, pers. comm.). There are eight bull trout spawning index reaches in the Hungry Horse Core Area. Collectively, these eight reaches represent up to 85 percent of the total Basin-wide spawning of bull trout. The data show that the four index streams in the wilderness support approximately 70 percent of the bull trout spawning in the Hungry Horse Core Area (MFWP redd count data, pers. comm.).

Hungry Horse Reservoir Core Area Summary:

There are ten local populations within the Hungry Horse Reservoir Core Area on the FNF. All ten local populations in the core area support adfluvial bull trout spawning, as there are no known resident populations. A similar pattern, in terms of importance, may have existed historically between these streams and today as they provide the largest amount of high quality groundwater-influenced spawning and rearing habitat due to their relative size and quality.

Table II-6 below summarizes relevant information from each of local populations in the Hungry Horse Reservoir Core Area. It should be noted that Table II-6 also includes two simple core areas (Big Salmon and Doctor Lake). These two simple core areas are included in the Hungry Horse Reservoir Core Area discussion because they are within the Hungry Horse Reservoir watershed, but the bull trout in these lakes do not demonstrate interchange with the larger reservoir downstream. Thus, they are considered simple core areas as they have one designated spawning and rearing stream and one FMO water body (i.e., Big Salmon and Doctor Lakes).

The following table is a summary that provides an overall assessment of the estimated cost, timeframe, and importance of restoration activities for the entire Hungry Horse Core Area within the borders of the Flathead National Forest. It does not include necessary restoration activities in watersheds where the Forest has no ownership that may be critical for overall restoration of the bull trout population in the core area.

Table II-6. Summary of important local population attributes and conservation recommendations for the Hungry Horse Core Area (USFS 2013).

Local Population	Relative Importance to Core Area	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Danaher Creek	High	Lower Danaher Creek	High	Low	Conserve
		Upper Danaher Creek	High	Low	Conserve
		Basin Creek	High	Low	Conserve
		Rapid Creek	High	Low	
Youngs Creek	High	Lower Youngs Creek	High	Low	Conserve
		Upper Youngs Creek	High	Low	Conserve
		Babcock Creek	High	Low	Conserve
Gordon Creek	High	Lower Gordon Creek	High	Low	Conserve
Little Salmon Creek	High	Little Salmon Creek	High	Low	Conserve
Bunker Creek	Low	Lower Bunker Creek	High	Low	Passive
		Upper Bunker Creek	High	Low	Passive

Local Population	Relative Importance to Core Area	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
		Gorge Creek	High	Low	Conserve
Spotted Bear River	High	Lower Spotted Bear River	High	Low	Passive
		Dean Creek	High	Low	Conserve
		Middle Spotted Bear River	High	Low	Conserve
		Wall Creek	High	Low	Conserve
		Spotted Bear River Headwaters	High	Low	Conserve
Sullivan Creek	High	Sullivan Creek	High	Moderate	Active
Wheeler Creek	High	Wheeler Creek	High	Moderate	Active
Wounded Buck Creek	High	Wounded Buck Creek	High	Low	Passive
Doctor Lake Core Area	High	Upper Gordon Creek –	High	Low	Conserve
Big Salmon Lake Core Area	High	Big Salmon Lake	High	Low	Conserve

[a] **Active restoration** is management intervention systematically focused on improving a degraded habitat condition or dysfunctional watershed processes such that the improved habitat can be maintained via restored processes and removal of impairments; **passive restoration** is a restoration process more typified by simply reducing or eliminating the sources of degradation that may allow recovery over time. For instance, INFISH standards and guidelines are intended to reduce new or ongoing management pressures to riparian areas that can degrade or maintain degraded riparian and stream conditions; **conservation** is a strategy intended to maintain one or more existing local populations, habitats, and processes that, compared to other areas in the Core, are functioning well enough to provide a foundation from which other populations can anchor to and reconnect with as active improvements occur in other Core Area locations.

Swan Lake Core Area

The Swan Lake Core Area includes all of Swan Lake and the Swan River and all tributaries upstream. The Swan system is an important component of the overall Flathead River aquatic ecosystem. However, warm water temperatures in the lower Swan River (below Swan Lake) have most likely limited the degree of bull trout movement between Flathead Lake and the Swan Lake system (USFS 2013). The Swan Lake Core Area has therefore likely always functioned primarily as a separate core area from the Flathead Lake Core Area (ibid.).

Swan Lake is recognized as a bull trout stronghold. Current bull trout densities in the Swan Lake Core Area are roughly half of what they were historically. This is in contrast to most core areas in western Montana, where densities are much less than their historic level. Like the Flathead Lake and Hungry Horse Reservoir Core Areas, the distribution of populations throughout the Swan Lake Core Area is likely similar to historic patterns with populations still relatively widespread where suitably sized streams exist. Life form expression in this core area is dominated by adfluvial adults. This is likely similar to historical patterns, as no major barriers exist in the core area. Bigfork Dam, located approximately two miles upstream of Flathead Lake, is the only large barrier. However, the impact of the dam on bull trout movement is probably minimal due to the thermal barrier described above.

Bull trout populations in the Swan Lake Core Area were likely first exposed to significant human-caused impacts in the late 1800s. During this time, European settlement in the area increased, which brought more fishing pressure and intensive land uses that directly affected bull trout and their habitats. Logging on both private land and the national forest in the early 1900s was responsible for much of the change in habitat, as intensive harvest activities and road building took place.

In the 1950s-1960s, another era of extensive logging in the Swan Lake Core Area began. During this time additional roads were constructed to access the timber, which resulted in increased sedimentation into bull trout tributaries. Further, increased road building led to a proliferation of small-scale fish barriers at road and stream crossings. These roads not only affected habitat but also facilitated increased fishing and excessive harvest or poaching of spawning bull trout in many tributaries. These impacts occurred on both Forest Service and private and corporate lands throughout most of the Swan Lake Core Area.

As with the Flathead Lake Core Area, the early 1900's also saw the introduction of a number of non-native fish species. Yellow perch, brook trout, Yellowstone cutthroat trout, rainbow trout, and kokanee salmon were all stocked at various locations within the Swan Lake Core Area between 1910 and 1936. Brook trout represented the greatest threat to bull trout in the core area through direct competition for resources and hybridization. These threats continue today, primarily in a number of spawning and rearing tributaries of the Swan River. In several major bull trout spawning tributaries in the Swan Lake Core Area over half the *Salvelinus* biomass is composed of brook trout or bull trout × brook trout hybrids (USFS 2013). The introduction of kokanee, on the other hand, likely had a positive effect on bull trout populations by providing an abundant high-quality food source in Swan Lake. Although kokanee salmon may have largely replaced the native westslope cutthroat trout, this effect may have bolstered the bull trout population by creating an unnaturally elevated prey base. In the period from approximately 1930 to 1960, bull trout populations were more carefully managed with increased angling protection and were observed to have increased in the Swan Lake Core Area.

The mid to late 1900's saw yet another wave of non-native species introductions into the Swan Lake Core Area. Mysis shrimp were introduced into Swan Lake in 1967, and northern pike began appearing in Swan Lake around 1970. The introduction of Mysis shrimp had a beneficial effect on bull trout populations because they supplemented the food chain by providing forage for Swan Lake's kokanee salmon population. However, northern pike had a negative effect on bull trout in Swan Lake by preying upon juvenile bull trout, and also by competing with adult bull trout for resources. Bull trout and northern pike have been somewhat more compatible in Swan Lake than some other systems through the past four decades, likely due in large part to the partitioning of available habitat and limited northern pike recruitment combined with robust productivity of bull trout in the system.

The 2015 Columbia Headwaters Recovery Unit Implementation Plan (RUIP) for Bull Trout (USFWS 2015b) identified non-native fish as the primary threat to bull trout in the Swan Lake Core Area. Of non-native species, the greatest threat to bull trout is the recent introduction of lake trout into the system. In 1998 anglers in both Swan Lake and the Swan River began catching adult sized (20-30 inches) lake trout. These occurrences led to wide-spread concern given the ability for lake trout to rapidly dominate lacustrine fish communities with Mysis shrimp (Martinez 2009). In 2003, the level of concern was compounded when biologists gillnetted juvenile lake trout from Swan Lake during standard low-intensity sampling efforts, indicating that wild reproduction was occurring. Since 2003, lake trout catch by anglers as well as during biological sampling has continued to increase, another indication that the population was reproducing in the wild. Research efforts from 2006-2008 focused on lake trout population demographics and exploring potential techniques to reduce numbers while minimizing bull trout bycatch. Based on case histories from nearby waters, managers determined that developing long-term management actions to control this increasing lake trout population was necessary (Rosenthal and Fredenberg 2017). In 2009, a three-year experimental removal of lake trout in Swan Lake began (ibid.). This removal experiment was a feasibility study to determine the effectiveness of using targeted gillnetting as a technique to reduce the number of Lake Trout and thus minimize threats to bull trout. The project resulted in the removal of over 20,000 lake trout from Swan Lake between 2009 and 2011. The effort was extended for five years in 2012 (through 2016) to further evaluate the long-term effectiveness of lake trout suppression on Swan Lake. In total, over 59,700 lake trout were removed from Swan Lake (Rosenthal and Fredenberg 2017). The results of this assessment are under consideration by the Swan Valley Bull Trout Working Group, a group of representatives from state and federal agencies (including the Service, USFS, MFWP) and other interested groups (e.g., Trout Unlimited). At the time this biological opinion was written, the Service is recommending that lake trout suppression on Swan Lake continues in an effort to address the primary threat to the Swan Lake Core Area. This recommendation has been made to the remaining members of the Swan Valley Bull Trout Working Group, but a consensus on the need for continued lake trout suppression has not been met. The Service is continuing to engage with all members of the working group to try and identify a path forward, and address the impact that invasive lake trout are having on bull trout populations in the Swan Lake Core Area.

In the mid-1990s, greater angling restrictions were instituted on bull trout harvest within the Swan Lake Core Area. Perhaps most significantly, the four most important spawning streams (Lion, Goat, Squeezer, and Elk Creeks) allow no recreational fishing at all, thus eliminating any incidental mortality. This action, along with habitat practices, helped generate a noticeable increase in the Swan Lake Core Area bull trout population for the next decade or more. Until very recently, the Swan Lake Core Area was considered strong enough to permit a limited recreational fishery on Swan Lake.

Many of the past direct habitat impacts associated with logging and road construction have been reduced or eliminated, and therefore some stressors on the population no longer play as large a role as they did historically. Most spawning streams have relatively good habitat conditions. Recent inventory and monitoring work has found that many streams are within a standard deviation of unmanaged, reference streams (USFS 2013). Beginning in the 1990s and continuing into the early 2000s many historic, undersized culverts were replaced and best management practices on road surfaces greatly reduced the legacy impact of roads. Since 2006, acquisition and conservation easements on more than 85,000 acres of lands through the Montana Legacy Project, The Nature Conservancy, BPA, Trust for Public Lands, the Service, congressional appropriation, and MFWP, as well as other improvements through programs such as the Montana Department of Natural Resources and Conservation’s Habitat Conservation Plan, should continue to contribute to this positive habitat trend.

Despite improved habitat practices and elimination of all angler harvest, bull trout populations in the Swan Lake Core Area appear to be steadily decreasing based on redd count data. Annual redd counts in the Swan Lake Core Areas four index streams (Elk, Goat, Squeezer and Lion Creeks) totaled 519 in 2000. By contrast, the total counts from those four streams in 2016 (the most recent counts available) was 177 (MFWP pers. comm.). There may be several reasons for this decline including the introduction of lake trout into Swan Lake, and expression of the inherently high variability in bull trout populations. While bull trout numbers in the Swan Lake Core Area have declined over the past decades relative to historic levels, they remain stronger than many core areas in the Columbia Headwaters Recovery Unit. Given the presence of tributaries dominated by hyporheic (i.e., groundwater) flow, it is likely that bull trout populations in the Swan Lake Core Area will remain strong if the lake trout threat can be successfully addressed.

Currently, the main factor limiting bull trout populations in the Swan Lake Core Area are non-native fish communities throughout the system (lake trout in Swan Lake and brook trout in tributaries). Other impacts, such as fishing mortality and poaching, also remain a concern.

It should be noted that there are two disjunct populations within the Swan Lake Core Area that are designated as separate core areas: the Holland Lake Core Area and Lindbergh Lake Core Area. Both of these are considered simple core areas, and they both occur wholly within the Swan Lake Core Area drainage. Unfortunately, lake trout have recently been documented in both the Holland Lake and Lindbergh Lake Core Areas. Introduction was likely from individual lake trout travelling up the Swan River from Swan Lake. While there may be a small degree of interchange between the Swan Lake, Holland Lake and Lindbergh Lake Core Areas, there is no evidence that suggests this occurs with any regularity. These two simple core areas are included in the Swan Lake Core Area discussion because they are within the Swan Lake watershed, but the bull trout in these lakes do not demonstrate interchange with the larger complex core area (Swan Lake).

Swan Lake Core Area Summary

There are nine local populations of bull trout within the Swan Lake Core Area (see Table II-7 below). Although adfluvial bull trout do spawn in other tributaries, these tributary streams support the majority of fluvial spawning, and redd numbers within them likely represent over 90 percent of the total adfluvial spawning that occurs in the core area.

Of the nine local populations in the core area, Lion Creek, Goat/Squeezer Creeks, and Elk Creek currently support the majority of adfluvial bull trout spawning. A similar pattern, in terms of importance, may have existed historically between these streams as they provide the largest amount of high quality groundwater-influenced spawning and rearing habitat due to their relative size and quality.

Table II-7 summarizes relevant information from each of the 6th field HUC local populations. This summary provides an overall assessment of the estimated cost, timeframe, and importance of restoration activities for the entire Swan Lake Core Area within the borders of the Flathead National Forest. It does not include necessary restoration activities in watersheds where the FNF has no ownership that may be critical for overall restoration of the bull trout population in the core area.

Table II-7. Summary of important local population attributes and conservation recommendations for the Swan Lake Core Area (USFS 2013).

Local Population	Relative Importance to Core Area	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Elk Creek	High	Elk Creek	High	Low	Conserve
Cold Creek	Low	Cold Creek	Low	Moderate	Active
Jim Creek	High	Jim Creek	High	Low	Active
Piper Creek	Medium	Piper Creek	Moderate	Low	Conserve
Lion Creek	High	Lion Creek	High	Low	Conserve
Goat Creek	High	Goat Creek	High	Low	Conserve
Woodward Creek	High	Woodward Creek	High	Low-Moderate	Passive
Soup Creek	Low	Soup Creek	Low	Moderate	Conserve
Lost Creek	Medium	Lost Creek	Moderate	Low	Conserve
Lindbergh Lake Core Area	High	Headwaters Swan River	High	Low	Active
Holland Lake Core Area	High	Holland Creek	Moderate	Moderate	Passive

[a] **Active restoration** is management intervention systematically focused on improving a degraded habitat condition or dysfunctional watershed processes such that the improved habitat can be maintained via restored processes and removal of impairments; **passive restoration** is a restoration process more typified by simply reducing or eliminating the sources of degradation that may allow recovery over time. For instance, INFISH standards and guidelines are intended to reduce new or ongoing management pressures to riparian areas that can degrade or maintain degraded riparian and stream conditions; **conservation** is a strategy intended to maintain one or more existing local populations, habitats, and processes that, compared to other areas in the Core, are functioning well enough to provide a foundation from which other populations can anchor to and reconnect with as active improvements occur in other Core Area locations.

2. Status of Critical Habitat in the Action Area

The baseline for critical habitat will be discussed for the core area as a whole. Critical habitat applies only to those specifically designated streams (75 FR 63898) and only to the area within the ordinary high watermark. The following description and discussion considers all designated critical habitat within each bull trout core area included in the Action Area. While much of the actual stream segments or lakes/reservoirs are not on lands administered by the FNF, these water bodies are still considered inside the Action Area due to their close proximity to FNF lands or potential downstream effects on FNF lands within the drainages.

Critical Habitat in the Flathead Lake Core Area

A total of 283 miles of streams rivers and 126,474 acres of lakes—Flathead Lake (122,318 acres), Cyclone Lake (141), Frozen Lake (22), Upper Stillwater Lake (593), Upper Whitefish Lake (80), and Whitefish Lake (3,320)—are included in the designation of critical habitat for the Flathead Lake Core Area on NFS lands.

The operation of Hungry Horse Reservoir and downstream temperature/flow influence may affect PCEs 4, 5, 7, and 8.

PCE 9 is degraded because of the influence of lake trout within Flathead Lake. Brook trout abundance within this core area is absent to low, but interaction between bull trout and brook trout is greatest in Bear Creek.

Critical Habitat in the Hungry Horse Reservoir Core Area

A total of 223 miles of streams and 28,710 acres of reservoirs/lakes—Hungry Horse Reservoir (23,602 acres), Big Salmon Lake (973), and Doctor Lake (53)—are included in critical habitat for the Hungry Horse Reservoir Core Area. Forest management has relatively little influence in the reservoir. This core area exhibits perhaps the strongest record of an increasing/stable trend across the entire U.S. range of bull trout due to the majority of populations within the Bob Marshall Wilderness. Consequently, the PCEs in this core area appear to be functioning appropriately for the most part, with perhaps the exception of local populations outside the wilderness and the management of reservoir levels. Risk to the function of the PCEs appears minimal.

The large surface area of the reservoir allows for greater solar insolation and raises, water temperatures in the reservoir, although the impact on fish, if any, is unclear (PCE 5). The dam and its regulation based on energy production needs disrupt the natural hydrograph governing the timing and quantity of runoff (PCE 7) downstream of Hungry Horse Dam and subsequently Flathead River. The Hungry Horse Reservoir Core Area is most likely the only core area in Montana that does not have any local populations influenced by non-native species, and thus PCE is very strong.

Critical Habitat in the Swan Lake Core Area

A total of 90 miles of stream/river and 4,506 acres of lakes—Swan (3,275 acres), Holland (414), Lindbergh (817)—are included in the critical habitat for the Swan Lake Core Area. The greatest threat to critical habitat in this core area is non-native lake trout in Swan Lake, affecting PCE 9. Forestry practices have also had extensive impacts to this core area , affecting PCEs 3, 4, 6, and 8.

G. EFFECTS OF THE ACTION

Effects of the action are "…the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline." [50 CFR §402.02] These effects are considered along with the predicted cumulative effects to determine the overall effects to the species for purposes of preparing a BO on the proposed action. Direct effects are defined as those that result from the proposed action and directly or immediately impact the species or its habitat. Indirect effects are those that are caused by, or will result from, the proposed action and are later in time, but still reasonably certain to occur.

1. Factors to be Considered

Proposed forest-wide desired conditions, objectives, guidelines and standards will affect subsequent project design when implementing forest management activities in the future. These forest-wide desired conditions, objectives, guidelines and standards affect future management decisions, but authorize no immediate activities or changes to ongoing ones. Therefore, all effects of the Revised Forest Plan are indirect, and no direct effects occur to bull trout as a result of the proposed action. Project-level activities that result from implementation of forest plan direction will undergo site-specific environmental review and section 7 ESA consultation., as appropriate, as they are proposed.

Nearly all Forest Service management activities allowed within the different Management Area categories in the Revised Forest Plan have the potential to affect bull trout and their habitats, either directly or indirectly, where they overlap with occupied habitat. Land management activities that disturb the soil surface adjacent to or in occupied habitat have the greatest potential to result in adverse effects to bull trout and bull trout critical habitat. Those activities that have the greatest potential to affect bull trout and bull trout critical habitat include: vegetation management, fuels management, livestock grazing, roads, mining, recreation and aquatic restoration activities. In addition, watershed improvement designations in the Revised Forest Plan provide opportunities for activities to restore, improve, or rehabilitate habitat quantity and quality, thus contributing to bull trout recovery. The potential impact of these various management activities is discussed below.

Vegetation Management

General Effects of Vegetation Management

Vegetation management has the potential to cause accelerated erosion primarily through construction of temporary roads and skid trails to access treatment areas. Timber harvest may affect flow regimes by reducing evapotranspiration, interception, and snow accumulation patterns, and by increasing soil moisture and surface runoff. Timber harvest directly adjacent to streams and wetlands can reduce shade, raise water temperatures, and reduce the potential for recruitment of woody material. Greater temperature fluctuations (both diurnal and seasonal) can also occur when riparian vegetation is removed or decreased.

Studies have documented increased sediment erosion associated with timber harvest, but the primary agent is sediment from roads (Bilby et al. 1999, Sugden and Woods 2007). Management actions can control non-point delivery of sediment within harvest areas through the use of water and soil conservation practices and best management practices (USFS 2012). These efforts are typically focused on stabilization of log skidding and landing networks where erosion is most likely to occur. Elliot et al. (2000) found that erosion after disturbance from timber harvest typically lasted 1 to 3 years. They also found that following timber harvest and site preparation, regrowth of vegetation covers the soil surface with plant litter and soils armor, and potential erosion hazard becomes low (ibid.).

The loss of forest canopy in harvest sites can also alter the water balance of an aquatic ecosystem. Studies in the Pacific Northwest have documented cases where excess water from harvest areas influenced the peak and timing of stream flows (Keppeler and Ziemer 1990, Moore and Wondzell 2005, Stednick, 1996). 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. Peak flow increases were raised as a concern due to their potential to alter stream morphology and degrade water quality. 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 et. al 2006, Macdonald et. al 2003).

Prescribed fire associated with vegetation management can also have impacts to aquatic ecosystems. Burned areas can accelerate runoff due to soil sealing from ash that lowers the infiltration capacity of soils (Doerr et al. 2006, Larsen et al. 2009). These conditions vary spatially and decrease over the first year as products of burning in the soil degrade (Doerr et al. 2006, Wondzell and King 2003). 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.

Effects of Vegetation Management Specific to the Proposed Action

Under implementation of the proposed action, most vegetation management activities are anticipated to occur in management areas 6b and 6c (general forest). Vegetation management activities are allowed in management areas 3a (special areas), 4a (research natural areas), 4b (experimental forests), 5a, 5b, and 5c (backcountry), 6a, 6b, and 6c (general forest), and 7 (focused recreation areas), although only management areas 6b, 6c, and a portion of 7 are suitable for scheduled timber production.

The Revised Forest Plan would limit the effects of vegetation management activities to bull trout in the action area through direction provided in standards and guidelines that pertain to Riparian Management Zones (RMZs). Specifically, Revised Forest Plan standard FW-STD-RMZ-06 only allows vegetation management in the inner portion of the RMZ if that activity is required to restore or enhance aquatic and riparian-associated resources (see Appendix 2). As a result, entry into the inner zone of an RMZ will be limited due to the critical role this zone serves in terms of providing shade, large woody debris recruitment, bank stability, and sediment control. This standard ensures that riparian and aquatic processes and functions receive primary consideration within the inner RMZ.

The proposed action will also include Forest Plan components that will prohibit the construction of roads and landings associated with vegetation management within the RMZ (FW-GDL-RMZ-11), as well as prohibit the use of ground-based equipment within the RMZ (FW-GDL-RMZ-12). While limited vegetation management within the outer RMZ will be allowed under the proposed action, the Revised Forest Plan includes a number of elements that will ensure a diverse forest structure within the RMZ. Guidelines FW-GDL-RMZ-08 through 10 apply to the entire RMZ and direct actions in a manner that will retain live reserve trees and snags greater than 12 inches in diameter. With the implementation of RMZ-associated standards and guidelines, implementation of the Revised Forest Plan will only allow activities that provide a direct benefit to aquatic resources (inner RMZs), or do not retard riparian and stream function (outer portion of the RMZs).

Increase sediment resulting from vegetation management activities can affect aquatic habitats for bull trout. Revised Forest Plan direction is intended to protect bull trout and bull trout designated critical habitat from possible detrimental effects due to timber harvest. Desired conditions for soils include maintaining soil productivity and hydrologic function as well as minimizing effects and recovering areas that have incurred detrimental disturbance (FW-DC-SOIL-01, 02, 03). The desired conditions, standards, and guidelines for soils will benefit bull trout by reducing negative effects resulting from sediment delivery to designated critical habitat. The plan components that provide direction for decommissioning temporary roads (FW-STD-SOIL 3 and 4) will provide improved conditions over the existing Forest Plan since temporary roads were not addressed.

Restoring soil productivity on previously impacted areas is a forest-wide objective (FW-OBJ-SOIL-01), and existing sediment issues would therefore continue to improve under the proposed action. Project-level design criteria contain direction to protect soils during vegetation treatments such as timber harvest and prescribed fire (FW-GDL-SOIL-01, 02, 03, 04). Further, soil productivity would be maintained or improved under the Revised Forest Plan. FW-GDL-RMZ-13 minimizes effects to RMZs by limiting ground-based logging equipment, skid trails, landings, and roads. As restoration activities trend vegetation towards desired conditions and road segments are improved to reduce likelihood of culvert failures (FW-GDL-CWN-01), watershed health is expected to improve. FW-DC-WTR-04 and 06 emphasize the protection of water quality and habitat during all management activities, and improved water quality will ultimately benefit bull trout.

Fuels Management

General Effects of Fuels Managment

Fuels management typically consists of wildfire suppression and prescribed fire associated with multiple resource objectives. Resource objectives associated with fire are typically driven by desired conditions for on-site vegetation.

Suppression of natural fire regimes has resulted in forests with more trees and associated leaf area. This results in higher evapotranspiration and interception levels, which decreases water volumes available for surface and sub-surface flow. Lower levels of instream flow can affect the aquatic species as a result of warmer water temperatures and changes in water chemistry. In addition, fire suppression can allow fuels to accumulate above natural levels, which results in wildfires that burn more severely. High intensity fire can change infiltration characteristics of the soil and change hydrologic characteristics in watersheds when they occur over large areas (Doerr et al. 2000, Cannon et al. 2010). Fire suppression tactics, such as retardant use and drafting water from streams also affect riparian and aquatic resources. Conversely, use of wildland fire for multiple objectives and prescribed fire can affect flow regimes by reducing evapotranspiration, interception, and snow accumulation patterns, and by increasing soil moisture and surface runoff.

The severity of fires along streambanks and shorelines can vary. 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 ground cover, and result in soil erosion and sedimentation to nearby water bodies and loss of important transitional habitats for aquatic dependent species (Zwolinski 2000).

Prescribed fire is commonly used on the forest to prepare sites for planting, improve wildlife forage, and reduce fuels for future fire suppression. Types of treatment are typically defined by their timing which is late spring just before green up or in the fall when the risk of wildfire is greatly reduced.

Spring burns typically are used to improve wildlife forage. They protect soils and retain some duff layer component due to the high soil moisture present in spring (Robichaud and Miller 1999). Fall burns typically expose about 20-30% mineral soil and are more typically associated with site preparation for replanting areas harvested for timber (USFS 2017). In both cases sediment production from the burned areas would be minimal. Some burn units may have fireline constructed which exposes bare soil. Standard erosion control practices or BMP's would be applied to minimize sediment production. Rare instances of storm-event erosion, channeling of water down soil depressions, or minor road surface erosion from equipment use may result in minor additional fine sediment loads in streams proximate to operations. The magnitude of the expected sediment change is small, and the minor additional load that may result from prescribed fire treatments typically results in immeasurable and discountable effects to bull trout and designated critical habitat.

Effects of the Fuels Management Specific to the Proposed Action

The proposed action would limit the impact of fire suppression activities on sensitive areas and RMZs. The Revised Forest Plan will carry forward forest plan components that will locate fire camps away from riparian areas where risk of sedimentation and degradation to water quality is highest (FW-GDL-RMZ-03). The Revised Plan will also include a guideline with stronger language to avoid degrading water quality from suppression activities by minimizing suppression activities in RMZs (FW-GDL-RMZ-05). Specifically, this will include specific direction to avoid fuel storage in RMZs that could contaminate streams (FW-GDL-RMZ-04).

Impacts to bull trout 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 than would be caused by the addition of chemical, foam, or additive delivery to surface waters in RMZs.

Other fire suppression effects to water quality may occur during fire retardant drops. Large quantities of retardant can kill fish, and even indirectly applied fire retardant can kill stream invertebrates and cause eutrophication of downstream reaches (Spence et al. 1996). The Revised Forest Plan would improve direction for fire retardant drops. Rather than relying solely on resource advisors to avoid risks, areas of high risk would be mapped to improve the communication of where aerial operations need to avoid dropping fire retardant (FW-GDL-RMZ-02). 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, 2011a). Potential meltwater stonefly habitat, defined as areas in proximity to ice masses, have been mapped and have been added to the retardant avoidance maps.

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, and because wildfires are natural disturbance events. However, monitoring of these effects has shown mostly temporary, transient effects of wildfire on water quality. Monitoring by MFWP of percent fines in the North Fork Flathead River drainage in Trail, Whale, Coal and Big Creeks following the Moose Fire (2001) and the Robert Wedge Fire (2003) showed only small increases in sediment in the year following each fire, with a return to base levels within several years.

Access Management - Roads

General Effects of Roads

Road networks have been shown to have detrimental effects on water and aquatic resources in forested landscapes. Road systems can change a natural hydrologic regime by altering natural flow patterns and increasing sediment delivery to streams. Roads have been shown to destabilize side-casted material and hillsides, expand the lengths of gullies and stream channels, increase sediment delivery, and alter streamflow and channel adjustments (Furniss et al. 1991).

The presence of roads can also affect natural drainage patterns over the long-term. Roads intercept subsurface drainage in cutslopes, capture rainfall on hardened road surfaces, and route excess runoff into the stream channel system. These impacts increase as the road system becomes more connected, in terms of hydrology, to the natural channel network. 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. These alterations can increase the delivery of water to the mouth of a watershed during snow melts and storm events, which can increase peak flows in streams and water levels in ponds, lakes, and wetlands.

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 et al. 2010, 2016). In general, roads lacking surface rock, those with steep grades and steep side slopes, and those that cross streams or are in proximity to streams are the greatest contributors of sediment from surface erosion. In steep terrain, roads can increase the rate of fill slope failures and soil mass wasting. Excessive fine sediment loading can lead to changes in channel morphology and water temperature because of pool filling, widening of the channel, and making the channel shallower, which can result in water temperature increases as a result of having a shortened water column that takes less solar energy to heat. Such changes in channel morphology are typically found at road-stream crossing locations and in response to mass failures associated with road runoff. Sometimes roads capture flow out of the channel and result in the stream rerouting down the road, which typically results in road failure and more sediment delivery to streams.

Vehicle traffic also contributes to sediment delivery from roads, particularly if ruts develop in the road and if traffic is heavy when the ground is more saturated. Log haul during timber sales is typically done on the same road system for weeks or months at a time, and thus the quantity and repeated nature of this traffic make it a systematic, recognizable source of sediment on forest roads (Al-Chokhachy et al. 2016, Cissel et al. 2014).

The location and design of valley bottom roads can also lead to long-term effects on aquatic resources. Poorly placed roads can encroach on stream channel and floodplain areas. Many historic roads were constructed very close to stream channel areas, often in the floodplain. In some cases, streams were straightened to accommodate road placement. Roads can affect stream channels directly if they are located on active floodplains or directly adjacent to stream channels. For example, a road located adjacent to a stream can be a chronic source of sediment. If the road changes the morphological characteristics of the stream, a chain reaction of channel adjustments that can result in accelerated bed and streambank erosion, which produces excessive sediment (Al-Chokhachy et al. 2016).

Not all sediment production from roadways reaches the aquatic system. Many of the aforementioned effects of roads can be mitigated by design changes that disperse rather than concentrate road runoff. Properly designed and maintained road treatments can decrease runoff and sediment loading to streams. Proper design provides stable cut and fill slopes, and adequate drainage that allows water to filter through vegetated strips or sediment traps before entering the stream channel. The effectiveness of vegetative strips generally increases with increased width and lower hillslope gradient, but the effects of chronic road problems may still impact streams even when streams are protected by wide and intact vegetative strips (Trombulak and Frissell 2000). Other design elements used to mitigate road interception and runoff are the addition of gravel surfacing and seasonal road closures. Road treatments can upgrade or remove problem culverts to allow sediment and wood to move downstream instead of accumulating upstream of roads, potentially leading to culvert blockages and failures. However, temporary, short-term, and long-term sediment and turbidity increases can occur from project implementation as well as from post-project stabilization.

Turbidity and sediment increases can also result from the construction of roads. This increase is typically due to the heavy equipment required for road grading, ditch cleaning, culvert replacement, road ripping/decompaction, and the installation of water bars. Minor amounts of fine sediment can be delivered to streams during implementation of road treatment activities and during the first substantial runoff event. Subsequent runoff events would contribute less sediment production over time, but these contributions can be expected to last up to one year later or until vegetation is established on bare-soil areas adjacent to streams. Design criteria and best management practices are used to minimize the amount of fine sediment entering stream channels while work is in progress and after the work is completed, including promoting vegetation establishment through seeding.

Roads that are at high risk of failure and have the potential to cause extensive resource damage are candidates for relocation or decommission. Preferred locations for roads are away from stream channels, riparian areas, steep slopes, high-erosion-hazard areas, and areas of high mass movement. Realignment of roads so they traverse riparian areas and streams at perpendicular angles rather than parallel angles can also improve the quality of riparian and aquatic habitats in presently impacted stream reaches by reducing chronic sediment sources.

The potential for roads to have detrimental effects on aquatic resources exists as long as the road is retained. Continued use of roadway segments poses a risk of erosion, slope failure, and sediment delivery to receiving waters. Road decommissioning reduces the long-term risk of sediment delivery to streams from roads and roadside ditches through reducing culvert failures and landslides, eliminating vehicular traffic, improving infiltration of water into the ground through decompaction of road surfaces, and reducing overland and ditch flow into streams. Although a short-term increase in sediment delivery is typically expected during culvert removal and/or the road decommissioning process, the amount of sediment delivered in the long-term is usually expected to be significantly less than would occur if the roads were left under current maintenance. Cook and Dresser (2007) found that stream crossings that were restored through decommissioning delivered only 3 to 5 percent of the amount of fill material that was originally located at each crossing.

Removal or closure of roads adjacent to streams can have short- and long-term positive effects on soil hydrologic function, soil productivity, and stream water temperature. Trees and other riparian vegetation can recolonize a ripped roadbed and help provide shade. The magnitude of these improvements can depend on a variety of factors, including existing stream shade that blocks solar radiation and water temperature, stream size, and how much riparian road is removed or closed.

<u>Effects of Roads Specific to the Proposed Action</u>

The Revised Forest Plan does not include any objectives specifically for road construction as it relates to soil and aquatic resource protection or restoration. However, the plan does include an objective for 30 to 60 miles of road decommissioning or the placing of roads into intermittent storage (FW-OBJ-IFS- 01). These efforts are likely to occur on lands designated as management area 6, where active restoration opportunities present themselves through the implementation of site-specific projects. With the implementation of Revised Forest Plan direction, overall watershed conditions would improve with the reduction in road densities.

Current management activities to improve water quality and aquatic habitats have included a reduction in the number of stream crossings or rehabilitation of their condition. This emphasis on improving or removing stream crossings for the benefit of bull trout and other native fish would continue with implementation of the revised Forest Plan through standards, guidelines and objectives (FW-STD-IFS-7, FW-GDL-IFS- 3-11, 14, and 15. Revised Forest Plan objectives FW-OBJ-WTR-02 and 03 help to remove or mitigate risk factors associated with roads and to improve watersheds and water quality.

There are several guidelines (FW-GDL-4, 5, 6, and 11) that address roads that may be behind gates or berms, and provides direction that they should be treated to assure that they are hydrologically disconnected from the stream network and in a stable condition. The FNF has developed a culvert monitoring plan that will be implemented as part of the Revised Forest Plan as a monitoring requirement (USFS 2017). The monitoring plan develops a rotating panel of culverts on the FNF in an effort to survey the condition of existing culverts, and correct problems that may be identified. The comprehensive culvert monitoring plan can be found in Appendix D of the BA (USFS 2017).

Bull trout would benefit by the direction for the conservation watershed network, which has a desired condition to provide for cold water refugia in the face of climate change (FW-DC-CWN-1), and the objectives (FW-OBJ-CWN-01 and 02) will proactively stormproof open roads to reduce the risk of culvert failures that might occur with increasing fall rain events, as well as not allowing a net increase of road network in these watersheds.

The Revised Forest Plan also contains an objective to decommission, or place into storage, between 30 and 60 miles of roads over the life of the plan (anticipated to be 15 year). When implemented with required design criteria, these activities are expected to have a beneficial effect on bull trout or their habitat. However, there will be times when these projects have adverse short-term effects on bull trout or their habitat.

Impacts stemming from road decommissioning may include increased sediment production at the points of soil disturbance, such as berm construction sites and along the road prisms where recontouring takes place. When the road surface becomes vegetated, the potential for sediment delivery is reduced. Road closure is often accomplished by blocking access to the road or road segment with a gate or earth berm. Culverts that remain in the road behind gates and berms that are not properly sized, positioned, and inspected will be considered for removal through implementation of the culvert monitoring plan.

Though hydrologic function of the hillslope is not restored when roads are closed or stored (versus decommissioned), a reduction or elimination of road use can result in a reduction in sediment generation and delivery, even if the road prism remains (Reid and Dunne 1984). Reduced road use by wheeled vehicles fosters vegetation of the road surface, ameliorating rainfall impacts and reducing erosion (Burroughs and King 1989). When decommissioning incudes recontouring and obliteration the road fill would be excavated and placing it in the road cut. The fill would be blended with the cut slope to re-establish the preconstruction or similar hillslope. All culverts and most other water handling devices are removed from the road prism. This type of road closure offers the greatest long-term benefit by reducing sediment delivery, reducing the risk of culvert failure, and the need for maintenance.

One of the principal concerns associated with road closures is the amount of exposed soil that is created as a result of road ripping, the removing of fill from culvert and bridge locations and the post obliteration slope. Roads that are obliterated that will likely adversely affect bull trout are typically those within close proximity to a stream channel. Exposed, unconsolidated soil near a stream channel has the potential to enter the stream through sheet, rill or localized channeled flow. While these activities may adversely affect bull trout or critical habitat in the short term, we anticipate that these activities will likely be beneficial to bull trout population in in the long-term.

Proposed forestwide direction would lead toward further improvement regarding the effects of roads on bull trout and designated critical habitat.

Livestock Grazing

General Effects of Livestock Grazing

Livestock grazing near streams can result in changes in channel morphology (Belsky et al. 1999). Livestock trailing, chiseling, 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, resulting in a change in channel type. Livestock trampling and hoof chiseling along streambanks can increase ground exposure, surface erosion, and increased sedimentation (Doumitt and Laye 2010). 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 sub-surface water flow.

Loss of riparian vegetation can influence the amount of solar radiation reaching a water body and increase water temperatures (Doumitt and Laye 2010). Greater temperature fluctuations (diurnal and seasonal) can also occur when riparian vegetation is removed or decreased. In addition, removal of riparian vegetation can increase nitrate levels which can increase the biological production in water. Livestock grazing has the potential to cause increased sediment delivery through trampling of stream banks and by removal of riparian vegetation.

Effects of Livestock Grazing Specific to the Proposed Action

Although livestock grazing is a minor component of management on the Forest, there may be localized effects of current and past management activities. Livestock numbers have decreased since the 1986 forest plan, as amended. Currently, there is one allotment in Piper Creek that has five cow-calf pairs that would be considered to be within a watershed that supports bull trout. The Holland Lake allotment is near the confluence with Swan River, and the outlet of Holland Lake is considered too warm to support bull trout.

The proposed action will include forest-wide standards and guidelines would protect and minimize the effects of grazing on aquatic resources. Three guidelines specific to grazing (FW-GDL-GR-03, 04, and 05) would help to reduce impacts on water quality. These guidelines would reduce bank trampling and minimize livestock operations within RMZs. Reducing the length and timing of the grazing season in RMZs allows for more growth of grasses and forbs that capture overland flow, prevent rills from forming, and prevent erosion from delivering sediment to water bodies, thereby lowering turbidity and fine sediment deposition in the waterbody. It would also reduce potential bacteria such as E. coli, which has been shown to affect nutrients.

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.

Recreation

General Effects of Recreation

Permanent development and campground facilities in riparian areas can result in sediment increases to nearby streams, loss of stream bank vegetation, and reduced water infiltration. Associated human activities, such as off-highway vehicle use on trails and stream bank trampling, can also decrease ground cover and increased soil disturbances. Direct effects to channel morphology include the loss of pool volumes, habitat complexity, and decrease in the size of stream channel substrate. Recreational use, primarily from ATVs, can cause soil compaction and loss of vegetation in wetlands and/or directly adjacent to them. This can reduce sub-surface water flow and increase surface runoff. Increases in surface runoff may contribute sediment to streams and associated aquatic habitats, depending on the proximity or connectedness to the hydrologic network. Facilities can be similar to roads in terms of potential effects. Facilities can permanently affect wetlands by interrupting natural flow paths and reducing vegetation.

Motorized recreation is a growing concern as use increases and off-road vehicle technology improves. Off-highway vehicles are becoming more powerful, have better suspension, and better traction than ever before. With the advent of improved technology, visitors will be able to access areas previously inaccessible to off-highway vehicles, which may contribute cumulatively to effects on soils and aquatic resources. Off-road vehicle use is anticipated to increase even more into the future, as populations increase. Along with this increased use there may an associated increase in effects to soil and aquatic resources.

Non-motorized and motorized watercraft use can "disturb" or "stress" adult and juvenile fish. Typical activities associated with non-motorized use include floating, wading, and swimming in areas where fish are holding, rearing, or spawning. Studies conducted on the Rogue River in Oregon have shown that juvenile salmon and steelhead that were passed by non-motorized 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.

Effects of Recreation Specific to the Proposed Action

A guideline to mitigate the effects from recreation facilities located within RMZs, FW-GDL-REC-06, would ensure new facilities or infrastructure are located to minimize impacts on water and riparian resources. Appendix C of the Revised Forest Plan (USFS 2016) includes strategies to address impacts from existing recreation facilities located in RMZs, including impacts on water quality in fish-bearing waters.

However, it is assumed that minor, localized impacts to riparian vegetation, woody debris, and water quality would still occur where recreation use and 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 completely 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 and riparian areas in order to protect and improve water quality and aquatic habitats.

Mining/Minerals Development

General Effects of Mining/Minerals Development

Mining activities can reduce surface water flow, increase sedimentation, decrease pH, and leach heavy metals into surface waters supporting bull trout. Placer mining in stream channels causes direct increased sediment, affects aquatic insect communities, and disturbs channel substrate. Instream dredges can cause bank erosion, channel instability, and loss of riparian vegetation.

Leasable mineral development includes oil and natural gas extraction from underneath NFS lands. Salable minerals development includes extraction of common varieties of sand, stone, gravel, and decorative rocks. The USFS salable mineral material policy 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 USFS uses materials such as gravel, riprap, and crushed aggregate for maintenance and new construction of roads, recreation sites and repair of damage caused by fire, floods, and landslides. These materials can come from pits and quarries located on NFS lands. The type, volume, and source location of in-service mineral material varies year by year and according to need. Free-use permits can be issued to any state, federal, or territorial agency, unit, or subdivision. As an example, the Glacier View Ranger District has issued crushed stone to Flathead County for maintenance and improvement of the North Fork Road. Free-use permits can also be issued to the general public. An individual may obtain a free-use permit to collect rock, as long as it is not for commercial use, sale, or barter. Only hand tools can be used to collect the rock; no digging is permitted, and only the collection of loose rock is authorized.

Effects of Mining/Minerals Development Specific to the Proposed Action

There are no existing mining operations on the Forest. Recreational mining, such as suction dredging, may occur, although the FNF has not received requests for special-use permits for recreational mining. Suction dredging is regulated by federal and state mining laws and regulations. The Montana Department of Environmental Quality has closed many of the FNF's bull trout and westslope cutthroat streams to suction dredging, and therefore impacts from mining will not be seen 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. The Revised Forest Plan would require remedial action and protection of soil and water resources if permits are approved.

The North Fork Watershed Protection Act of 2013 (H.R. 2259) withdrew federal lands (430,000 acres) within the North Fork and Middle Fork of the Flathead River watershed from all forms of location, entry, and patent under mining laws and from disposition under all laws related to mineral or geothermal leasing. There are no active salable mineral leases on the FNF. 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 from free-use permits to the general public. Any future special use permits that would allow mining on the FNF would be subject to project-specific analysis, including ESA section 7 consultation if appropriate.

Watershed Improvement

General Effects of Watershed Improvement

Restoring stream and riparian function would increase depth, complexity and shading within the affected streams providing for cooler water temperatures, reduced evaporation, and potentially more stable flows through the summer low flow period. Similar benefits would occur during winter low flows. Intact riparian communities provide an insulatory benefit that prevents streams from freezing during extreme cold. Deeper water also provides better rearing habitat as it is also less likely to freeze completely. Increasing the frequency of large woody debris (LWD) not only can increase instream complexity but also serves as a long-term nutrient supply. Increasing LWD generally also increases available habitat which in turn provides increased carrying capacity.

Culvert removal and replacements are one of the most common and effective improvements available for implementation. Restoring connectivity by removing culverts would prevent them from plugging and the associated fill slope failures from occurring, reducing the risk of large increases in stream channel sediment. A short-term increase in sediment can be expected with culvert removal, especially at live stream crossings. The amount of sediment input as a result of removals can be minimized by dewatering the disturbed area while the culverts are removed. Unnatural channel width, slope, and streambed form often occur upstream and downstream of stream crossings (Lee et al. 1997). The channel often times is reconstructed to minimize the adjustment process and resulting sedimentation following culvert removal. Large rocky substrate and woody debris would be used to armor the new channel. Additionally, mulch and seeding disturbed areas would also minimize sediment input.

Typically the effects to bull trout and their habitat are site specific and negligible. Minimization measures such as timing restrictions and BMP implementation are beneficial in reducing sediment entering the waterway and other potential effects to bull trout. Associated sediment transport is also very limited. The long-term benefits of reducing water routing and sediment input and restoring fish passage will outweigh the short-term effects of roadwork. Aquatic habitat elements to benefit in the long term include: connectivity, embeddedness, increased pool depth, decreased width to depth ratio, improved stream bank condition, restored drainage network, reduced road density and improved road location.

Effects of Watershed Improvement Specific to the Proposed Action

The proposed forest-wide objectives, standards, and guidelines described previously would protect bull trout and their habitats when implementing land management activities. Watershed, soil, riparian, and aquatic habitat conditions under the proposed action, in general, are expected to improve as a reflection of the current trend in reductions of timber harvest activities and associated ground disturbance as well as proposed conservation and habitat protection direction in the Revised Forest Plan. For example, forest-wide directions are designed to improve overall watershed condition (FW-OBJ-WTR-01 thru 04); protect soil conditions and soil quality; and restore riparian and aquatic habitats (FW-STD-SOIL-01 through 04, and FW-STD-RMZ-01 thru 06). Additionally, FW-DC-P&C-15 emphasizes cooperation and coordination to help recover bull trout.

Impacts to bull trout will be analyzed and consulted on individually during project-level implementation site-specific management activities such as travel management proposals, timber sales, and recreational site improvements.

Aquatic Conservation Strategy

The Inland Native Fish Strategy (INFISH) (USFS 1995), which is the existing aquatic conservation strategy for the FNF, was designed to provide protection for native fish. Although it allowed for restoration, INFISH primarily provided direction for protection and passive restoration measures. With the INFISH amendment in 1995, the FNF Forest Plan direction reduced the risk to watersheds, soils, and riparian and aquatic resources from new and ongoing activities primarily with standards and guidelines that influenced management within Riparian Habitat Conservation Areas (USFS 1995a). For some resources, standards and guidelines in the 1986 forest plan contained general direction for repairing past damage, although INFISH direction was lacking for other resources such as timber harvest. During implementation of the 1986 Forest Plan (as amended in 1995), the intensity and risks associated with new and ongoing land management activities have been greatly reduced compared to the decades prior.

In an effort to improve upon INFISH direction that is over 20 years old, the USFS is moving toward an Aquatic Riparian Conservation Strategy (ARCS) that will provide similar land management direction, but is based on more updated scientific information. The Revised Forest Plan will include similar ARCS guidance and adds an active restoration component through desired conditions, objectives, guidelines, and standards that would supplement the retained passive components of INFISH. The Revised Forest Plan would also help move projects and activities towards the desired conditions and improve aquatic habitats. Table II-8 provides a conceptual crosswalk between INFISH and comparable components in the Revised Forest Plan.

Table II-8. Crosswalk of Plan Components under INFISH to ARCS (adopted from USFS 2017).

1995 INFISH Component	Comparable INFISH component/strategy In 2017 Flathead Plan	Differences between 1995 INFISH and 2017 Flathead Plan	Rationale for Changes
Riparian goals	Component: Instead uses a required plan component (i.e., Desired Conditions)	More description listed in plan revision for desired conditions, focused on ecological conditions that sustain riparian and aquatic habitat	Goals are optional components in 2012 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.	Flathead draft plan relies on desired conditions, which focus on retaining process function, in combination with PIBO monitoring data and analysis, which compares populations of managed conditions against populations of unmanaged conditions	BASI since 1995 has moved away from the expectation that numerical values found in high value habitat should occur everywhere at the same time: also, objectives in 2012 planning rule require a completion date, which would be difficult to predict for riparian instream conditions.
Riparian habitat	Component carried forward with Name change Riparian	Some adjustments to widths for wetlands	Changes made between proposed action and DEIS to

1995 INFISH Component	Comparable INFISH component/strategy In 2017 Flathead Plan	Differences between 1995 INFISH and 2017 Flathead Plan	Rationale for Changes
conservation areas (RHCAs)	Management Zone, to be consistent with Planning Rule	(Increase), otherwise draft plan components do require minimum widths same as 1995 Infish.	clarify intent and insure necessary protection continues under new plan.
Standards and guidelines (for activities in or affecting RHCAs)	Component carried forward with few exceptions; now distinguish between standard and guide	No longer just Standard and Guide, split into either Standard or a Guide. Also Some text changes in individual standards and guidelines	Concept was retained for S &G's but language was sometimes changed to ensure a standard or guideline was achievable, and/or to clarify intent. Split also aligns with 2012 Planning Rule.
Priority watersheds	Component-other required content Carried forward in 2 way: 1. priority watersheds as other plan content identified for WCF as required by 2012 rule; and objective for storm-proofing objective development of a Conservation Watershed Network (similar to 1990 priority list contained in Amendment #3).	2 watersheds under this revision will be identified as priorities for restoration activities on Forest to be compatible with 2012 rule. Objective for Conservation Watershed Network prioritizes the most important watersheds to treat for stormproofing during the span of the new plan	WCF recognizes the agency moving towards attaining desired outcomes from project, versus the standard outputs typically associated with target accomplishment.
Watershed analysis	Not carried forward as described in 1995 INFISH. Instead, Multi-Scale Analysis is included as a strategy in appendix C of the revised forest plan, 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 data and analysis tools much greater than 1995, multi scale sharpens focus on the need to integrate information commensurate with issues
Watershed restoration	Component Carried forward in 2 way: 1. priority watersheds as other plan content identified for WCF as required by 2012 rule; and objective for storm-proofing objective development of a Conservation Watershed Network (similar to 1990 priority list contained in Amendment #3).	Often WCF identified priorities will focus on immediate watersheds needing focused attention. While they may not be the highest priorities for fish, the Conservation Watershed Network Objective does identify the most important watersheds for fish conservation.	WCF recognizes the agency moving towards attaining desired outcomes from project, versus the standard outputs typically associated with target accomplishment. Watersheds prioritized for stormproofing under Conservation Watershed Network objective are priorities for stormproofing to help watersheds be more resilient to climate change.
Monitoring	Other Plan material- ultimately, BLM and USDA Forest Service adopted PIBO monitoring Strategy	PIBO monitoring Strategy carried forward and strengthened development of data analysis tools.	

Summary

Nearly all activities allowed within the different management area categories in the Revised Forest Plan have the potential to 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 the greatest potential and risk of adverse effects. Activities that have the greatest potential to disturb soils and indirectly affect bull trout and designated critical habitat include vegetation management, fuels management, livestock grazing, roads, watershed restoration, and recreation. The effects on bull trout from land management activities are typically indirect, meaning it is difficult to predict exactly what would happen to bull trout habitat and populations as a result of implementation.

2. Analysis for Effects of Bull Trout

In addition to forest-wide direction discussed above, the potential indirect effects to bull trout stemming from the proposed action depend largely on the management area designation for a given area. Analysis of management area designation and the anticipated effects to bull trout are discussed for each core area below:

Flathead Lake Core Area

The majority of the Flathead Lake Core Area (64 percent) on the FNF is allocated to management areas 1a and 1b (62 percent), or 2 (2 percent) (Tables II-9 and II-10). Management area 1a is a wilderness designation, and management area 1b is recommended wilderness and has the greatest restriction on all uses. Management area 2 is a wild and scenic river designation that also limits Forest activities. An additional 16 percent of the Flathead Lake Core Area is allocated to management area 5 with is designated as backcounty (Table II-9). A wide range of uses are allowed in management area 5; however, these lands are anticipated to be relatively large areas, without roads, that would provide a variety of motorized and non-motorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would mostly be temporary. The allocation of 80 percent of the Flathead Lake Core Area to management areas 1, 2, and 5 would limit the likelihood of adverse effects on bull trout and bull trout critical habitat in these areas.

Approximately 19 percent of FNF lands within the Flathead Lake Core Area are designated as management area 6 (Table II-9). NFS lands designated management area 6 across this core area will be affected by scheduled timber harvest, recreation, prescribed fire, and access management. These land management strategies may result in increased sediment, substrate embeddedness, and other direct or indirect effects from project-level activities.

In Big, Coal, and Red Meadow Creeks, the majority of acres are allocated to management areas 5 and 6. As described above, effects on bull trout would be reduced with a management area 5 allocation, but may occur in association with recreational trail improvements and access. The next highest allocation is management area 6b in these watersheds where moderate intensity timber harvest and general forest activities would occur. Effects would be greater than in management area 5 primarily due to road management activities, but effects to bull trout from management activities would be minimized through implementation of RMZ standards and guidelines, as well as standards that require the FNF to maintain baseline conditions for road densities within the NCDE primary conservation area for grizzly bears (see grizzly bear chapter of this document for details). Restoration such as storm-proofing roads in these watersheds may result in additional short-term adverse effects related to sedimentation or in-stream activities. However, these actions are anticipated to result in long improvements in conditions for bull trout.

The Frozen Lake, Trail Creek and Whale Creek watersheds have the majority of their acres in management area 1b (recommended wilderness). This is expected to be beneficial to bull trout since these areas are located within the headwaters of these local populations. Management areas 6a and 6b are designated lower within the watersheds and primarily below bull trout spawning. This reduces the likelihood of sediment generated from management activities to affect bull trout spawning habitat, as well as egg/larval survival. Further, Trail and Whale Creeks are prioritized for upgraded culverts and reducing road-related effects as part of the Conservation Watershed Network. These upgrades may have short-term effects that will result in long-term benefits by storm-proofing these watersheds in the face of climate change. Trail and Whale Creeks would also receive additional protection due to being recommended as Wild and Scenic Rivers. This designation provides additional riparian and stream protections to these local populations by establishing a ¼-mile corridor along each side of the stream where management will be limited.

Bear, Morrison, and Granite Creeks are in a mix of management areas 1a, 1b, 5, 6a and 6b. The largest allocation is in management areas 1a and 1b, with a range of 43-94 percent, and management area 6 is 24 percent in both Bear and Granite Creeks (Table II-9). Soils in this area are erosive when compared to other areas on the FNF and, unlike other bull trout watersheds in the Middle Fork Flathead River, the headwaters are outside of designated wilderness. Revised Forest Plan components to implement BMPs and avoid areas with mass failure potential will minimize sediment in the headwaters. Morrison and Granite Creeks both have middle reaches inside wilderness, which provides a high degree of protection. Bear Creek parallels Highway 2 and the BNSF railroad. Coordination with the Montana Department of Transportation and BNSF will continue to ensure that maintenance operations are conducted on FNF lands through special-use permits that would have requirements to reduce sediment into Bear Creek.

The other bull trout watersheds within the Middle Fork of the Flathead River in the Flathead Lake Core Area are within wilderness and receive a high degree of protection. However, potential impacts to bull trout can still occur from outfitter and guide operations. The FNF and the Service went through formal section 7 consultation on the issuance of the permits that allows these operations to take place (USFWS 2015h). The subsequent BO issued to the FNF contained a variety of terms and conditions from previous consultations to provide measures in special-use permits to reduce impacts to bull trout.

Table II-9. Flathead Lake Core Area - acres and percentages of bull trout-occupied drainages in the action area by management area (MA).

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the FLCA
Trail Creek	32,693 (77)	4,443 (11)	0	0	84 (< 1)	4,977 (12)	0	42,197
Whale Creek	24,142 (63)	4,247 (11)	0	0	1,168 (3)	8,659 (23)	0	38,216
Red Meadow Creek	2,716 (15)	18 (< 1)	0	0	5,076 (28)	10,556 (57)	0	18,366
Coal Creek	0	0	0	0	24,592 (61)	15,785 (39)	0	40,626
Big Creek	0	0	0	0	19,666 (38)	29,578 (57)	2,807 (4)	52,051
Bear Creek	12,253 (52)	47 (< 1)	0	0	5,467 (23)	5,735 (24)	0	23,455
Granite Creek	7,918 (43)	44 (< 1)	0	0	5,978 (33)	4,399 (24)	0	18,295
Morrison Creek	30,235 (94)	75 (< 1)	0	0	465 (1)	1,522 (5)	0	32,297
Strawberry Creek	17,303 (100)	0	0	0	0	0	0	17,303
Bowl Creek	18,428 (100)	0	0	0	0	0	0	18,428
Clack Creek	37,595 (100)	0	0	0	0	0	0	37,595
Schafer Creek	16,136 (100)	0	0	0	0	0	0	16,136
Dolly Varden Creek	16,465 (100)	0	0	0	0	0	0	16,465
Long Creek	14,078 (100)	0	0	0	0	0	0	14,078
Basin	11,720 (100)	0	0	0	0	0	0	11,720
Trail (Middle Fork)	12,495 (100)	0	0	0	0	0	0	12,495
Frozen Lake	5,922 (69)	0	0	0	2,654 (31)	0	0	8,576

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the FLCA
Total acres (%) in core area	260,099 (62)	8,874 (2)	0	0	65,150 (16)	81,211 (19)	0	418,299

Table II-10. Simple Core Areas within the Flathead Lake Core Area - acres and percentages of bull trout-occupied drainages in the Stillwater and Whitefish drainages by management area (MA).

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5 a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the FLCA
Upper Stillwater Lake	0	0	0	0	1759 (100)	0	0	1759
Upper Whitefish Lake	0	0	0	0	3866 (79)	1054 (21)	0	4920
Whitefish Lake	0	0	0	0	541 (14)	3278 (86)	0	3819

Hungry Horse Reservoir Core Area

NFS lands designated management area 6 (15 percent) occur mainly along Hungry Horse Reservoir and its tributaries (Table II-11). Activities in these areas may include scheduled timber harvest, recreation, prescribed fire, access management and restoration activities. These actions may result in increased sediment delivery, substrate embeddedness, and other direct or indirect effects from project-level activities. Of the local populations with management area 6 lands, the largest percentage occurs in Quintonkon Creek and Wheeler Creek (48 and 44 percent respectively). However, effects to bull trout that could result from forest management activities would be minimized through implementation of RMZ standards and guidelines. Restoration activities in these watersheds may also result in additional short-term adverse effects related to sediment or in-stream activities, but it is likely that these actions will result in long-term improvements in habitat conditions. Management areas 6a and 6b are designated lower within the watersheds and primarily below bull trout spawning habitat. This reduces the likelihood of sediment generated from management activities to affect bull trout spawning and egg/larval survival. Headwaters tend to be protected by management allocation areas that will have less forest management.

An additional 10 percent of the action area in within the Hungry Horse Reservoir Core Area is allocated to management area 5 (Table II-11). A wide range of uses are allowed in management area 5; however, management area 5 lands would generally be relatively large and free of roads, providing a variety of motorized and non-motorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would be restricted due Revised Plan standards that require road densities within the NCDE primary conservation area to be maintained at baseline conditions (see grizzly bear chapter of this document for further details).

Further, the majority (67 percent) of the Hungry Horse Reservoir Core Area is allocated to existing wilderness, management area 1a (Table II-11). Management area 1 is a wilderness designation and has the greatest restriction on all uses. The allocation of 77 percent of this core area to management areas 1 and 5 would limit the likelihood of adverse effects on bull trout in these areas.

Even though the majority of bull trout spawning occurs within the Bob Marshall Wilderness, there are known outfitter camps along bull trout spawning reaches particularly along Big Salmon, Little Salmon and Youngs Creeks, where disturbance may and does occur from stream crossings and outfitter camp activity such as getting water that may temporarily move bull trout off redds. Few adverse effects other than trail and outfitter use are anticipated for the wilderness local populations because they are allocated to management area 1 where few allowable uses would occur.

Wounded Buck Creek and Sullivan Creek have been identified as the highest priorities for storm-proofing within the Revised Forest Plan's Conservation Watershed Network. This designation would result in an overall reduction of potential culvert failure but would result in short term increases in sediment as culverts are removed or upgraded. Additionally, the Spotted Bear River would receive additional protection due to being recommended as a Wild and Scenic River under the Revised Forest Plan. This designation provides additional protection to riparian and aquatic ecosystem function by implementing a ¼-mile corridor on either side of the river that limits management activities.

Table II-11. Hungry Horse Reservoir Core Area—acres and percentages of bull trout-occupied drainages in the action area by management area (MA).

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the HHRCA
Danaher Creek	72,053 (100)	0	0	0	0	0	0	72,053
Youngs Creek	77,732 (100)	0	0	0	0	0	0	77,732
Gordon Creek[1]	42,315 (100)	0	0	0	0	0	0	42,315
White River	56,718 (100)	0	0	0	0	0	0	56,718
Little Salmon Creek	36,485 (100)	0	0	0	0	0	0	36,485

Population / drainage name (HUC)	MA1a and 1b acres (percent)	MA2a and 2b acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5a, 5b, and 5c acres (percent)	MA6a, 6b, and 6c acres (percent)	MA7 acres (percent)	Total acres of drainage in the HHRCA
Big Salmon Creek[2]	49,741 (100)	0	0	0	0	0	0	49,741
Bunker Creek	20,235 (62)	15	0	0	9,754 (30)	2,841 (9)	0	32,830
Sullivan Creek	0	0	0	0	23,412 (76)	7,502 (24)	0	30,914
Quintonkon Creek	0	0	0	0	9,274 (51)	8,498 (48)	187 (1)	17,959
Wheeler Creek	1,014 (6)	0	0	0	8,965 (49)	8,021 (44)	113 (< 1)	18,113
Wounded Buck Creek	1,198 (11)	0	0	0	4,990 (44)	4,933 (34)	142 (1)	11,263
Spotted Bear River	93,047 (81)	5,273 (5)	0	0	7,912 (7)	8,194 (7)	0	114,426
Total acres (%) in core area	450,538 (67)	52,886 (8)	0	0	64,307 (10)	104,296 (15)	442 (< 1)	672,027

[1] also covers Doctor Lake
[2] also covers Big Salmon Lake

Swan Lake Core Area

The majority of the Swan Lake Core Area is allocated to management areas 1a and 1b (48 percent), and general forest management areas 6b and 6c (34 percent) (Table II-12). NFS lands designated management area 6 (34 percent) across this core area will be foreseeably affected by scheduled timber harvest, recreation, prescribed fire, and access management. Effects to bull trout from these activities are anticipated, primarily through increased sediment delivery, increased substrate embeddedness, and other direct or indirect effects from project-level activities. The local populations with the largest percentage of management area 6 lands in the Swan Lake Core Area are Jim Creek (63 percent), Cold Creek (54 percent), and Piper Creek (49 percent. It should also be noted that 51 percent of FNF lands within the Holland Creek Core Area are designated as management area 6. As discussed previously in this opinion, the Holland Creek Core Area is a simple core area that occurs wholly within the Swan Lake Core Area watershed. As such, we include discussion of the Holland Lake Core Area in the Swan Lake Core Area sections. As described above, we anticipate that adverse effects to bull trout would be reduced in this management area 6 lands through implementation of RMZ standards and guidelines. Restoration in these watersheds may result in additional short-term adverse effects related to sediment or in-stream activities. However, these activities will likely result in long-term improvements in habitat conditions.

An additional 14 percent of the action area in the Swan Lake Core Area is allocated to management area 5 (Table II-12). Lost Creek has the largest allocation of management area 5 at

76 percent, followed by Soup Creek at 56 percent. A wide range of uses are allowed in management area 5; however, management area 5 lands would generally be relatively large areas without roads, providing a variety of motorized and non-motorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would be restricted due to additional Revised Forest Plan direction implemented as part of the NCDE grizzly bear Conservation Strategy (see grizzly bear chapter of this document for further details). Management area 1 is a wilderness designation and has the greatest restriction on all uses. Approximately 48 percent of the Swan Lake Core Area is designated as management area 1. As a result, over 60 percent of the Swan Lake Core Area is either management area 1 or 5. We anticipate that this would limit the likelihood of adverse effects on bull trout in these areas given the restricted nature of activities allowed on these lands.

Streams that drain from the west along the Mission Mountains (i.e., Elk, Jim, Cold and Piper Creeks) have their headwaters protected within the Mission Mountain Wilderness. Additionally, Lion Creek's headwaters are protected within lands designated as management area 1b, recommended wilderness. Potential impacts from management activities would be less in these local populations due to the headwaters being protected by wilderness. However, impacts to Goat, Squeezer, Soup, and Woodward Creeks might be greater due to a higher percentage in general forest management areas 6b and 6c (Table II-12). Lost Creek has a large percentage of lands allocated to management area 5 (76 percent), which allows some timber harvest but is not scheduled. In addition, road construction would be largely limited within bull trout watersheds because they are in the primary conservation area for grizzly bears (see grizzly bear chapter of this document for a details description).

Goat Creek and Lion Creek are identified as the highest priorities for storm-proofing within Revised Forest Plan's Conservation Watershed Network. This designation would result in an overall reduction of potential culvert failure but would result in short-term increases in sediment as culverts are removed or upgraded. Elk Creek, Lion Creek, and the headwaters of the Swan River above Lindbergh Lake would receive additional protection due to being recommended as wild and scenic rivers. These designations would further limit the amount of activity that may impact riparian or aquatic systems by providing a ¼-mile corridor within which management activity is limited.

Table II-12. Swan Lake Core Area - acres and percentages of bull trout-occupied drainages in the action area by management area (MA).

Population / drainage name (HUC)	MA1 acres (percent)	MA2 acres (percent)	MA3 acres (percent)	MA4 acres (percent)	MA5 acres (percent)	MA6 acres (percent)	MA7 acres (percent)	Total acres of drainage in the SLCA
Elk Creek	12,645 (78)	2,447 (15)	0	0	421 (3)	774 (5)	0	16,287
Cold Creek	9,179 (44)	3 (< 1)	0	0	394 (2)	11,110 (54)	0	20,683
Jim Creek	3,884 (33)	0	0	0	483 (4)	7,271 (63)	0	11,638
Piper Creek	4,998 (45)	0	0	0	622 (6)	5,394 (49)	0	11,014

Population / drainage name (HUC)	MA1 acres (percent)	MA2 acres (percent)	MA3 acres (percent)	MA4 acres (percen t)	MA5 acres (percent)	MA6 acres (percent)	MA7 acres (percent)	Total acres of drainage in the SLCA
Lion Creek	11,283 (55)	3,314 (16)	0	0	770 (4)	5,111 (25)	0	20,478
Goat Creek	9,036 (68)	0	0	0	927 (7)	3,416 (26)	0	13,379
Woodwar d Creek	0	0	33 (1)	0	888 (23)	3,011 (77)	0	3,932
Soup Creek	0	0	0	0	1,363 (56)	1,050 (44)	0	2,413
Lost Creek	47 (< 1)	55 (< 1)	0	0	11,956 (76)	3,582 (23)	0	15,640
Lindbergh Lake	17,385 (71)	837 (3)	4 (< 1)	0	1,821 (7)	4,533 (18)	0	24,580
Holland Lake	4,383 (36)	0	0	0	1,028 (8)	6,253 (51)	590 (5)	12,254
Total acres (%) in core area	72,840 (48)	6,656 (4)	0	0	20,673 (14)	51,505 (34)	0	151,674

3. Effects to Critical Habitat

The Revised 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 will 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 will undergo their own environmental analyses and Section 7 consultation. An analysis for the anticipated effect of management activities on the primary constituent elements (PCEs) for bull trout is given followed by expected impacts each core area.

Effects from Forest Management Activities

<u>Vegetation Management</u>

Vegetation management may have temporary impacts on PCE 1 (water quality), PCE 4 (instream habitat) and PCE 6 (substrate characteristics) when harvest activities generate increases in sediment. The Revised Forest Plan contains standards and guidelines that will minimize many effects of vegetation management by providing direction within the RMZs. These standards and guidelines will ensure that in some areas vegetation management is prohibited unless required for aquatic resource benefits. As a result, riparian vegetation will be allowed develop under natural processes. Thus, vegetation management is not expected to impact PCE 2 (migration habitat), PCE 3 (food availability), and PCE 8 (water quantity). In addition, we do not anticipate vegetation management to affect PCEs 5 (water temperature), 7 (stream flow), and 9 (non-native species) are not affected.

Fuels Management

Fuel management through the use of prescribed fire and hand thinning is expected to have little direct effect on bull trout PCEs. Fuel management may reduce the potential for severe and intense wildfires. 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 standards require avoidance of waterways, and the Revised 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, we anticipate that adherence to these practices will reduce potential impacts to water temperature (PCE 5) by maintaining riparian vegetation during the course of fuels management activities.

Access Management and Recreation

Access management and recreation affect bull trout critical habitat primarily through the delivery of sediment. This impact affects PCEs 1, 2, 3, 4 and 6 (see Table A3-2 in Appendix 3. In some cases, stream crossings that may also present a barrier to migration, affecting PCE 7. Where road fill impinges directly on the stream or where soils become compacted in wetland and riparian areas from dispersed camping, effects to PCE 6 may occur. Forest-wide desired conditions, objectives, standards, and guidelines in the Revised Forest Plan that emphasize road decommissioning, regular road maintenance, removal of barriers at stream crossings, and motor vehicle use designations designed to move OHV use away from riparian areas will reduce but not eliminate effects to bull trout critical habitat. While we anticipate that these activities will be beneficial to bull trout critical habitat in the long-term, some of these activities may result in short-term adverse effects to bull trout critical habitat.

Livestock Grazing

Livestock grazing may affect bull trout critical habitat due to trampling or trailing along streambanks and grazing or trampling of riparian vegetation. These impacts may reduce the function of PCEs 1-4 and 8 by increasing bank instability, creating erosion, increasing sediment. Reduction of riparian vegetation through consumption or physical impacts from trampling can also affect the function of PCEs 1, 2 and 5 (see crosswalk Table A3-2 in Appendix 3) by removing overhanging vegetation, which provides shade to reduce temperatures and nutrients and habitat to support an abundant food base. Grazing occurs primarily along roads and in transitory range where previous timber harvest has created an open understory with herbaceous vegetation, so direct impacts to streams are less likely. Avoidance of timber harvest in riparian areas was instituted via forest plan amendment in 1995 and will continue with direction in the Revised Forest Plan, thus allowing for increased canopy cover along streams. Piper Creek is the only designated critical habitat with an active grazing allotment, and it has 5 cow-calf pairs.

Watershed Improvement

As discussed previously, in many cases watershed improvement/restoration activities result in a short-term negative effect due to a pulse of increased sediment. This impact would affect PCEs 1, 2, 3, 4 and 6 (see crosswalk Table A3-2 in Appendix 3). However, these activities have the potential to result in long-term positive impacts to PCEs 1 through 8, depending on the specifics of the project. As with all project-level decisions, separate consultation looking at design and site-specific impacts would occur prior to any project implementation.

Effects to Core Areas

The potential impact from the Revised Forest Plan to designated bull trout critical habitat in each core area is displayed in Table II-13 as the percentage of critical habitat drainages within each core area allocated to different management areas on FNF lands. With the exception of the Holland Lake and Whitefish Lake Core Area, no drainage on FNF lands that impacts designated critical habitat contains more than 21 percent of management area 6 lands. Actions on Management Area 6 (General Forest) lands will likely have the greatest effect on critical habitat since the management options available are much greater than other designations (e.g., wilderness, backcountry). Forest management activities have little potential to affect critical habitat in large lakes and reservoirs, where regulation of water level and fisheries management are the predominant effects.

Table II-13. The percentage of bull trout core areas on FNF lands by management area designation. Some core areas are not discussed here if NFS lands are less than 10 percent (see section D.3. *Species and Critical Habitat Affected*). Adopted from USFS 2017.

Core Area	1 (a&b)	2 (a&b)	3	4	5 (a-c)	6 (a-c)	7
Flathead Lake	63	2	0	0	16	19	0
Frozen Lake	69	0	0	0	31	0	0
Upper Stillwater Lake	0	0	0	0	100	0	0
Upper Whitefish Lake	0	0	0	0	79	21	0
Whitefish Lake	0	0	0	0	14	86	0
Hungry Horse Reservoir	67	8	0	0	10	15	< 1
Doctor Lake	100	0	0	0	0	0	0
Big Salmon Lake	100	0	0	0	0	0	0
Swan Lake	48	4	0	0	14	34	0
Lindbergh Lake	71	3	< 1	0	7	18	0
Holland Lake	36	0	0	0	8	51	5

Flathead Lake Core Area

Critical habitat has been designated in Trail, Whale, Red Meadow, Coal, Big, Bear, Morrison, and Granite Creeks as well as in the mainstem North Fork and Middle Fork Flathead Rivers. Limited adverse effects may occur at the project level, particularly associated with restoration activities such as culvert removals, upgrades, and other road-related work. Effects from other management activities would be limited through application of Revised Forest Plan direction and other measures (e.g., retained decisions, BMPs, Forest Service Handbook and Manual direction, other legal and regulatory requirements) as described previously. There should be incremental corresponding improvements in the indicator of sediment over the long term of the plan, with short-term effects from road and culvert work that affects PCEs 2, 3, and 6. Over the life of the plan, improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7, through implementation of the bull trout conservation strategy (USFS 2013) and the Revised Forest Plans Conservation Watershed Network. Substantial changes in PCEs 6, 8, and 9 are not expected in the Flathead Lake Core Area.

Hungry Horse Reservoir Core Area

Critical habitat has been designated for each of the local populations (Danaher, Youngs, Gordon, White River, Little Salmon, Big Salmon, Bunker, Sullivan, Quintonkon, Wheeler, and Wounded Buck) as well as the mainstem South Fork Flathead River and Spotted Bear River. Doctor Lake and Big Salmon Lake are also designated as critical habitat. Limited adverse effects may occur at the project level, particularly associated with restoration activities such as culvert removals, upgrades and other road related work. Effects from other management activities would be limited through application of Revised Forest Plan direction and other measures (e.g., retained decisions, BMPs, handbook and manual direction, other legal and regulatory requirements) as described previously. There should be incremental corresponding improvements for the indicator of sediment over the long term of the plan with short term effects from the road and culvert work which affects PCEs 2, 3, and 6. Over the life of the plan, minor improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7, given that passive restoration has been identified as a conservation strategy in many of the watersheds within this core area (Table II-6~~7~~). Substantial changes in PCEs 6, 8, and 9 are not expected in the Hungry Horse Reservoir Core Area since much of the upper watershed is in the Bob Marshall Wilderness, and Hungry Horse Reservoir has not been invaded by lake trout.

Swan Lake Core Area

Critical habitat has been designated for each of the local populations in the Swan Lake Core Area as well as the mainstem Swan River. Limited adverse effects may occur at the project level, particularly associated with restoration activities such as culvert removals, upgrades, and other road-related work. Effects from other management activities would be limited through application of the revised forest plan direction and other measures (e.g., retained decisions, BMPs, Forest Service Handbook and Manual direction, other legal and regulatory requirements), as described previously. There should be incremental corresponding improvements in sediment over the lifetime of the Revised Forest Plan due to active restoration being identified as the preferred conservation strategy in the Cold Creek, Jim Creek and Lindbergh Lake watersheds. This improvement will impact PCEs 1, 2, 3, 4 and 6 (see crosswalk Table A3-2 in Appendix 3). Short-term effects from road and culvert work that affects PCEs 2, 3, and 6 is also anticipated in the Swan Lake Core Area. Over the life of the plan, minor improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7, through natural processes. Given the uncertain future of lake trout suppression in Swan Lake, which is largely out of the USFS control, we cannot make any assessment about potential impacts on PCE 9 (non-native species).

H. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future

Federal actions are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

For the purpose of this consultation, cumulative effects are primarily the effects attributable to state and private landowners with adjacent lands or inholdings on the FNF, or to the actions of state and local governments when no other federal nexus (e.g., permit, funding) is present. The largest non-federal land owners are the State of Montana and Weyerhaeuser Co. Both of these entities manage their lands under existing habitat conservation plans (HCP) completed and approved under section 10 of the Endangered Species Act and consulted on through section 7, and hence are not considered in the cumulative effects analysis.

Numerous smaller private landowners within the boundaries of the FNF implement activities such as timber harvest, road building and maintenance, livestock grazing, water diversion, residential development, and agriculture. Future private activities will continue and, presumably increase. As population density rises, demand for residential and commercial development is also likely to grow. Such increased use and demand would increase the importance of quality habitat on NFS lands as strongholds for bull trout persistence and recovery.

Non-native fish species are identified as the primary threat to both the Flathead Lake and Swan Lake Core Area in the Columbia Headwaters RUIP (USFWS 2015b). The extent to which non-native fish populations grow in both size and distribution is largely under the control of state natural resource agencies. As such, the proliferation of non-native fish species in the action area will continue to threaten bull trout populations in the Flathead Lake and Swan Lake Core Areas until a solution to this threat can be agreed upon and implemented.

Angler harvest and poaching has been identified as one reason for bull trout decline (USFWS 2015b). It is likely that recreational fishing, especially in known spawning streams in the fall, will increase as the human population in western Montana increases. Misidentification of bull trout has been a concern because of the similarity of appearance with brook trout. Although harvest of bull trout in the majority of the action area is illegal, incidental catch likely occurs (legal harvest in Hungry Horse Reservoir and portion of S. Fork Flathead River). The fate of released bull trout is unknown, but some level of hooking mortality is likely due to the associated injuries and the stress of handling fish (Long 1997). Unintentional and illegal harvest could have a direct effect on the bull trout in the action area. The extent of the effect is dependent on the amount of increased recreational fishing pressure, which is a function of the increased number of people fishing each season. Illegal poaching is difficult to quantify, but generally increases in likelihood as the human population in the vicinity grows (Ross 1997). This may increase as the human population grows, but we anticipate that closed roads and limited public access will keep this low.

Global climate change and the related warming of our climate have been well documented. Evidence of global climate change/warming includes widespread increases in average air and ocean temperatures, accelerated melting of glaciers, and rising sea level. Given the increasing certainty that climate change is occurring and is accelerating (IPCC 2007, Battin et al. 2007), we can no longer assume that climate conditions in the future will resemble those in the past. Potential increases in water temperature due to climate change are likely to occur in the future.

The impact of increased water temperature on bull trout is difficult to predict, but we anticipate that higher temperatures will reduce the distribution of bull trout within the action area as some streams become unsuitable. Further, we anticipate that increased water temperature will also affect bull trout by creating more favorable conditions for non-native fish species such as brook trout and potentially brown trout.

The cumulative effects within the action area are reflected in bull trout population numbers and life history forms and the habitat conditions described herein. All core areas are at risk of the continued increase of non-native fish species and fisheries management; and concern for the viability and effects to bull trout populations are well documented (USFWS 2015). Activities occurring on private lands at the same time that the proposed federal activities may exert cumulative adverse effects on bull trout. However, some non-federal activities will likely improve conditions for bull trout over the long-term and will work in conjunction with federal actions toward recovery of bull trout in some instances. Since the proposed action is programmatic in nature, it does not in itself mandate or approve future implementation of activities on the FNF. Therefore, any future actions would undergo separate analysis and consultation related to the effects to listed species and/or critical habitat. Any site-specific information of future activities that will occur on no-federal land that may contribute to cumulative effects would be considered at that time.

I. CONCLUSION

1. Jeopardy Determination

After reviewing the current status of bull trout, the environmental baseline (including effects of federal actions covered by previous consultations) for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the Flathead National Forest's Revised Forest Plan, as proposed, is not likely to jeopardize the continued existence of bull trout. This conclusion is based on the magnitude of the project effects to reproduction, distribution, and abundance in relation to the listed population. Implementing regulations for section 7 (50 CFR 402) defines "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." Our conclusion is based on, but not limited to, the information presented in the 2017 biological assessment (USFS 2017), correspondence during this consultation process, information in our files, and informal discussions between the Service and the FNF.

Jeopardy determinations for bull trout are made at the scale of the listed entity, which is the coterminous United States population (64 FR 58910). This follows the April 20, 2006, analytical framework guidance described in the Service's memorandum to Ecological Services Project Leaders in Idaho, Oregon and Washington from the Assistant Regional Director – Ecological Services, Region 1 (USFWS 2006). The guidance indicates that a biological opinion should concisely discuss all the effects and take into account how those effects are likely to influence the survival and recovery functions of the affected [then] interim recovery unit(s), which should be the basis for determining if the proposed action is "likely to appreciably reduce both survival and recovery of the coterminous United States population of bull trout in the wild."

As detailed earlier in this BO (see Section D.1 and Table II-3), the approach to the jeopardy analysis in relation to the proposed action follows a hierarchical relationship between units of analysis (i.e., geographical subdivisions) that characterize effects at the lowest unit or scale of analysis (the local population) toward the highest unit or scale of analysis (the Columbia Headwaters Recovery Unit). The hierarchical relationship between units of analysis (local population, core areas) is used to determine whether the proposed action is likely to jeopardize the survival and recovery of bull trout. As mentioned previously, if the adverse effects of the proposed action do not rise to the level where it appreciably reduces both survival and recovery of the species at a lower scale, (such as the local population or core area) then the proposed action could not jeopardize bull trout in the coterminous United States (i.e., range wide). Therefore, the determination is appropriately a no-jeopardy finding. However, if a proposed action causes adverse effects that are determined to appreciably reduce both survival and recovery of the species at a lower scale of analysis (i.e., local population or core area), then further analysis is warranted at the next higher scale.

The proposed action represents a programmatic decision that authorizes no specific action, and therefore, would have no direct effects on listed species or their habitats. The Revised Forest Plan provides the direction under which future management decisions would be made. Any direct or indirect effects would occur later, during individual project implementation when site-specific decisions are made based on Revised Forest Plan direction. All project level activities may be subject to consultation, as appropriate, under the Endangered Species Act prior to implementation.

Minimization of the effects of land management activities on bull trout and their habitats is controlled through the management direction provided for in the Revised Forest Plan. Baseline conditions are expected to improve where active watershed restoration is implemented in combination with conservation of those watersheds currently in proper functioning condition. Adverse effects are expected to occur in all four core areas as a result of forest management activities that would be reasonably expected to be implemented over the life of the Revised Forest Plan. Effects to bull trout and their habitat would primarily be attributable to short-term sediment generation through management activities authorized by the plan. The level of effects is not expected to result in discernible negative impacts to core area populations.

As a result, the Service concludes that implementation of the proposed action is not likely to appreciably reduce the reproduction, numbers, or distribution of bull trout at the scale of any of the affected core areas, and by extension in the Flathead Lake Geographic Region and the Columbia Headwaters Recovery Unit. Therefore, the Service concludes that implementation of the Revised Forest Plan will not appreciably reduce both the survival and recovery and would not jeopardize bull trout at the range-wide scale of the listed entity, the coterminous population of the United States.

2. Adverse Modification Determination

After reviewing the current status of the four Critical Habitat Subunits in the action area (Flathead Lake North Fork Flathead River, Flathead Lake Middle Fork Flathead River, Flathead Lake South Fork Flathead River, and Swan River and Lakes) and their relationships to the bull trout core area, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, the Service concludes that while these effects will temporarily lower the function of spawning and rearing habitat in the action area due to some level of unavoidable sediment loading, these effects are unlikely to significantly change the functional capacity of the Critical Habitat Subunits described above. On that basis, it is the Service's biological opinion that implementation Flathead National Forest's Revised Forest Plan, as proposed, is not likely to destroy or adversely modify bull trout critical habitat.

Pursuant to current national policy and the statutory provisions of the Act, destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (50 CFR 402.02).

The approach to the adverse modification analysis in relation to the proposed action follows a hierarchical relationship between units of analysis (discussed in detail in Section D.2 and Table II-4 above). The hierarchical relationship between units of analysis (e.g., stream segment, critical habitat subunit) is used to determine whether the proposed action is likely to adversely modify designated bull trout critical habitat. Should the adverse effects of the proposed action not rise to the level where it appreciably diminishes the value of critical habitat at a lower scale, such as the individual stream segment or subunit, the proposed action could not adversely modify bull trout critical habitat at larger scales such as the critical habitat unit or the coterminous United States (i.e., range wide). Therefore, the determination will result in a no adverse modification finding.

The proposed action represents a programmatic decision that authorizes no specific action, and therefore, would have no direct effects on critical habitat. The Revised Forest Plan provides the direction under which future management decisions are made. Any direct or indirect effects would occur later, during individual project implementation when site-specific decisions are made based on Revised Forest Plan direction. Projects must be consistent with forest-wide standards and guides in the Revised Forest Plan, which are designed to minimize impacts to critical habitat by placing limits on activities that may occur in riparian areas and on the timing of such activities. Other standards and guides require that habitat values be maintained or improved in the long term. Such measures in combination with the small percentages of critical habitat that may potentially see future impacts are not expected to reduce the conservation value within the critical habitat units as a whole, and, therefore, are not expected to adversely modify critical habitat on a range-wide basis. Active restoration in priority bull trout watersheds would be expected to contribute to the conservation value of critical habitat over the long term. All project level activities may be subject to consultation, as appropriate, under the Act prior to implementation. As a result, the Service concludes that implementation of the proposed action is not likely to significantly change the functional capacity of the Critical Habitat Subunits described above.

J. INCIDENTAL TAKE STATEMENT

Section 9 of the Act, and Federal regulations pursuant to section 4(d) of the Act, prohibit the take of endangered and threatened species, respectively without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

This biological opinion identifies management direction that allows for future activities that may adversely affect bull trout and designated bull trout critical habitat, including vegetation management, road construction, use, and maintenance, unplanned and prescribed fires, grazing, recreation, and mining. The proposed action reduces the potential for incidental take to occur as a result of these actions. The mere potential for future take from these actions is not a legitimate basis for providing an exemption for take. Subsequent consultation, as appropriate, on the specific actions developed pursuant to the Revised Forest Plan will serve as the basis for determining if an exemption from the section 9 take prohibitions is warranted. If so, the Service will provide Reasonable and Prudent Measures and Terms and Conditions, as appropriate, to minimize the impacts of the take on bull trout in accordance with 50 CFR 402.14(i).

K. REPORTING REQUIREMENTS

In order to monitor the impacts of incidental take, the Federal agency or any applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [(50 CFR 402.14 (i)(3)]. This BO does not contain an explicit incidental take statement. However, the Forest, in this Revision, proposes a culvert monitoring plan that affects some former projects. The Service hereby revises the reporting requirements on those and future affected projects in the following manner.

The Service agrees that the Culvert Monitoring Plan Version 1.0 will replace the culvert monitoring requirements contained in the Terms and Conditions issued in the following past biological opinions:

- Amendment 19 Revised Implementation (November, 2010)

- Robert Wedge Post-Fire Project (November, 2004)
- West Side Reservoir Post-Fire Project (November, 2002)
- Moose Post-Fire Project (November, 2002)
- Spotted Beetle Project (March, 2002)

The specific Term and Condition in each biological opinion is presented in the Culvert Monitoring Plan (Table 1). From this date forward, the Service will consider the Terms and Conditions presented in Table 1 of the plan as being amended such that adherence to the Culvert Monitoring Plan Version 1.0 (and any subsequent version agreed to by the Service) will function in lieu of existing culvert monitoring requirements. We believe a more comprehensive, Forest-wide culvert monitoring and remediation effort will native fish and wildlife species. The Service's approval of the Culvert Monitoring Plan and amendment of existing Terms and Conditions are based on the following:

- Current monitoring requirements are spread throughout the Forest in a handful of bull trout watersheds. The Culvert Monitoring Plan will monitor culvert conditions in ALL bull trout watersheds across the Forest.

- The Culvert Monitoring Plan includes remedial actions that shall be taken by the Forest if a failing culvert is found. Remedial actions will be developed in coordination with the Service.

- The Culvert Monitoring Plan includes an adaptive management strategy. This strategy will optimize the monitoring effort by allowing changes to be made based on past years' data, changes in watershed conditions, or major climatic events (e.g., floods, fire). The adaptive management process will be carried out in coordination with the Service

- Annual reporting requirements are included in the Culvert Monitoring Plan. These requirements include an annual meeting between the Service and the Forest, and will ensure an annual assessment of the effectiveness of implementation.

- As part of the adaptive management strategy, the Culvert Monitoring Plan indicates that if at any time implementation cannot be effectively achieved, the Forest will revert back to the original Term and Condition monitoring requirements (as presented in Table 1. of the Culvert Monitoring Plan Version 1.0).

L. CONSERVATION RECOMENDATIONS

Sections 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibilities.

During the course of this consultation, the Service noted several elements that will contribute to the conservation of endangered, threatened, proposed, and candidate species. These elements were proposed by the USFS as part of FNF's Revised Forest Plan. These elements are: the Revised Forest Plan will implement the Aquatic Riparian Conservation Strategy (ARCS). The goal of the ARCS is to maintain or restore watershed conditions. Implementation of the Revised Forest Plan will also include the establishment of a Conservation Watershed Network (CWN). This process seeks watersheds identified as native fish strongholds with appropriately functioning aquatic habitats. CWN watersheds are 10 to 12^{th} code hydrological unit codes (HUCs) intended to protect stronghold populations of native salmonids and complement restoration efforts. Through Revised Forest Plan direction, CWN watersheds will maintain high quality habitat and functionally intact ecosystems that are contributing to and enhancing conservation and recovery of bull trout. The ongoing efforts by the Forest Service to cooperate with other federal, state, local, and tribal agencies and private landowners in the action area are important in supporting coordinated bull trout conservation efforts.

This biological opinion identifies the following conservation recommendations that, in addition to the proposed action and other ongoing conservation actions, will support recovery of listed species. As discussed above, these conservation recommendations are discretionary agency activities meant to minimize or avoid adverse effects to listed species. The conservations recommendations are:

1. Section 2672.2 of the Forest Service Manual states: "The Forest Service must manage habitats at levels that accomplish the recovery of federally listed species so that protective measures under the Act are no longer necessary." The Bull Trout Conservation Strategy (USFWS 2013) was intended, in part, to "help direct resources to the most important opportunities, where FS management has the potential to increase habitat quality and connectivity." The Bull Trout Conservation Strategy should be considered for management opportunities to improve habitat conditions that are conducive to the recovery of bull trout.

2. When planning future projects at the watershed scale, consider actions designed to improve the functional condition of habitat baseline conditions (e.g., FUR to FAR) for bull trout.

3. Work cooperatively with other state and federal agencies to address the potential impacts of non-native fish species (e.g., lake trout) in the Swan Lake and Flathead Lake core areas. Consider actions that include suppression and removal of non-native fish species.

4. Consider implementation of recovery actions identified in the Service's Bull Trout Recovery Plan and the associated Columbia River Headwaters Recovery Unit Implementation Plan (USFWS 2015, 2015b).

In addition to management direction that will contribute to the recovery of bull trout, direction relative other listed species (i.e., grizzly bear, Canada lynx, water howelia) is also contained in the FNF's Revised Forest Plan. These elements are documented in the biological assessment (USFS 2017) or species-specific chapters of this biological opinion. Upon review the Service concludes that the FNF's Revised Forest Plan demonstrated a commitment to conservation of threatened and endangered species, and will continue to contribute to the recovery of these species.

Upon review of Forest Plan components that will be carried forward, and components that are being proposed, we conclude that the features of the FNF's Revised Forest Plan can be considered elements of a program for the conservation of endangered species and threatened species, as described in section 7(a)(1) of the Act. Further, we conclude that this proposed action demonstrates the USFS's commitment to conservation of threatened and endangered species on NFS lands in the action area.

M. REINITIATION NOTICE

This concludes formal consultation for bull trout and bull trout critical habitat on the effects of the revised Land and Resource Management Plan for the Flathead National Forest. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if:

(1) the amount or extent of incidental take is exceeded;

(2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion;

(3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or

(4) a new species is listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. The Service retains the discretion to determine whether the conditions listed in (1) through (4) have been met and reinitiation of formal consultation in required.

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CHAPTER III. BIOLOGICAL OPINION ON GRIZZLY BEARS

Table of Contents

A. CONTEXT OF THE PROPOSED ACTION FOR GRIZZLY BEAR

This section describes the relationship of the action area to grizzly bear habitat and then focuses on the elements of the Revised Forest Plan that may affect grizzly bears. This section also describes the guidelines and standards intended to provide security for grizzly bears, conservation of grizzly bear habitat, and specific measures proposed to avoid, reduce or minimize potential adverse effects of forest management activities on bears at the project level.

This biological opinion will consider the effects of implementing the proposed Revised Forest Plan framework as well as the effects of implementing proposed standards and guidelines at the project level. Note that this biological opinion does not provide an analysis of effects for specific actions. Future actions undertaken by the FNF will undergo detailed analysis and further public comment as part of the site-specific NEPA process, and will undergo consultation under section 7 of the ESA as appropriate. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect grizzly bears as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion.

1. Action Area

As discussed in Chapter I of this biological opinion, the action area for the proposed action in the entirety of the FNF. The Grizzly Bear Recovery Plan (Recovery Plan) prompted the identification of six grizzly bear recovery zones, defined as areas within which the criteria for achievement of recovery would be measured (USFWS 1993). The FNF lies within the Northern Continental Divide Ecosystem (NCDE) (Figure 10). The remaining recovery zones are discussed in *Status of the Species* Section.

2. Description of the Proposed Action

As described in Chapter I, Revised Forest Plan direction is organized by suitability, desired conditions, objectives, guidelines, and standards. The Revised Plan Forest-wide direction describes the framework under which lands will be managed for 15 years or so on the FNF. Components of the FNF's Revised Forest Plan are presented in Appendix 4 of this biological opinion, or in Appendix D of the biological assessment (USFS 2017).

Relationship of the Proposed Action to On-Going Grizzly Bear Conservation Efforts

In 2013, the Service announced the availability of a draft NCDE Grizzly Bear Conservation Strategy for public review and comment (USFWS 2013a). When finalized, the Conservation Strategy will become the post-delisting management strategy for the NCDE grizzly bear population and its habitat. The NCDE Grizzly Bear Conservation Strategy contains habitat-related management direction that pertains to the portions of the Flathead, Helena-Lewis and Clark, Kootenai, and Lolo National Forests that are located within the NCDE. It should be noted that the Helena National Forest and Lewis and Clark National Forest have recently been administratively combined but still have separate forest plans in place, each of which are being amended.

Habitat conditions and management on NFS lands within the NCDE (including the FNF) have contributed to the increased population size and improved status of the grizzly bear across the NCDE. Supporting a healthy, recovered grizzly bear population in the NCDE will depend on continued, effective management of the grizzly bear habitat. As part of the proposed action the FNF will incorporate the desired conditions, standards, guidelines, and monitoring items in the Revised Forest Plan that are relevant to management of NFS lands and that will contribute to the recovery of the NCDE population of grizzly bears.

The NCDE Conservation Strategy uses an approach that provides differential protections in areas depending on their relative importance to grizzly bears (USFWS 2013a). Under the NCDE Conservation Strategy, the following management zones and areas are designated:

- Primary Conservation Area (PCA): The PCA is the same area as the NCDE Recovery Zone, and will be managed as a source area where the objective is continual occupancy by grizzly bears. Habitat conditions in the PCA will be maintained in a manner that is compatible with a stable to increasing grizzly bear population.

- Management Zone 1 (zone 1): The objective in zone 1 is continual occupancy by grizzly bears, but at lower densities than inside the PCA. Protections in zone 1 will focus on managing motorized routes and implementing food/attractant storage orders.

- Demographic Connectivity Areas (DCA): Within zone 1, two DCAs will be established (Salish and Ninemile). These areas will be established to allow the NCDE to serve as a "source" population to other ecosystems (i.e., Cabinet-Yaak and Bitterroot). Protections in the DCAs will support female occupancy and dispersal by managing miles of motorized routes, maintaining current roadless areas, and implementing food/attractant storage orders.

- Management Zone 2 (zone 2): National Forest System (NFS) lands in zone 2 will be managed to provide the opportunity for grizzly bear dispersal, particularly males, to other ecosystems. The protections in zone 2 will center on grizzly bear-human conflict prevention and response. As with the PCA, zone 1 and the DCAs, a food/attractant storage order would be implemented on NFS lands within zone 2.

- Management Zone 3 (zone 3): Zone 3 is primarily comprised of areas that do not contain suitable habitat for long-term survival and/or occupancy of grizzly bears. Management in zone 3 will focus on grizzly bear-human conflict response.

Key Forest Plan Components Related to Grizzly Bear

Key management direction for grizzly bear habitat consistent with what is being developed in the draft NCDE Conservation Strategy will be incorporated into forest plan components (i.e., desired conditions, standards, guidelines, monitoring) of the Revised Forest Plan. A detailed list of the desired conditions, standards, guidelines, and monitoring items is presented in Appendix 3. The effects of these components will be discussed further in this BO. Following is a summary of features of the proposed action:

- Within the PCA, there will be no net increase in open motorized route density (OMRD) or total motorized route density (TMRD), and no net decrease in secure core. Temporary changes could occur (see below), but baseline levels would be maintained in each grizzly bear subunit. The definition of "baseline" for the Revised Forest Plan is consistent with the definition in the NCDE Grizzly Bear Conservation Strategy (see glossary and standard FW-STD-IFS-02 for details).

- In the DCA, habitat protections would focus on limiting miles or density of motorized roads/routes open to the public during the non-denning season (see GA-SM-STD-01 for details).

- Temporary increases in open and total motorized route densities and temporary decreases in secure core would be allowed for projects (see "project" definition in the glossary). However, temporary deviations from baseline conditions will not exceed a five percent increase for OMRD, a three percent increase for TMRD, and a two percent decrease for security core. Temporary deviations will be calculated using a ten-year running average for each bear management subunit (procedures for this calculation are presented in Appendix 2; see FW-STD-IFS-03 for details).

- Restricted roads would not be opened for temporary use by the public during the non-denning within secure core habitat (see FW-STD-IFS-04 for details). Within the PCA, administrative use of restricted roads would be limited (see FW-STD-IFS-01 for details).

- High use non-motorized trails would no longer be considered when calculating secure core habitat. This methodology is being proposed in an effort to remain consistent with the NCDE Grizzly Bear Draft Conservation Strategy.

- Within modeled grizzly bear denning habitat in the PCA, there would be no net increase in the percentage of area or miles of routes designated for over-snow vehicle use on NFS lands during the den emergence time period (see FW-STD-REC-05 for details).

- Special orders for storage of food/wildlife attractants would be in place across NFS lands in the PCA and zone 1, including the Salish DCA (see FW-STD-WL-02 for details).

- Within the PCA, developed recreation sites designed and managed for overnight use (e.g., campgrounds, cabin rentals, huts, guest lodges, recreation residences) during the non-denning season would be limited to one increase above the baseline in number or capacity per decade per bear management unit (see FW-STD-REC-01 for details).

- Vegetation management would be designed to consider grizzly bear habitat and to reduce the risk of grizzly bear-human conflicts within the PCA (see FW-GDL-TE&V-01 through 05 for details).

- Livestock allotments in the PCA would have requirements for no net increase in the number of cattle and sheep allotments and no net increase in sheep animal unit months (AUMs). Livestock allotments would be managed to limit the risk of grizzly bear-human conflicts in the primary conservation area and zone 1 (see FW-STD-GR-01 through 06 for details).

- Mineral and energy development would be managed with consideration of grizzly bear habitat and to reduce the risk of grizzly bear-human conflicts in the primary conservation area and zone 1. New leases for leasable minerals (e.g., oil and gas) in the PCA would be required to have a no surface occupancy stipulation (see FW-STD-E&M-01 through 09 and FW-GDL-E&M-01 through 06 for details).

- Forest plan monitoring items would be added (see MON-NCDE-01 through 08).

B. STATUS OF THE SPECIES

1. ESA Listing History

The Service listed the grizzly bear as a threatened species in the contiguous United States in 1975 (40 FR 31734-31736, July 28, 1975). The Service identified the following as factors establishing the need to list: (1) present or threatened destruction, modification, or curtailment of habitat or range; (2) overutilization for commercial, sporting, scientific, or educational purposes; and (3) other manmade factors affecting its continued existence. The two primary challenges in grizzly bear conservation are the reduction of human-caused mortality and the conservation of remaining habitat (USFWS 1993).

The Service subsequently developed the Grizzly Bear Recovery Plan (Recovery Plan) in 1982, which was later revised in 1993 (USFWS 1993). The 1993 revised Recovery Plan delineated grizzly bear recovery zones in 6 mountainous ecosystems in the U.S. The Recovery Plan details recovery objectives and strategies for the grizzly bear recovery zones in the ecosystems where grizzly bear populations still persist. These recovery zones are: the Northern Continental Divide Ecosystem (NCDE), Greater Yellowstone Ecosystem (GYE), Cabinet-Yaak Ecosystem (CYE) and the Selkirk (SE) Ecosystem. The Recovery Plan also includes recovery strategies for the North Cascades Ecosystem (NCE) in Washington, where only a very few grizzly bears are believed to remain, and for the Bitterroot Ecosystem (BE) of Idaho and Montana, where suitable habitat remains, but no grizzly bear occupancy has been documented for more than 50 years.

Since the original listing of the grizzly bear, the Service has completed four, 5-year status reviews (46 FR 14652, February 27, 1981; 52 FR 25523, July 7, 1987; 56 FR 56882, November 6, 1991; and September 6, 2011). The Service has undertaken a number of other actions to review the status of individual grizzly bear populations. Between 1986 and 2007, the Service received and reviewed 10 petitions requesting a change in status for individual grizzly bear populations (51 FR 16363, May 2, 1986; 55 FR 32103, August 7, 1990; 56 FR 33892, July 24, 1991; 57 FR 14372, April 20, 1992; 58 FR 8250, February 12, 1993; 58 FR 38552, July 19, 1993; 58 FR 43856, August 18, 1993; 58 FR 43857, August 18, 1993; 59 FR 46611, September 9, 1994; 64 FR 26725, May 17, 1999; 72 FR 14866, March 29, 2007; 72 FR 14866, March 29, 2007). Through this process, we determined the CYE, SE, and NCE warrant endangered status. These uplistings remained warranted but precluded by higher priority listing actions until 2014 (63 FR 30453, June 4, 1998; 64 FR 57534, October 25, 1999; 66 FR 54808, October 30, 2001; 67 FR 40657, June 13, 2002; 69 FR 24876, May 4, 2004; 70 FR 24870, May 11, 2005; 71 FR 53756, September 12, 2006; 72 FR 69034, December 6, 2007; 73 FR 75176, December 10, 2008; 74 FR 57804, November 9, 2009; 75 FR 69222, November 10, 2010; 76 FR 66370 October 26, 2011; 78 FR 70104 November 22, 2013). As of 2014, the NCE remains warranted but precluded while the CYE and SE populations were no longer warranted (79 FR 72450 December 5, 2014). However, the determinations for the CYE and SE were recently vacated. The Service previously determined that grizzly bears in the CYE warranted a change to endangered status, but were precluded from uplisting. However, for several years this population's status has been improving and the Service determined in 2014 that the CYE population no longer warranted endangered status. This determination was recently vacated on August 22, 2017 and the matter is currently remanded to the Service for further consideration. The regulatory environment for grizzly bears had not changed between the time the bear was considered warranted for endangered status but precluded, no longer warranted endangered, and now a matter remanded to the Service. In other words, no management controls were relaxed in 2014.

In 2007, the Service determined that the GYE supported a grizzly bear population with sufficient numbers and distribution of reproductive individuals so as to provide a high likelihood that the species will continue to exist and be well distributed throughout its range for the foreseeable future. Therefore, based on the best scientific and commercial information available, the Service delisted the Yellowstone grizzly bear DPS, effective April 30, 2007. However, on September 21, 2009, a court order vacated the final rule designating the Yellowstone DPS and removing the Yellowstone grizzly bear DPS from the list of threatened species and remanded the rule back to the Service. In accordance with the court order, in March of 2010, the Yellowstone grizzly population was once again listed as a threatened population under the Endangered Species Act (75 FR 14496, March 26, 2010).

The best available scientific and commercial data continue to indicate that the GYE population of grizzly bears has recovered and no longer meets the definition of an endangered or threatened species under the Act. Therefore, on March 11, 2016, the Service proposed to identify the GYE grizzly bear population as a distinct population segment (DPS) and to remove the DPS from the list of endangered and threatened wildlife (81 FR 13173). On June 30, 2017, the Service published a final rule removing the GYE grizzly bears from the list of endangered and threatened wildlife (82 FR 30502). The final rule became effective on July 31, 2017.

2. Species Description, Life History, and Population Dynamics

Species information for the grizzly bear is presented in detail in the updated 1993 Grizzly Bear Recovery Plan (USFWS 1993), below is a summary of this information:

Grizzly bears are large and long-lived mammals. Male grizzly bears are usually larger than females (400-600 lbs for males and 250-350 lbs for females), and individuals in the wild typically live between 15 and 25 years (Blanchard 1987). Grizzly bears are omnivorous, opportunistic feeders that have large caloric requirements. This is particularly true in later summer and fall when bears need to build fat reserves that will be utilized during the denning period. Grizzly bears are generally solitary animals, with the exception of the mating season when male and female bears tolerate one another, and a female with cubs. Grizzly bears do not defend territories, but instead have home ranges they share with other grizzly bears, although social systems influence movements and interactions among resident bears. Home range sizes for adult female grizzlies vary from 50 to 150 square miles; an adult male can have a home range size as large as 600 square miles (Servheen 1983).

Grizzly bears in the contiguous United States spend 5 to 6 months in their dens, typically beginning in October or November (Craighead and Craighead 1972). During this period, they do not eat, drink, urinate, or defecate. Over the course of the denning season, grizzly bears hibernate and may lose 30 percent of body weight. All of this weight is stored as fat, which is acquired during the 2 to 4 months prior to entering dens. During the pre-denning period, bears increase their food intake dramatically and may gain as much as 3.64 pounds per day (Craighead and Mitchell 1982).

Mating occurs from May through July, and cubs are born inside the den in late January or early February. Cubs remain with their mother for 2 to 3 years (Schwartz et al. 2003). The age at which females produce their first litter varies from 3 to 8 years, with litter size varying from one to four cubs. Grizzly bears have one of the lowest reproductive rates among terrestrial mammals. Grizzly bear females cease breeding successfully some time in their mid to late 20s (Ibid.).

3. Habitat Requirements

Grizzly bears are opportunistic omnivores and will eat berries, grasses, leaves, insects, roots, carrion, small mammals, fish, fungi, nuts, and ungulates. Grizzly bears are selective in their seasonal use of various kinds of forage and, therefore, move across the landscape as they follow the growth and abundance of preferred forage items (Mace et al. 1996; McLellan et al. 1999; Kasworm et al. 2010).

Grizzly bears are habitat generalists. Basic habitat requirements include the availability of food and water, security (from humans and other bears), and den sites (Mace et al. 1996; Mace et al. 1999; Linnell et al. 2000) (Table III-1). While biologists agree that preferred habitats of grizzly bears include early seral forests, the proximity of hiding cover is also an important variable that has been shown to influence the use of foraging habitat. Given equal foraging opportunities, under cover and in the open, bears prefer to feed in areas with cover.

As mentioned, grizzly bears will typically move across the landscape in search of their preferred forage items. As a result, the productivity of grizzly bear populations is likely more strongly influenced by the availability of high quality food resources than by density-dependent regulating factors (IGBC 1987). It has also been observed that grizzly bears of all ages will congregate readily at plentiful food sources and form a social hierarchy unique to that grouping of bears (Hornocker 1962, USFWS 1993).

Table III-1. Grizzly bear key habitat requirements (USFWS 2011).

Habitat Requirement	Key Habitats
Spring foraging[1]	Low-elevation mesic vegetation
Summer, autumn foraging[1]	Moderate- to high-elevation mesic vegetation
Security cover and isolation from humans[2,3]	Cover provided by vegetation and topographic breaks; absence or low density of roads and trails with motorized use.
Denning habitat[4]	Remote, high-elevation areas with slopes greater than 30 degrees; friable, deep soils; and snow accumulations

1 Mace et al. (1996); Mace et al. (1999); McLellan and Hovey (2001); Nielsen et al. (2002); Waller and Mace (1997).
2 Archibald et al. (1987); Kasworm and Manley (1990); Mace et al. (1996); Mace et al. (1999); Mattson et al. (1987); McLellan and Shackleton (1988, 1989); Wielgus et al. (2002).
3 Mace and Waller (1997); White et al. (1999); Graves et al. (2003).
4 Pearson (1975); Servheen (1981); Zager and Jonkel (1983); Podruzny et al. (2002).

With the exception of a few forest vegetation types, such as horsetail associations, the majority of vegetative food items preferred by grizzly bears occur in early seral communities where forest cover is absent or relatively sparse (Servheen 1983). Foraging areas that are consistently described in the literature as favored by bears include avalanche chutes (Mace et al. 1996; Waller and Mace 1997; Ramcharita 2000; McLellan and Hovey 2001), fire-mediated shrub fields (McLellan and Hovey 2001), and riparian areas (Servheen 1983; McLellan and Hovey 2001; Kasworm et al. 2010). Avalanche chutes may be used at any time of year, but seem to attract bears particularly in the spring. These areas are typically moist (due to deep snows that melt later than in other areas), and they contain both valuable forage species and sufficient vegetation that provides visual screening. Fire-mediated shrub fields often contain soft-mast producing shrub species (e.g., berries), an important food source for foraging bears in mid-summer and early fall. Riparian areas are primarily used in spring and early summer when habitats at higher elevations are still covered with snow or plant growth is otherwise delayed. Riparian areas provide a variety of key forbs and grasses, and a complex tree and shrub structure offering hiding cover. When bears emerge from their dens in the spring, their fat stores have been severely depleted. At this point, foraging to rebuild energy reserves is their primary focus. It is important that bears have adequate spring foraging opportunities close to their dens, especially when cubs have been born, to build up fat stores quickly.

Food habits not only vary between seasons but also between the recovery zones. Radio collared grizzly bears in the Cabinet Mountains and Yaak River (in the CYE) made greatest annual use of closed timber, timbered shrub fields, mixed shrub snow chutes, mixed shrub/cutting units, alder shrub fields, huckleberry shrub fields, and graminoid and beargrass side-hill parks (Kasworm et al. 2010). In the GYE, grizzly bears have been documented of feed on more than 260 species of plants and animals (Gunther et al. 1991a; Gunther et al. 2014). Due to the challenge of monitoring such a diverse diet, four food sources with relatively high energetic values are monitored because of the relative ease in measuring their abundance. Ungulates (primarily elk and bison) serve as an important food source in early spring (winter killed) before most vegetation is available, early summer (during the calving period), and throughout the year from usurped wolf kills (Green et al. 1997; Mattson 1997; Ballard et al. 2003; Fortin et al. 2013; Gunther et al. 2014). Although the availability of cutthroat trout has declined since the early 2000s, spawning cutthroat trout (*Oncorhynchus clarki*) are a source of nutrition for grizzly bears in the Yellowstone population in the early summer when available (Mattson et al. 1991a; Felicetti et al. 2004; Fortin et al. 2013). These grizzly bears will then feed on army cutworm moths (*Euxoa auxiliaris*) during the late summer and fall as they try to acquire sufficient fat levels for winter hibernation (Mattson et al. 1991b; French et al. 1994). Further, in some years, whitebark pine (*Pinus albicaulis*) seeds may serve as an important fall food due to its high-fat, energy-rich content (USFWS 2011).

In the NCDE grizzly bears eat roots/corms/bulbs and other vegetation in the early summer months before berries become available (Aune and Kasworm 1989; McLellan and Hovey 1995). Grizzly bears on the eastern front of the Northern Rockies and in Glacier National Park also feed on concentrations of lady bird beetles and army cutworm moths (Mattson et al. 1991b). Once berries become available, NCDE grizzly bears consume a wide variety of available species. McLellan and Hovey (1995) analyzed scat samples and determined that the amount and species of berries varies annually based on their availability. During late summer to fall, grizzly bears in the NCDE continue to eat berries but also consume more meat and roots/bulbs/corms (Aune and Kasworm 1989; McLellan and Hovey 1995). Late summer to fall is also the time when grizzlies make use of whitebark pine nuts when and where they are available (Aune and Kasworm 1989).

In addition to foraging habitat, a degree of isolation from humans and human-associated activities are necessary habitat components for grizzly bears (Mattson et al. 1987; McLellan and Shackleton 1988, 1989; Mace et al. 1996, 1999). Human activities can result in direct mortality of bears, as well as indirect negative effects by displacing bears to less suitable habitats (McLellan et al. 1999; Wakkinen and Kasworm 2004). The most effective way to minimize the risk of adverse interactions between humans and bears is to provide spatial separation between areas of human activity and areas of bear activity. In areas where such separation is not possible, providing large areas of secure habitat that include seasonal habitats may reduce the potential for contact and minimize risk of disturbance and illegal mortality (Mace and Waller 1998).

Managing public motorized access to grizzly bear habitat is one of the most common and effective ways to maintain a level of separation between grizzly bears and humans. This separation provides a number of benefits: (1) minimizes human interaction and reduces potential grizzly bear mortality risk; (2) minimizes displacement from important habitat where energetic requirements can be met with limited disturbance from humans; and (3) minimizes habituation to humans (Mattson et al. 1987; McLellan and Shackleton 1988; McLellan 1989; Mace and Manley 1993; Mace et al. 1996; Wakkinen and Kasworm 1997). Secure habitat for grizzly bears (referred to as security core or secure core areas) is specifically defined by the Interagency Grizzly Bear Committee (IGBC) as areas that are at least 0.31 miles from any open or gated road, motorized trail, or non-motorized high intensity route during the core period (IGBC 1998). Such lands should also encompass areas of seasonal importance for grizzly bears throughout the year.

While security cover allows grizzly bears to avoid contact with humans, the cover is sometimes necessary for bears to avoid contact with other bears. Strict territoriality among grizzly bears is not known, and intraspecific defense behavior generally tends to be limited to defense of limited food concentrations, defense of young, and surprise encounters (USFWS 1993). Adult male bears are known to kill juveniles, and adults also occasionally kill other adults. Females with cubs require spatial separation from aggressive males. This is particularly true in spring, when cubs-of-the-year are most prone to attack. Data are insufficient to fully assess the effects of predation on younger bears by adult bears (USFWS 1993), particularly when considering potential indirect effects of various human activities that may displace a subadult bear into the home range of an aggressive adult bear. Females with cubs often select rugged and isolated habitats for this reason (Mace and Waller 1997; Russell et al. 1979). Shrub and tree cover, as well as topographic landscape features, are commonly used as security from humans or other bears (McLellan and Hovey 2001; Wielgus et al. 2002), and dispersing subadult bears may be forced to choose poor home ranges that may be equally dangerous to their survival (USFWS 1993).

Another key habitat requirement for grizzly bears is the presence of suitable denning habitat. Den site characteristics are variable, but several researchers have described dens located at high elevations in remote areas with slopes greater than 30 degrees, soils that are deep, and aspects where snow accumulates (Craighead and Craighead 1972; Linnel et al. 2000; Mace and Waller 1997; Podruzny et al. 2002). Sloped sites are often selected because they facilitate easier digging and are generally stabilized by trees, boulders, or root systems of herbaceous vegetation. In addition to excavating dens, grizzly bears den in natural caves and hollows under the roots of trees. While individual den sites are rarely reported to be used for more than one winter, numerous researchers have observed that dens rarely occur singly, but are concentrated in areas that apparently possess appropriate environmental conditions (Craighead and Craighead 1972).

4. Habitat Fragmentation

Habitat linkage and connectivity are important components of grizzly bear habitat (Servheen et al. 2001; USFWS 1993). As a result, habitat fragmentation is particularly relevant to the survival and recovery of grizzly bears. Grizzly bears require extensive home ranges due to their large size and high metabolic demands. Large expanses of unfragmented habitat are important for feeding, breeding, sheltering, traveling, and other essential behavioral patterns. Historically, as human settlements and developments along roads increased in grizzly bear habitat, grizzly bear habitat (and eventually populations) became fragmented. Fragmentation continues today, as grizzly bears attempting to move within, or even between, recovery zones often encounter high traffic roads (e.g., highways, interstates), concentrated human development, and/or altered vegetation that does not provide foods, cover, or security. These conditions can continue to contribute to fragmented grizzly bear habitat and populations, and may even lead to direct mortality if bears conflict with humans. Maintaining suitable linkage (areas providing safe passage across/through less than optimal environments) and connectivity (contiguous preferred habitat or cover) between small, isolated grizzly bear populations can benefit grizzly bears in several ways, including (1) allowing immigrant grizzly bears to bolster a resident population in an area that has been affected by catastrophic events or negative environmental conditions, and (2) preserving genetic diversity by reducing negative effects from inbreeding. Task 37 in the Grizzly Bear Recovery Plan (USFWS 1993) called for the evaluation of linkage potential between grizzly bear recovery zones.

5. Dispersal, Movement and Genetic Health

Grizzly bears live at relatively low population densities and are vulnerable to excessive human-caused mortality. As a result, fragmentation of historically contiguous populations into isolated "remnant" populations is a management reality on the current ecological landscape (Forman and Alexander 1996; Proctor et al. 2012; Servheen et al. 2001). However, the extinction risk of isolated populations is reduced through minimal levels of connectivity (Soulé 1987). At greatest risk of extinction are small isolated populations with less than 100 individuals. Such populations are more susceptible to extinction through demographic processes such as human-caused mortality, natural mortality, and lower population growth rates as well as environmental processes such as poor food years, climate change, and habitat loss. While the CYE and SE grizzly bear populations contain less than 100 individuals each, they are not isolated from Canadian populations. Small populations benefit greatly from both demographic rescue (i.e., the immigration of female bears) and to a lesser degree genetic rescue (i.e., immigration of male bears). Although reconnection of these somewhat isolated populations is challenging (Forman and Alexander 1996; Lindenmayer and Fischer 2006), metapopulation theory directs that connectivity is the best long-term conservation practice to increase the resiliency, redundancy, representation, and overall probability of persistence of remaining grizzly bear populations in the lower 48 States (Boyce 2000).

Proctor et al. (2012) compiled and analyzed all known genetic and movement data for grizzly bears in 10 different study areas. They assessed the current state of genetic fragmentation within and between these study areas and used genetic assignment testing and movement data from radio-collared individuals to compile what is known about current levels of male and female movement. Samples from coastal British Columbia and the Selkirk Mountains south of Canadian Highways 3 and 3A (i.e., the SE) have unique genetic material that is dissimilar to other grizzly bear populations in southern Canada and the northern U.S. In the Selkirk Mountains this difference is most likely due to genetic drift acting on a small isolated population over several generations because of anthropogenic pressures (Proctor et al. 2012).

Although there are differences in heterozygosity values among study areas and recovery zones, there have been no detectable consequences on grizzly bear morphology, physiology, ecology, or biology related to these differences in genetic diversity. This is evidenced by normal litter size, little evidence of disease, an equal sex ratio, and physical characteristics such as body size and weight (Schwartz et al. 2006, 2006a; Kasworm et al. 2008; USFWS 2011). Proctor et al. (2012) determined that these genetic differences are not the result of natural selection in varying environments or indicative of historical conditions. Instead, they are artifacts of human pressures (Ibid.). Grizzly bears face high mortality risk when moving between secure blocks of habitat. This mortality risk and very low population sizes resulting from past range contraction and mortality have resulted in genetic fragmentation. Each of these fragmented populations may possess genetic material missing from other populations. Maintenance of this genetic material is important to the long-term ability of this region's grizzly bears to respond to environmental changes.

Because grizzly bears have low reproductive rates, long generational periods (8-10 years), and are slow to disperse across landscapes, there can be a lag time between population fragmentation and the subsequent genetic change (Proctor et al. 2004). The genetic data collected by Proctor et al. (2012) reflect fragmentation occurring on the landscape in the recent past (i.e., last 30-60 years). The researchers also examined grizzly bear movements between ecosystems that displayed varying levels of genetic separation. Movement data were collected from 1985-2007 and represent a more recent picture of fragmentation than genetic data. In general, males move more frequently and over longer distances than females. This result is expected based on what is known about female home range size and the dispersal process. Females typically establish smaller home ranges than males, and new female home ranges also overlap with their mother's (Servheen 1983). As a result, females generally disperse over much shorter distances than male grizzly bears (McLellan and Hovey 2001; Proctor et al. 2004). The majority of migrants that moved from one study area to another were males, but small number of females were also observed moving between genetically fragmented populations (Proctor et al. 2012). This is consistent with finding in western Montana and Wyoming. The earliest detections of grizzly bears from the NCDE found in the intervening area between the NCDE and the GYE were male, and males make up most of the known occurrences in this region (Mace and Roberts 2012).

Connectivity must be examined in a genetic (requires males only) and demographic (requires females) framework. While dispersing males can enhance genetic diversity, in-turn reducing genetic fragmentation (Miller and Waits 2003; Proctor et al. 2012), female dispersal into small populations is necessary to enhance growth rate (Proctor et al. 2012). This concept is relevant to grizzly bear recovery in the NCE, SE, and CYE recovery zones, all of which contain small populations that are demographically and genetically isolated to varying degrees.

Increasing genetic and demographic fragmentation across Canada Highway 3 has been documented (Proctor et al. 2012). This fragmentation could lead to a loss of connectivity between some U.S. populations and Canadian grizzly bears. Canada Highway 3 is at least a partial barrier to population connectivity by minimizing female crossings (Ibid.). Maintaining and increasing movements by females (i.e., demographic rescue) from larger populations (e.g. Canada or the NCDE) into the small populations (NCE, SE, and CYE) is critical to the long-term conservation of these populations. Recovery could be accomplished via natural movements or translocating animals.

Another aspect of connectivity Proctor et al. (2012) examined was known habitat use by grizzly bears in intervening habitats between Service-identified recovery zones. This habitat use is relevant to understanding how and where grizzly bears in different ecosystems may be linked in the near future. The researchers found 4 males and 1 female using habitat between the Selkirk and Purcell Mountains in Canada, although there was no evidence indicating any migration between these 2 mountain ranges. Mace and Roberts (2012) documented the distribution of grizzly bears in and adjacent to the NCDE recovery zone based on a compilation of telemetry data, mortality data, and DNA detections. The study found that a small number of both male and female grizzly bears are occupying habitat a substantial distance from the recovery zone boundary, including areas to the south, east and west of the NCDE recovery zone. One female grizzly bear with a cub was found to be regularly using habitat between the NCDE and CYE. Telemetry data on this female indicate that she and her offspring spent most of their summer in the Salish Mountains less than 2 miles east of the edge of the CYE while denning within the boundaries of the NCDE recovery zone (Kasworm et al. 2010). The detection of grizzly bears outside the NCDE recovery zone has been increasing in recent years (Costello et al. 2016). Kasworm et al. (2012) have documented multiple grizzly bears, including females with cubs, in the Tobacco BORZ (Bears Outside Recovery Zone), an area situated between the CYE and NCDE.

6. Range-Wide Status

When grizzly bears in the lower 48 States were listed under the ESA in 1975, the vast reduction in range, increase in trail and road construction, increase in recreation, livestock use of NFS lands, unsustainable human-caused mortality, lack of data regarding populations, and isolation were identified as factors affecting their conservation status (40 FR 31734, July 28, 1975). To date, all of these threats have been addressed to varying degrees in different areas.

New information regarding grizzly bear biology, current status, and threats has become available over the years since listing. This research and information has been valuable in addressing the impacts and management of roads, trails, recreation, and livestock management. It has also indicated the need for public information and assistance programs, and attractant storage protocols to limit human-caused mortality of grizzly bears.

Although there are six grizzly bear recovery zones, five are occupied; the BE does not have a grizzly bear population at this time. We have recent population data for the GYE, NCDE, CYE, and SE. The current range and distribution of grizzly bears in the lower 48 States is not a static measure as dispersal is occurring, and the specific distribution has not been quantified systematically across all ecosystems. Grizzly bears now occur both within the formally designated recovery zones and in habitat adjacent to the NCDE, GYE, SE and CYE (Wittinger 2002; USFS 2009; Mace and Roberts 2011, 2012).

Following is a summary of the status of grizzly bears for the five recovery zones not included in the action area, followed by a more detailed discussion for the recovery zone that is included in the action area (NCDE).

North Cascade Ecosystem

The North Cascade Ecosystem (NCE) recovery zone lies in north central Washington and is 9,694 square miles in area. Grizzly bears were historically abundant in the NCE, but numbers have declined substantially in recent decades. Sullivan (1983) compiled 233 reports of grizzly bears in the North Cascades and adjacent British Columbia from the mid-1800s through 1983. The last grizzly bear killed in the North Cascades was in Fisher Creek in 1967 (Sullivan 1983), and the last verified sighting occurred in the Glacier Peak Wilderness during 1996 (North Cascades Grizzly Bear Recovery Team 2004). A grizzly bear habitat evaluation of the North Cascades was conducted from 1986 to 1991 (Almack et al. 1993; Gaines et al. 1994). The evaluation and a Technical Committee Review Team (Servheen et al. 1991) concluded that the ecosystem contained sufficient habitat to maintain and recover a grizzly bear population.

Currently, it is estimated that the NCE supports less than 20 grizzly bears (Almack et al. 1993). The nearest population of grizzly bears is immediately north in Canada with an estimated 25 individuals but populations to the east and west of the Cascades in Canada are considered extirpated (North Cascades Grizzly Bear Recovery Team 2004). The distribution of grizzly bears within the NCE is unknown due to a lack of data (USFWS 2011), and very few credible sightings and reports exist. A recent confirmed sighting in the U.S. occurred in September 2010, and there have been credible reports in the British Columbia portion of this ecosystem (*Ibid.*).

The National Park Service and the Service are working in cooperation with the U.S. Forest Service, and the Washington State Department of Fish and Wildlife in the development of an EIS process for restoring Grizzly Bears to the North Cascades Ecosystem (NCE). That EIS was released to the public for review on January 12, 2017.

Selkirk Ecosystem

The Selkirk Ecosystem (SE) recovery zone lies within northwestern Idaho, northeastern Washington, and southeastern British Columbia. It encompasses 2,201 square miles and is unique in that it is split between Canada (47 percent) and the U.S. (53 percent). The 1993 Recovery Plan defined a portion of the SE within Canada so that it was at least 2,000 square miles in size. This size would promote the Recovery Plan's minimum population goal of 90 grizzly bears in the SE (USFWS 1993). In Canada, land ownership is roughly 65 percent Crown (i.e., public) land and 35 percent private. In the U.S. portion of the SE, land ownership is approximately 80 percent Federal, 15 percent State, and 5 percent private lands. Within the SE, 3 percent (39,976 acres) is designated Wilderness Area. The habitat is contiguous across the border and radio-collared bears are known to move back and forth across the border. Therefore, the grizzly bears north and south of the border are considered one population (USFWS 1993).

The SE grizzly bear population has yet to reach recovery criteria presented in the Recovery Plan (USFWS 1993) for females with cubs. In 2004, Wakkinen and Kasworm (2004) estimated that the SE grizzly bear population was increasing at a rate of 1.8 percent annually. More recently, Proctor et al. (2012) compiled data from multiple sources and conducted DNA-based population surveys to estimate a population size of 83 grizzly bears in the SE. The most recent data indicate that population status is below recovery goals in the SE for number of unduplicated females but meets the criteria for distribution of females with young in bear management subunits (Kasworm et al. 2016a). The human-caused mortality levels for total bears and female bears were in excess of calculated limit during 2010-2015 (Ibid.). After known mortality was subtracted, a minimum of 30 grizzly bears were identified in the SE during 2013-2015 based on captures, genetic information, mortality, and sightings of unique individuals (Kasworm et al. 2016a). The recovery plan established a goal of zero human-caused grizzly bear mortality for the SE. This goal was not met.

Bitterroot Ecosystem

The Bitterroot Ecosystem (BE) recovery zone is located in east central Idaho and western Montana, and encompasses 5,785 square miles. Though suitable habitat remains, grizzly bears have been extirpated from the BE. At this time the BE is not considered to be occupied by a population of grizzly bears (USFWS 2011). The Service released a final environmental impact statement (EIS) and decision notice addressing the impacts of reintroducing grizzly bears into the Bitterroot Ecosystem in east central Idaho (USFWS 2000).

Cabinet-Yaak Ecosystem

The Cabinet-Yaak Ecosystem (CYE) recovery zone is 2,609 square miles in size and is located primarily in northwestern Montana with small portions in northern Idaho. The location of the CYE relative to the SE and NCDE (east and west, respectively) makes it essential to long-term survival and recovery of grizzly bears throughout a significant portion of its range in the U.S. Land ownership in the CYE is approximately 90 percent Federal, 5 percent State, and 5 percent private lands. The Kootenai National Forest manages approximately 72 percent of lands within the CYE recovery zone, with the Idaho Panhandle and Lolo National Forests administering the remaining Federal lands within the recovery zone. Approximately 5.6 percent (94,272 acres) of the CYE recovery zone is designated Wilderness. Major private land owners in the recovery zone include Weyerhauser and Stimson Timber Companies. Individual landowners live on various-sized acreage along the major rivers. The relative distribution of grizzly bears across this ownership pattern is unknown, but is believed to be proportionate to land ownership (i.e., approximately 90 percent of the grizzly bear population lives on the 90 percent of public land within this recovery zone). In Canada, the portion of British Columbia directly north of the CYE recovery zone is largely public with the exception of the Moyie and Kootenay River valleys.

The CYE is often described in terms of having two portions. The Cabinet Mountains portion forms the southern half of the CYE and is topographically diverse with steep mountain ranges (up to 8,700 feet) and definable seasonal habitats. The Yaak portion has gentler topography, lower elevations (up to 7,700 feet), and seasonal habitats are not as clearly definable. More research and telemetry work has occurred in the Yaak than the Cabinet Mountains.

After known mortality was subtracted, a minimum of 41 grizzly bears were identified in the Cabinet-Yaak recovery zone during 2013-2015 based on captures, genetic information, mortality, and sightings of unique individuals (Kasworm et al. 2016a). Grizzly bears also occur to the north of the U.S.-Canada border, and interchanges of radio-collared bears across the border have been documented (USFWS 1993). Kasworm et al. (2016) also concluded that there is a 61 percent probability that the CYE grizzly bear population is increasing, and the rate of that increase was estimated at 1.1 percent from 1983 to 2015.

Kasworm et al. (2017, In Prep) provide additional evidence of an improving baseline. The text, table and figure presented below are provided as presented in Kasworm et al. 2017:

> "The estimated finite rate of increase (λ) for 1983–2016 using Booter software with the unpaired litter size and birth interval data option was 1.016 (95% C.I. 0.936–1.085, Table 15). Finite rate of change in the population was an annual 1.6% for the period (Caughley 1977). Subadult female survival and adult female survival accounted for most of the uncertainty in λ, with reproductive rate, yearling survival, cub survival, and age at first parturition contributing much smaller amounts. The sample sizes available to calculate population trend are small and small sample sizes yield wide confidence intervals around any calculated estimate of trend (i.e., λ). The probability that the population was stable or increasing was 66%.
>
> Sample size concerns limited calculation of point estimates of cumulative annual rate of change until 1998 (Fig. 9). Finite rates of increase calculated for the period 1983–1998 (λ = 1.067, finite change = 6.5% annual) suggested an increasing population. Survival rates for adult and subadult females were 0.948 and 0.901 respectively, at that time. Adult and subadult female survival rates declined to 0.926 and 0.740 respectively in 2006 at the lowest point in the cumulative lambda calculations (λ = 0.926, finite change = -7.7% annual decline) (Fig. 10). Human-caused mortality has accounted for much of this decline in survival rates and population trend. During 2016, adult female survival and subadult female survival had increased to 0.954 and 0.827 respectively and resulted in an improving population trend estimate since 2006. Improving survival by reducing human-caused mortality is crucial for recovery of this population (Proctor et al 2004)."

Table 15. Booter unpaired method estimated annual survival rates, age at first parturition, reproductive rates, and population trend of native grizzly bears in the Cabinet–Yaak recovery zone, 1983–2015.

Parameter	Sample size	Estimate (95% CI)	SE	Variance (%)[a]
Adult female survival[b] (S_a)	16 / 43.3[c]	0.954 (0.884–1.0)	0.032	23.5
Subadult female survival[b] (S_s)	18 / 22.4[c]	0.827 (0.655–0.961)	0.081	62.7
Yearling survival[b] (S_y)	33 / 16.2[c]	0.884 (0.726–1.0)	0.076	2.4
Cub survival[b] (S_c)[d]	38/38	0.632 (0.474–0.790)	0.079	5.2
Age first parturition (a)	11	6.5 (6.1–6.8)	0.200	0.7
Maximum age (w)	Fixed	27		
Unpaired Reproductive rate (m)[e]	13/20/21[f]	0.378 (0.302–0.492)	0.048	5.4
Unpaired Lambda (λ)	5000 bootstrap runs	1.016 (0.936–1.085)	0.039	

[a] Percent of lambda explained by each parameter

[b]Booter survival calculation which may differ from Kaplan-Meier estimates in Table 13.
[c]individuals / bear-years
[d]Cub survival based on counts of individuals alive and dead
[e]Number of female cubs produced/year/adult female. Sex ratio assumed to be 1:1.
[f]Sample size for individual reproductive adult females / sample size for birth interval / sample size for litter size from Table 15.

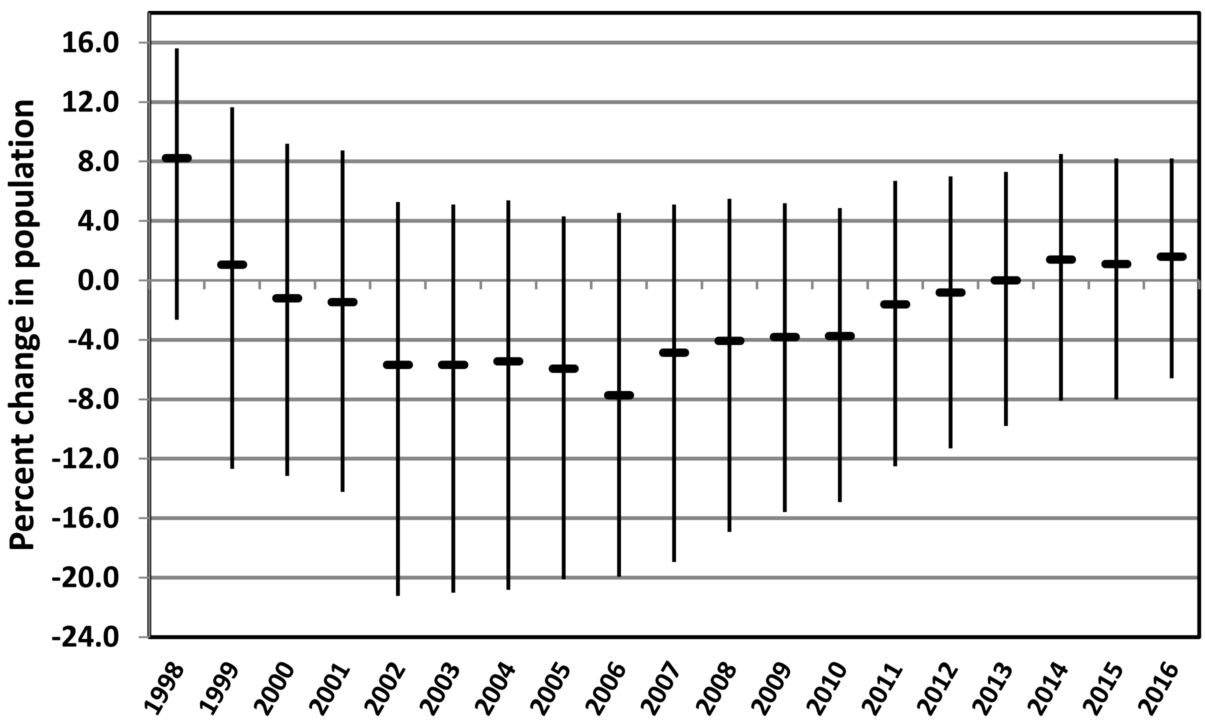

Figure 10. Point estimate and 95% confidence intervals for cumulative annual calculation of population rate of change for native grizzly bears in the Cabinet-Yaak recovery area, 1983–2016. Each entry represents the annual rate of change from 1983 to that date.

> "Population Estimate
>
> During 2012 the USGS used mark-recapture techniques to estimate the CYGBRZ (generally the CYE) grizzly bear population at 48-50 (Kendall et al. 2016). This was the best recovery area wide population estimate. Using the midpoint of this starting estimate, the calculated rate of increase (1.6%), and the numbers and fates of individuals in the augmentation program (five additions but two mortalities = net gain of three) we estimate the 2016 population at approximately 55 individuals." (Kasworm et al. 2017, In Prep)

The Service determined multiple times – most recently in 1999, that grizzly bears in the CYE warranted a change to endangered status, but were precluded from uplisting (see ESA Listing History, above). However, for several years, this population's status has been improving and the Service determined in 2014 that the CYE population no longer warranted endangered status. This determination was recently vacated by the Court on August 22, 2017 and the matter is currently remanded to the Service for further consideration. The population trend has now changed from ‘declining’ to ‘increasing.’ The USFS has established regulatory mechanisms for motorized access management and attractant storage and researchers have documented some movement between the Cabinet-Yaak and other populations in Canada. These improvements have reduced the threats to the CYE grizzly bear population, but motorized access management has not been fully implemented and more progress is expected (USFS 2015; USFWS 2013).

Greater Yellowstone Ecosystem

The 9,209 square mile Greater Yellowstone Ecosystem (GYE) recovery zone includes portions of Wyoming, Montana, and Idaho; portions of five National Forests (Beaverhead-Deerlodge, Bridger-Teton, Custer-Gallatin, Shoshone, and Targhee NFs); Yellowstone and Grand Teton National Parks; John D. Rockefeller Memorial Parkway; portions of adjacent private and state lands; and lands managed by the Bureau of Land Management. Grizzly bears also frequently occur in and use areas outside of the defined GYE recovery zone.

Population recovery criteria are measured within the 19,279 square mile demographic monitoring area, which includes the recovery zone and all suitable habitat within the GYE. A large proportion of the GYE grizzly bear population occurs within the recovery zone, but grizzly bears also inhabit large areas outside the recovery zone and some areas outside of the demographic monitoring area. Yellowstone and Grand Teton National Parks make up 39.4 percent of the GYE recovery zone. Private holdings and other ownership make up 2.1 percent of the recovery zone and the remaining 58.5 percent occurs on NFS land. National Park Service and NFS lands support roughly 89 percent of the currently known distribution of the grizzly bears in the GYE recovery zone.

Three demographic criteria found in the 1993 Grizzly Bear Recovery Plan (USFWS 1993) have been reevaluated and updated. The second criterion pertaining to the distribution of females with offspring remains unchanged, while the first and third criteria pertaining to the minimum allowable number of females with cubs of the year and sustainable mortality limits have been revised and updated to reflect current methods based on the best available science (USFWS 2017). The current demographic recovery criteria appended to the 1993 Recovery Plan are:

- Demographic Recovery Criterion 1 – Maintain a minimum of population size of 500 grizzly bears and at least 48 females with cubs-of-the-year in the GYE demographic monitoring area, as indicated by methods established in published, peer-reviewed scientific literature and calculated by the Interagency Grizzly Bear Study Team. If the estimate of total population size drops below 500 in any year or below 48 females with cubs-of-the-year in 3 consecutive years, then this criterion will not be met;

- Demographic Recovery Criterion 2 – Sixteen of 18 bear management units (BMUs) within the recovery zone must be occupied by females with young, with no two adjacent bear management units unoccupied, during a 6-year sum of observations. This criterion is important as it ensures that reproductive females occupy the majority of the recovery zone and are not concentrated in one portion of the ecosystem. If less than 16 of 18 bear management units are occupied by females with young for 3 successive 6-year sums of observations this criterion will not be met;

- Demographic Recovery Criterion 3 – Maintain the population within the DMA around the 2002–2014 model-averaged Chao2 population estimate (average = 674; 95% CI = 600–747; 90% CI = 612–735) by maintaining annual mortality limits for independent females, independent males, and dependent young as per table 2. These adjustable mortality rates were calculated as those necessary to manage the population to the model-averaged Chao2 population estimate of 674 bears which occurred during the time period that the population had a relatively flat population trajectory. If mortality limits are exceeded for any sex/age class for three consecutive years and any annual population estimate falls below 612 (the lower bound of the 90% confidence interval), the IGBST will produce a Biology and Monitoring Review to inform the appropriate management response. If any annual population estimate falls below 600 (the lower bound of the 95% confidence interval), this criterion will not be met and there will be no discretionary mortality, except as necessary for human safety.

The first and third criteria were changed because the Service no longer considers the 1993 recovery plan criteria, as supplemented in 2007, the best scientific method available. The Chao2 estimator is now used to calculate the total number of independent females from unique observations of females with cubs-of-the-year. This then allows calculation of total population size instead of the minimum population size as used in the 1993 method. Additionally, unknown and unreported mortalities can now be calculated, which allows more conservative mortality management based on annually updated information rather than the estimate of unknown and unreported mortality as used in the 1993 recovery plan. Data on the reproductive performance of GYE grizzly bears, survival rates of cub and yearling grizzly bears, the trajectory of the GYE grizzly bear population under alternate survival rates, and the impacts of spatial and environmental heterogeneity on the GYE grizzly bear demographics has been improved and updated.

Using the 2017 revised recovery criteria, it was determined that independent male and dependent young mortalities were under the limits in 2015 (Haroldson and Frey 2016). Independent female mortality exceeded the threshold for 2015. The independent female, independent male, and dependent young mortalities were all under the limits in 2013 and 2014 (Haroldson and Frey 2014, 2015). The criterion states that independent female, independent male, and dependent young mortality cannot be exceeded in 3 consecutive years. Because the threshold for independent female mortality was not exceeded in 2014 and the thresholds for independent male and dependent young mortality were met in each of the last three years the revised demographic recovery criteria are met for independent females, dependent young, and independent males.

The GYE grizzly bear population has increased from estimates as low as 136 individuals when listed in 1975 to approximately 717 animals as of 2015 (Haroldson et al. 2016). This population had been increasing since the mid-1990s and was increasing at 4 to 7 percent per year (USFWS 2007, 2007a). A slowing of population growth began in the early 2000s, primarily due to a decline in survival of dependent-aged bears (van Manen et al. 2016). The population for the recent period has a relatively flat population trajectory (van Manen, in litt.). According to van Manen et al. (2016) this slowing of population growth may be the result of an increase in grizzly bear density (rather than a decline in food resources); possibly indicating the population is near or at carrying capacity. The range of this population also has increased dramatically as evidenced by the increase in occupied habitat since the 1970s. GYE grizzly bears continue to increase their range and distribution annually and grizzly bears in the GYE area now occupy habitats they have been absent from for decades.

In 2007, the Service determined that the GYE supported a grizzly bear population with sufficient numbers and distribution of reproductive individuals so as to provide a high likelihood that the species will continue to exist and be well distributed throughout its range for the foreseeable future. Therefore, based on the best scientific and commercial information available, the Service delisted the Yellowstone grizzly bear DPS, effective April 30, 2007. However, on September 21, 2009, a court order vacated the final rule designating the Yellowstone DPS and removing the Yellowstone grizzly bear DPS from the list of threatened species and remanded the rule back to the Service. In accordance with the court order, in March of 2010, the Yellowstone grizzly population was once again listed as a threatened population under the Endangered Species Act (75 FR 14496, March 26, 2010).

The best available scientific and commercial data continue to indicate that the GYE population of grizzly bears has recovered and no longer meets the definition of an endangered or threatened species under the Act. Therefore, on March 11, 2016, the Service proposed to identify the Greater Yellowstone Ecosystem (GYE) grizzly bear population as a DPS and to remove it from the list of endangered and threatened wildlife (81 FR 13173). The Service has determined that the GYE DPS has increased in size since being listed as threatened and has more than doubled its occupied range. The threats to the population are sufficiently minimized. The threats to the population are sufficiently minimized, And members of the Yellowstone Ecosystem Subcommittee of the IGBC signed and finalized the 2016 Conservation Strategy for the GYE on December 16, 2016 (USFWS 2016). On June 30, 2017, the Service published a final rule removing the GYE grizzly bears from the list of endangered and threatened wildlife (82 FR 30502). The final rule became effective on July 31, 2017.

Northern Continental Divide Ecosystem

The Northern Continental Divide Ecosystem (NCDE) recovery zone is in north central Montana (8,926 square miles), and is approximately 45 miles from the BE and 15 miles from the CYE. Of the 8,926 square miles within the NCDE recovery zone, approximately 84 percent is on public lands administered by state or federal agencies. The remaining lands are comprised of Tribal, local government, and private ownership. Federally managed land is primarily divided among Glacier National Park and the five National Forests previously discussed in this document. Thirty-two percent (2,805 square miles) of all lands inside the NCDE recovery zone are designated Wilderness Areas.

Recently, a draft Grizzly Bear Conservation Strategy was prepared for the NCDE (USFWS 2013a). Five federal agencies (the Service, USFS, National Park Service, U.S. Bureau of Land

Management, and U.S. Geological Survey), two Montana State agencies (Montana Fish, Wildlife and Parks and Montana Department of Natural Resources and Conservation), and two tribal entities (the Blackfeet National and Confederated Salish Kootenai) participated in development of the NCDE Grizzly Bear Conservation Strategy. A draft was published in 2013, and the above mentioned agencies will be signatories to an agreement to implement the final conservation strategy. The expectation is that the signatories will incorporate the set of habitat standards and guidelines relevant to their jurisdiction into their respective management plans in a manner that is consistent with the agency's requirements. Under the draft NCDE Conservation Strategy, all federal agencies would manage lands within the PCA so that (1) there would be no net decrease in secure core from the baseline and no net increase in open and total motorized route densities from the baseline (with specific allowances for temporary changes); (2) the number and capacity of developed recreation sites would be limited; (3) there would be no net increase in the number of livestock allotments and no net increase in the number of sheep animal unit months from the baseline; (4) vegetation management would be conducted in a way that considers grizzly bear habitat needs; and (5) mineral and energy development would be designed to avoid, minimize, or mitigate adverse impact to grizzly bears. Many of these aspects of the NCDE Conservation Strategy have been discussed above, and will continue to be discussed throughout this document.

The Service is currently evaluating habitat-based recovery criteria for the NCDE. On May 11, 2016, a notice was published in the Federal Register informing scientists and other interested parties that they would have the opportunity to submit oral or written comments on habitat-based recovery criteria for the NCDE grizzly bear population. On July 7, 2016, the Service conducted a workshop to hear oral presentations and also accepted written comments during July 2016. If it is determined that habitat-based recovery criteria are needed for the NCDE population, such criteria may be appended to the Recovery Plan. The draft NCDE Conservation Strategy includes measurable criteria for motorized access and secure habitat, developed recreation sites, and livestock allotments. The Conservation Strategy also addresses minerals management and vegetation management measures to maintain or enhance connectivity between grizzly bear ecosystems, and requires proper storage of food and attractants. The Revised Forest Plan as proposed will serve to incorporate elements consistent with the Conservation Strategy, if necessary the Revised Forest Plan can be revised or amended once the NCDE Conservation Strategy is finalized.

<u>NCDE Population Size and Trend</u>

Current estimates indicate that the NCDE grizzly bear population is growing and has experiences significant population growth over the last four decades. The population size and trend are measured within the 16,640 square mile area comprised of the recovery zone and Zone 1, as defined in the draft NCDE Grizzly Bear Conservation Strategy (USFWS 2013c). In 2004, a DNA-based mark-recapture study was conducted in a 7.8-million-acre area occupied grizzly bears in and around the NCDE recovery zone. Extrapolating from the 563 individuals detected, the overall grizzly bear population in the NCDE was calculated to be 765 grizzly bears, including all sex and age classes (Kendall et al. 2009). Between 2004 and 2009, Mace et al. (2012) radio-collared and monitored 83 female grizzly bears in the NCDE and calculated that the population was increasing at a rate of 3.06 percent per year (95 percent confidence interval = 0.928-1.102).

Further, data from this study indicated that more than 1,000 grizzly bears resided in and adjacent to the NCDE recovery zone and Zone 1 in 2012.

More recently, Costello et al. (2016) calculated a slightly lower population growth rate of 2.3 percent for grizzly bears in the NCDE. However, this lower growth rate was thought to be the result of more through analytical techniques instead of a decline in the population. The authors stated: "we do not believe the observed difference in the two estimates is a result of actual population change. Our current models included a covariate for trend, and no negative trend was observed in any of the vital rates. Rather, we believe that the differences between Mace et al. (2012) and this report can be attributed to: (1) an increase in sample sizes for estimation of all vital rates; (2) better representation of conflict females in the estimation of vital rates; and (3) subtle but significant differences in methods of analysis."

To maintain a healthy grizzly bear population in the NCDE, it is necessary to have a balance between reproduction and mortality (USFWS 2013b). Grizzly bear mortality and survival in the NCDE affects population growth and is influenced by age, sex, reproductive status, and home range location (e.g., proximity to human developments). The average age of first reproduction in the NCDE is 5.4 years, but can vary from 3-8 years of age (Mace et al. 2012). Mean litter size in the NCDE is about two cubs, can range between one to four cubs (Mace and Waller 1997a; Schwartz et al. 2003). Cubs are born in the den in late January or early February and remain with the female for 1.5 to 2.5 years, making the average time between litters in the NCDE 3.0 years (Mace and Waller 1997; Schwartz et al. 2003).

Teisberg et al. (2015) assessed grizzly bear population health and body condition, finding that adult females across all ecoregions of the NCDE enter dens at mean fat levels above those thought to be critical for cub production. They stated that there is no evidence to conclude that the widely varying food resources across the NCDE are inadequate to meet the needs of reproductively active adult females. As opportunistic omnivores, grizzly bears in all regions of the NCDE exploit diverse combinations of food items to arrive at productive body conditions (Teisberg et al. 2015). Costello et al. (2016) documented a survival rate for adult females (the most important group affecting population trend) of 94.7 percent with a 95 percent confidence interval of 91.9 to 97.2 percent (Costello et al. 2016).

Grizzly bear mortalities can be attributed to variety of causes and fluctuate from year to year. Human-caused mortality is the most significant factor influencing grizzly bear survival in the NCDE. Costello et al. (2016) analyzed human-caused mortality of independent-aged (i.e., greater than 2 years old) grizzly bears from 2004–2014, and found that human-caused death accounted for 71 percent of all grizzly bear mortality in the NCDE. They also determined that the leading cause of human-cause mortality was management removals, followed by poaching/malicious kills, and defense of life. However, when accounting for the fact that non-management removal deaths often go unreported, Costello et al. (2016) estimated that poaching/malicious kills likely accounted for the highest proportion of total independent bear mortality (27 percent), followed by management removals (16 percent), illegal defense of property (11 percent), and natural causes (9 percent).

The majority of management removals result from conflicts at sites associated with frequent or permanent human presence (USFWS 2013a). Unsecured grizzly bear attractants on private lands such as chicken coops, garbage, human foods, pet/livestock foods, bird food, chicken coops, livestock carcasses, wildlife carcasses, barbeque grills, compost piles, orchard fruits, or vegetable gardens are usually the source of these conflicts. Walters and Holling (1990) stated that managing human-caused mortality, monitoring both population and habitat parameters (e.g., road access), and responding when necessary with adaptive management are the best ways to ensure a healthy grizzly population

In each grizzly bear recovery zone, the Recovery Plan established minimum population goals that ensure a population of grizzly bears that is; (1) adequately distributed throughout the zone, (2) reproducing, and (3) can sustain existing levels of human-caused mortality (USFWS 1993). The Recovery Plan identified a minimum NCDE-wide grizzly bear population of 391 bears. The most recent population estimates indicate that this number is exceeded by a large margin, and the NCDE population is continuing to grow.

<u>NCDE Population Distribution</u>

In addition to increases in population size, grizzly bear distribution throughout the NCDE has also increased over the last few decades. To facilitate the assessment of grizzly bear population recovery objectives, the NCDE grizzly bear recovery zone was subdivided into smaller units called Bear Management Units (BMUs). Twenty-three BMUs were delineated in the NCDE (see Figure 1-4 in Appendix 1).

Costello et al. (2016) evaluated occupancy of the 23 BMUs in the NCDE by females with offspring during 2004–2014. Using a 6-year running average, as set forth in the recovery plan (USFWS 1993), they documented full occupancy of the recovery zone/PCA starting in 2009.

The NCDE recovery zone includes approximately 5.7 million acres of land. Using verified grizzly bear locations to create a current distribution map for the NCDE, Costello et al. (2016) estimated that bears currently occupy an area of roughly 13.6 million acres, more than double the size of the recovery zone or about 21,312 square miles, more than double the size of the recovery zone (8,926 square miles). This current distribution of grizzly bears encompasses the entire NCDE recovery zone/PCA, nearly all of zone 1, including 100 percent of the Salish demographic connectivity area and 63 percent of the Ninemile demographic connectivity area, and part of zones 2 and 3 (Costello et al. 2016). Both males and females are becoming increasingly common along streams and in shrubby draws to the east of the recovery zone boundary along the Rocky Mountain Front. Three female grizzly bear dens have been documented in short-grass prairie habitat along the eastern front of the Rocky Mountains (Mace and Roberts 2014).

Based on its large population size, increasing trend, and genetic diversity, the NCDE appears to be capable of serving as a source population for other grizzly bear populations in the contiguous United States (USFWS 2013a). Demographic connectivity may be especially important to support the small grizzly bear population in the CYE, which might not otherwise be viable over the long term. The NCDE population also has the potential to be a source population for recolonization of the BE.

Status of Habitat in the NCDE

Grizzly bears use a wide variety of habitats. The varying climate, topography, and vegetative conditions throughout the NCDE result in a mosaic of habitats and foods for grizzly bears to consume during different seasons. During spring and early summer, grizzly bears in the NCDE eat primarily roots, corms, bulbs, and other vegetation (Aune 1994; McLellan and Hovey 1995). Later in the summer, grizzly bears in the NCDE consume a wide variety of berries as they become available (McLellan and Hovey 1995). Summer foraging items also include concentrations of lady bird beetles and army cutworm moths on rocky talus slopes (Aune and Kasworm1989; Mattson et al. 1991; Servheen 1983). During late summer to fall, grizzly bears in the NCDE continue to eat berries but also consume more meat, herbaceous vegetation, and roots (Aune and Kasworm 1989; Mace et al. 1994; McLellan and Hovey 1995).

In the past, grizzly bears were known to feed extensively on whitebark pine nuts in the late summer to fall, particularly in the Whitefish Range and on the Rocky Mountain Front (Aune and Kasworm 1989; Kendall and Arno 1990). However, high infection rates and mortality of whitebark pine caused by white pine blister rust (Kendall and Keane 2001) have dramatically reduced or eliminated this food source. The NCDE grizzly bear population has continued to increase despite the loss of this food source, indicating that ample alternate food sources remain available to grizzly bears in the NCDE.

As described in the Recovery Plan, grizzly bears are an omnivorous and opportunistic species, with utilized food sources varying annually, seasonally, and even day to day (USFWS 1993). The abundance and distribution of food resources, availability of habitat components such as cover and denning sites, the levels and types of human activities, grizzly bear social dynamics, learned behavior of individual grizzly bears, and annual weather are important variables influencing the accessibility of foods for bears. Because of the complexity and interactions of these variables, there is no known way to deductively calculate the carrying capacity for grizzly bears across a landscape (USFWS 1993). A mosaic of vegetation providing forage and cover is desirable, but the complexity described above makes it difficult to quantify a desired landscape composition.

The NCDE contains large areas of congressionally-designated wilderness, totaling more than 1.6 million acres within the recovery zone/PCA. The Wilderness Act of 1964 precludes road construction, motorized and mechanized uses, permanent human habitation, new livestock allotments, new mining claims, new oil and gas leases, or other developments that would impair the wilderness character of wilderness areas, except for those specifically allowed by the enabling legislation (e.g., Schafer airstrip). Wilderness areas provide a high degree of security for grizzly bears. The NCDE also contains sizable amounts of inventoried roadless areas. These roadless areas, as well as certain other lands that have little or no permanent human presence or road development, are well distributed throughout the NCDE and contribute to secure habitat for grizzly bears.

The Nature Conservancy mapped landscape permeability for the Pacific Northwest (McRae et al. 2016) including western Montana, by classifying areas as having high, moderate or low landscape permeability. Resistance to movement was modeled by considering features such as land use, roads and rail lines, energy infrastructure, and housing development. Overall, the network of federal lands in northwestern Montana was estimated to provide a moderate to high degree of landscape permeability for wildlife, including grizzly bears. The USFS has been cooperating for many years with federal and state agencies and private organizations to improve habitat connectivity and mitigate the impacts of highways, train tracks, and other developments that impede movement by wildlife, including specific efforts for grizzly bears.

Grizzly bears utilize denning habitat in the winter to hibernate. On the west side of the NCDE, 52 separate females monitored during 1987-88 to 2012-13 denning seasons entered their dens between the first week of October and the fourth week of November, with most occurring the fourth week of October (Mace and Roberts 2014). In the spring, 72 females emerged from their dens between the third week of March and the fourth week of May, with most occurring during the second week of April (Mace and Roberts 2014). On the east side of the NCDE (i.e., Rocky Mountain Front), grizzly bears entered dens between October 10 and December 5, with a median date of November 7, and emerged in the spring between March 10 and May 13, with a median date of April 7 (Aune 1994; Mace et al. 1994).

Both males and females have a tendency to use the same general area to hibernate year after year, but the same den is rarely reused by an individual (Linnell et al. 2000). The average elevation of 252 grizzly bear dens in the NCDE ranged from 6,427 to 6,906 feet (USFS 2017). An estimated 47 percent (1,647,836 acres) of NFS land in the PCA provides potential denning habitat; therefore, the availability of denning habitat is not likely to be a limiting factor for grizzly bears in the NCDE (USFWS 2013a).

7. Factors Affecting the grizzly bear in the NCDE

In this section, we present the primary factors affecting the NCDE grizzly bear population Below, we summarize the status of human-caused habitat loss, habitat fragmentation and mortality, as well as habitat conservation within the NCDE.

Food and Attractant Storage

Improperly stored food and attractants remains a significant threat to NCDE grizzly bears. Improperly storing these attractants can result in the habituation of grizzly bears to human presence and/or conditioning grizzly bears to seek out human foods and attractants. Food-conditioned grizzly bears can learn to enter unsecured garbage containers, sheds, and other buildings in search of a food. The accessibility of attractants often leads to the mortality of a food-conditioned grizzly bear by management agencies or, in more dire circumstances, by private citizens defending their life or property. Grizzly bear are particularly susceptible to anthropogenic food sources during years of poor natural food production such as a berry crop failure. Measures that make attractants such as food, garbage, and livestock carcasses inaccessible through proper storage or disposal are very effective in reducing grizzly bear-human conflicts and the potential for injuries or mortalities.

In the Swan Mountains, the majority of grizzly bear-human conflicts and bear deaths were reported to have occurred on private lands in rural roaded areas (Mace et al. 1996). These conflicts often involved bears that were food-conditioned or habituated to human presence. Nearly 60 percent of management removals resulted from conflicts caused by unsecured food, garbage, pet and livestock foods, carcasses, orchard fruits, vegetable gardens, etc., that attracted bears into the proximity of humans.

On NFS lands, efforts to keep human food, garbage, and other attractants unavailable to bears are ongoing. This is primarily done through the issuance of food storage orders aimed at preventing grizzly bear–human conflicts. The first food storage order was issued in 1998 and included the entire Bob Marshall Wilderness Complex. Subsequent orders have been implemented on a number of National Forests, and have periodically been supplemented or updated as more needs arise. One notable update has been an increase in the spatial extent of food storage orders in recent years as the NCDE grizzly bear population expands outside the original NCDE recovery zone (i.e., PCA). A forest-wide food/wildlife attractant storage special order was issued by the Lolo National Forest in 2011. The Kootenai National Forest also implemented a forest-wide food storage and sanitation special order in 2011 that covered lands within both the NCDE and Cabinet-Yaak recovery zones (USFS 2011a). The Helena and Lewis and Clark National Forests have also issued food/attractant storage orders in 2005 and 2010 respectively, and special orders in effect on the Flathead National Forest were updated in 2010 and 2011 (USFS 2010, 2011).

Other federal agencies also use their authorities to provide for proper storage of food and attractants. Within Glacier National Park, the National Park Service has implemented food storage regulations (pursuant to 36 CFR 2.10 (d)) prohibiting anyone from leaving food unattended or stored improperly where it could attract or otherwise be available to wildlife. The Service administers the National Bison Range complex. National Wildlife Refuges within this complex are day-use only with no overnight camping allowed, and users are expected to pack out their trash as there are no garbage receptacles available anywhere on the refuges. On BLM lands occupied by grizzly bears, food storage guidelines are incorporated into their contracts.

Motorized Routes

A large body of research exists demonstrating that the presence of roads and associated human activities has detrimental impacts to grizzly bears. These impacts are largely due to increase potential for conflict, and displacement from important habitats resulting in lowered survival rates during the non-denning season.

Secure habitat is important to the survival and reproductive success of grizzly bears, especially adult females (Mattson et al. 1987; IGBC 1994). Grizzly bear habitat security is primarily achieved by managing motorized access, which results in four favorable outcomes for grizzly bears:

1. minimizes human interaction and reduces potential grizzly bear mortality risk;

2. minimizes displacement from important habitats;

3. minimizes habituation to humans; and
4. provides habitat where energetic requirements can be met with limited disturbance from humans.

Research has demonstrated that roads and associated human activities impact grizzly bears by displacing them from important habitats and lowering their survival rates during the non-denning season (Mace and Waller 1996; Mattson et al. 1987; McLellan and Shackleton 1989; Waller and Mace 1997). Mace and Manley (1993) also showed that grizzly bears adjusted their habitat use patterns in response to both total and open road densities, as well as the traffic levels on roads. In response, the Interagency Grizzly Bear Committee appointed an Access Task Force to develop guidelines for the management of motorized routes in grizzly bear habitat. The guidelines were originally published in 1994 and updated in 1998, and they recommended three parameters to include as components of access management: OMRD, TMRD, and security core habitat. In effect, these recommendations endorsed the basic premise of managing open and total route densities and security core during the non-denning season as an effective strategy to support recovery of grizzly bears (IGBC 1998).

Research findings from the Swan Mountain Range of the Flathead National Forest have been used to evaluate the effects of motorized route density on grizzly bears in the NCDE since 1995. Mace et al. (1996) converted a linear road map to a total road density map using a 1 km^2 (0.39 mi^2) moving window analysis and reported the following relationships to road density:

1. Road density was lower within the composite of the multiannual home ranges of 14 adult and subadult female grizzly bears (0.6 km/km^2 or 0.95 mi/mi^2) than was road density outside the composite home range (1.1 km/km^2 or 1.7 mi/mi^2);
2. As total road density increased, probability of selection by grizzly bears declined;
3. 56 percent of the composite female home range was un-roaded compared to 30 percent outside the composite home range;
4. Within seasonal ranges, grizzly bears were more likely to use areas with higher road densities during spring than during other seasons;
5. Selection for habitats within a 0.3 mi buffer around roads decreased as traffic volume increased.

Recent research conducted on grizzly bears in Alberta, British Columbia assessed the impact of linear road density on grizzly bears. This differs from the moving windows analysis endorsed by the IGBC described previously. Boulanger and Stenhouse (2014) found strong spatial gradients in grizzly bear population trends based upon road density. Further, the authors identified threshold values for road densities associated with desired grizzly bear population outcomes. A summary of the threshold values is presented in Table III-2 below.

The road density thresholds derived by Boulanger and Stenhouse (2014) further illustrate the effects that motorized routes, and access management by extension, can have on grizzly bears in the action area. This new research is being applied in the proposed action to prescribe open linear road density limits within zone 1 of the action area, which includes the Salish and Ninemile demographic connectivity areas (DCAs, and zone 1of the action area).

Table III-2. Grizzly bear population objectives and associated road density thresholds derived by Boulanger and Stenhouse (2014). The right-hand column presents how these thresholds were used in developing the proposed action.

Objective described in the Alberta study	Reported density km/km2	Converted to English units	Where used to assess effects of the Revised Forest Plan
Grizzly bear presence – Distribution of collared bears shows most bears occurred within road densities of 1.5 km/km^2 or less (p. 10)	1.5 km/km^2	2.4 mi/mi^2	Used to evaluate the ability to provide for bear movement on the FNF (zone 1). Density calculation included roads open for motorized use in the non-denning season on NFS lands.
Occupancy by females – Adult females occupied habitat with road densities of 1.25 km/km^2 or less. If lower survival rate of females with dependent young is considered, the threshold of road density that can be tolerated is reduced (p. 15)	1.25 km/km^2	2.0 mi/mi^2	Used to evaluate the ability of the Salish demographic connectivity area to support female occupancy. Density calculation included both roads and trails open for motorized use in the non-denning season on NFS lands.
Grizzly bear mortality risk- Most grizzly bear mortalities occurred at road densities greater than 1.0 km/km^2, except for adult males where mortalities occurred across all road densities (p.10)	1.0 km/km^2	1.6 mi/mi^2	Used to evaluate grizzly bear mortality risk in the Salish demographic connectivity areas. Density calculation included both roads and trails open for public motorized use in the non-denning season on NFS lands.
Alberta core conservation area – Allows for survival rates of females with dependent offspring high enough to ensure an increasing population (p. 18)	0.75 km/km^2	1.2 mi/mi^2	N/A [moving window analysis method is used in the primary conservation area]

Over-Snow Vehicles

The effects of winter activities (e.g., snowmobiling) on denning grizzly bears are not well studied, but there is no evidence to indicate that current levels of snowmobile use are inhibiting the recovery of the grizzly bear population in the NCDE. As described in the BA, an assessment of 252 known grizzly bear dens in the NCDE was conducted in 2014. These dens were assessed with respect to areas open to over-snow use or closed to over-snow use, and no apparent avoidance by grizzly bears of areas open to over-snow use was found. In a review of the limited information available on black, brown (grizzly), and polar bears, Linnell and others (2000) reported that bears readily den within 0.6–1.2 mi of human activity (roads, habitations, industrial activity) and appear to be undisturbed by most activity that occurs further than 0.6 miles from the den site. Further, litter abandonment by female grizzly bears due to snowmobiling activity has not been documented in the lower 48 states (Hegg et al. 2010), nor have adverse effects on bears from snowmobiles been substantiated (Mace and Waller 1997a).

As discussed in the Service's 2008 biological opinion on Amendment 24 to the Flathead National Forest (USFWS 2008), den abandonment has been documented in association with industrial activity and direct approach (Reynolds et al. 1986; Harding and Nagy 1980; Jonkel 1980; Craighead and Craighead 1972). Harding and Nagy (1980) found that one grizzly bear abandoned its den after having the den driven over by a seismic vehicle. Other events with seemingly similar levels of disturbance have not led to den abandonment (Jonkel 1980; Reynolds et al. 1986; Mace and Waller 1997; Linnell et al. 2000). We are not aware of any primary-source reports in the literature of grizzly bear den abandonment directly attributed to snowmobile activity (USFWS 2008). Nor has other substantive adverse effects on bears from snowmobile use been substantiated (see discussion in USFWS 2008). Mace and Waller (1997) reported no abandonment of dens by grizzly bear even though snowmobiles were often seen within 2 km of den sites. Likewise, the Interagency Grizzly Bear Study Team has intensively researched grizzly bear ecology in the GYE from the 1970's to present, but this research has never documented den abandonment attributed to snowmobiles.

In our 2008 biological opinion (USFWS 2008), we concluded that disturbance from snowmobiles may be most consequential shortly before or after den emergence of a female with cubs. Females and their cubs remain in the den site area for several weeks after emergence from dens (Haroldsen et al. 2002; Mace and Waller 1997). Females with cubs have high energetic needs, and cubs have limited mobility for several weeks after leaving the den. Disturbance levels that cause a female to prematurely leave the den in spring, or move from the den area, could ultimately impair the fitness of the female. Further, if the cubs attempt to follow, they will likely experience decreased fitness as well, as the family group may be pushed to less suitable habitat. To date, we are unaware of any documentation of snowmobile-related impacts on post-den emergent females with cubs, although detection of such events may go unreported. However, the Service's 2008 conclusion remains the same: "In the judgment of the Service, snowmobile-related impacts on post-den emergence females with cubs are more likely to impart serious consequences than any potential impacts to denning grizzly bears."

As described previously, Mace and Roberts (2014) reported that 72 females on the west side of the Continental Divide emerged in the spring between the third week of March and the fourth week of May, with most occurring during the second week of April. Peak den emergence in early April was also found on east side of the Continental Divide, in the Swan Mountains and Mission and Rattlesnake Mountains (Aune and Kasworm 1989; Mace and Waller 1997a; Servheen and Klaver 1983). Given the average den emergence period throughout the NCDE, there is potential for late-season (after March 31) over-snow vehicle use to affect grizzly bears.

Non-Motorized Trails

Several studies have investigated the behavioral response of bears to non-motorized trails (Jope 1985; Kasworm and Manley 1990; Mace and Waller 1996; MacHutchon 2014). These studies vary considerably in study design, trail use levels, grizzly bear sample sizes, and conclusions as to the impacts of non-motorized trails on bears. In Glacier National Park, bears more than 500 feet away from trails generally did not respond to hikers by fleeing (Jope 1985), and in 45 percent of all cases bears showed no movement in response to hikers. Hiker group size did not significantly affect initial bear behavior, and the relationship between group size and subsequent behavior was similarly weak. The higher presence of bear bells among larger groups may have influenced bear response.

McLellan and Shackleton (1989) reported that bears showed a stronger response to people on foot than in motor vehicles in "low human-use" areas. However, less than half of bears showed any response (walked or ran away) to stimulus greater than 250 feet away. McLellan and Shackleton also reported that grizzlies fled further in response to unexpected off-trail foot travel than to motorized use. Similarly, Mace and Waller (1996) reported that bear response to off-trail hikers was greater than that observed for other types of disturbances. Kasworm and Manley (1990) reported that grizzly bears used habitats within 100 meters (328 feet) of trails less than expected but used habitats 100-1,000 meters (3,281 feet) from trails in proportion to their availability.

Grizzly bear response to human disturbance may also differ between seasons or habitats. Jope (1985) noted that grizzly bears were more likely to respond to hikers through flight or charges in spring and early summer than later in the year, possibly due to habituation once human use became more common during the summer season. Kasworm and Manley (1990) found that bears used habitat within 100 meters of trails less than expected in spring and fall. Conversely, Mace and Waller (1996) found that distance to trails and/or lakes with campsites were significant variables only in summer and autumn.

Non-motorized recreation uses (hiking, horseback riding, mountain biking) also affect the risk of grizzly-bear human conflicts (Herrero and Higgins 1999). These conflicts can pose risks to human safety, as well as safety to grizzly bears. Herrero (1985) was one of the first researchers to report on the causes of bear attacks and how to avoid them. Based upon his study of bear attacks in Canadian national parks, Herrero reported that 68 out of 135 grizzly bear incidents in which the party's activity prior to the bear attack was known, hiking was the most common activity. Herrero reported that 75 percent of encounters he classified as "sudden" were known to involve bear mothers, with females and cubs of the year being most dangerous. Sudden encounters are the most likely situation to result in a grizzly bear-inflicted injury (S. Herrero, 1985). Attacks by bears on humans in North America are disproportionately more frequent in national parks, most being the result of sudden encounters between hikers and grizzly bears that react defensively to protect young or a food source (Herrero 1985; MacHutchon 2014). Fortin and others (2016) reported that most defensive attacks result from surprise encounters involving humans hiking off-trail, in the backcountry, and in areas of natural food abundance for grizzly bears.

Quinn and Chernoff (2010) conducted a literature review of the ecological effects of mountain bikes. A database of 33 grizzly bear-bicyclist encounters or confrontations within western North America revealed that in 95 percent (20 of 21) of encounters where the distance apart was estimated, the bear was 165 feet or less away. Schmor (1999) interviewed 41 mountain bikers in the Calgary region who cycled in the Rocky Mountains and concluded that the speed and relative silence of mountain bikes, especially when combined with environmental factors (e.g., dense vegetation, hilly terrain, running water), likely contributed to mountain bikers approaching bears closer than 50 meters (164 feet) before being detected by the bear. These factors make it less likely that an encounter can be avoided. MacHutchon (2014) stated that an alert mountain biker making sufficient noise and traveling at slow speed (e.g., uphill) would be no more likely to have a sudden encounter with a bear than would a hiker.

In 1998, the Interagency Grizzly Bear Committee assigned a task force to create standard definitions and procedures for managing motorized access in grizzly bear recovery zones. At that time, the task force recommended that the impacts of “high intensity use” non-motorized trails be considered in calculations of “core” habitat (i.e., security core) in the grizzly bear recovery area (IGBC 1998). When this recommendation was made there were no data or literature available to determine what defined a “high intensity use” trail or how high-use trails may relate to grizzly bear population parameters. The task force recommended that trails receiving greater than 20 parties per week during the non-denning season be considered “high intensity use” and that an influence zone would be used that was the same as motorized routes (i.e., 500 meter buffer). Figure 1-5 (in Appendix 1) shows the distribution of trails modeled as “high use” trails in the NCDE, the majority of which are located in Glacier National Park.

Because of the subjective method of establishing the threshold value of 20 parties per week, the lack of available data to quantify high-use non-motorized levels, and the lack of published research demonstrating increased grizzly bear mortality risk or population-level impacts associated with high use non-motorized trails, the NCDE conservation strategy team recommended removing consideration of high use non-motorized trails to define core habitat (USFWS 2013a). This new methodology for calculating security core habitat is one component of the proposed action, and will be discussed in more detail below.

Developed Recreation Sites

Developed recreation sites are sites or facilities on federal lands with features that are intended to accommodate public use and recreation. Examples include campgrounds, trailheads, rental cabins, fire lookouts, summer homes, and visitor centers. Developed recreation sites can affect grizzly bears through temporary or permanent habitat loss and displacement. However, the primary concern related to developed recreation sites is that of grizzly bear-human conflicts caused by unsecured bear attractants, habituation, and food conditioning (Knight et al. 1988). Developed recreation sites that support overnight use are considered to have a higher potential for grizzly bear-human conflict (USFWS 2013a). Grizzly bear-human conflicts have occurred at developed recreation sites on NFS lands, although efforts such as food storage orders, bear-resistant containers, and public education have been implemented to help reduce the risk of these instances in the future. The majority of grizzly bears removed or relocated by management agencies in the NCDE had been involved in conflicts related to unsecured attractants, such as garbage, pet/livestock feed, and human food. Although the majority of these grizzly bear mortalities associated with human conflict occur on private lands, developed recreation sites on public lands in the NCDE area remain a concern.

Livestock Management

When the grizzly bear was listed in 1975, the Service identified “livestock use of surrounding national forests” as detrimental to grizzly bears “unless management measures favoring the species are enacted” (40 FR, p. 31734). The primary concern with livestock operations is that they may lead to direct mortality of bears due to control actions resulting from depredation or learned use of bear attractants such as livestock carcasses and feed. Other potential effects include displacement due to livestock-related activity and competition for preferred forage

Predation on smaller animals such as domestic sheep and goats, calves, or chickens have been widely documented (Anderson et al. 2002; Knight and Judd 1983). Grizzly bears frequently coexist with larger livestock such as adult cattle without incident. However, predation on cattle does occur. When these incidents occur, management agencies may try to relocate bears, but often have to remove them from the population. Because of the increased likelihood of grizzly bears conflicts with sheep, the 1986 Interagency Grizzly Bear Guidelines emphasized the desirability of phasing out sheep allotments.

Approximately 7 percent of all human-caused grizzly bear mortalities in the NCDE between 1998 and 2011 were due to management removal actions associated with livestock depredations. In the NCDE, most livestock depredations by grizzly bears occur on sheep but also on young cattle. The majority of these livestock-related grizzly bear mortalities occur east of the Continental Divide, either on private lands or on the Blackfeet Indian Reservation along the Rocky Mountain Front.

There are also permitted grazing operations on NFS land for horses and mules in the NCDE. These are typically associated with outfitter and guide operations, or Forest Service administrative use. There is no evidence of conflicts with bears due to depredation, attractants, or forage competition related to horse and mule grazing permits. Honeybees are classified as livestock in Montana (MCA 15-24-921) and hives present a strong attractant to some grizzly bears. On-going efforts to keep grizzly bears away from honeybee operations (e.g., electric fences) have proven effective at minimizing conflict although these conflicts still occur.

Vegetation Management

Grizzly bears in the NCDE occupy a variety of habitat types but generally prefer to forage in areas with hiding cover nearby, particularly when feeding in the daylight hours (Aune and Kasworm 1989; Mace and Waller 1997a). To further illustrate this point, Waller (1992) reported that grizzly bears avoided recently harvested tree stands, as well as stands less than 30–40 years old where newly growing vegetation did not yet provide hiding cover. Nielson et al. (2004) suggested that forest design and silvicultural planning consider strategies such as increased perimeter-to-area ratio and low-impact site preparation to maximize grizzly bear food abundance, while minimizing human access (Nielsen et al. 2004).

Vegetation management (e.g., timber harvest, thinning, fire suppression) on NFS lands may alter the amount and composition of cover and forage in grizzly bear habitat. Some types of vegetation management may actually serve to increase grizzly bear forage through improved growth of grasses, forbs, and berry-producing shrubs (Zager et al. 1983). However, the roads and human activity associated with these activities can negatively affect grizzly bears by disturbing or temporarily displacing bears while operations are on-going. Further, human activity in grizzly bear habitat results in greater chances of a conflict (Zager et al. 1983).

Mineral and Energy Development

Mineral development refers to surface and underground extraction of leasable materials (e.g., oil, coal, hardrock mining), which is regulated by permits on NFS lands. Currently there are no plans to operate any commercial mines on NFS lands within the PCA, except for the Cotter Mine on the Helena National Forest. The production of oil and natural gas is conducted through a leasing process. As of 2012, there were 247 oil and gas leases inside the PCA (including public and private lands). At that time, nine leaseholders had submitted applications for permit to drill to the Bureau of Land Management, one of which was located on private lands. Within zone 1, there have been eleven applications for permit to drill submitted, only three of which are on NFS lands. The applications for permit to drill include surface use plans of operation, which require site-specific evaluation and analysis in compliance with National Environmental Policy Act.

Mineral and energy development may affect grizzly bears by reducing and fragmenting habitat. However, the increased human activity associated with these developments is a greater threat. Increased human presence can result in conflicts with grizzly bears. As with other factors affecting grizzly bears (e.g., developed recreation), situations where more humans and bears co-exist often lead to conflict due to habituation, improper storage of attractants, or even vehicle strikes.

Habitat Fragmentation

Linkage zones are rather recent concepts in broad management direction for grizzly bears and other large-ranging species (Servheen and Sandstrom 1993). Linkage zones, or zones of habitat connectivity within or between populations of animals, foster the genetic and demographic health of the species and a number of efforts to identify and conserve linkage areas are underway.

The NCDE recovery zone/PCA, at 8,926 square miles, encompasses multiple National Forests, Glacier National Park, and is contiguous with grizzly bear habitat in Canada, including Banff National Park. Large blocks of continuous wilderness or core areas occur, providing high levels of connectivity. Road densities on multiple use lands outside of core areas are being managed at levels based on grizzly bear research to reduce potential conflicts. A mix of federal, state, private lands, and highways occur along the North and Middle Forks of the Flathead River and along the Swan River. These areas typically have higher road densities, human settlements and other associated activity. Such factors represent risks for grizzly bears attempting to reside in or move through the area. However, no evidence exists that suggests a substantial lack of connectivity for grizzly bears across these valley bottoms. Grizzly bears are living in these areas and females are raising young; observations are documented each year.

Climate Change

Over the past 50 years the average temperature in the U.S. has risen more than 2 degrees Fahrenheit. Precipitation has increased an average of five percent, extreme weather events (e.g., drought, floods, extreme heat) have become more frequent and intense, and sea level has risen along most of the U.S. coast (Karl et al. 2009). Additionally, cold-season storm tracks are shifting northward and Arctic sea ice is declining.

Ecosystem processes are affected by climate and by the concentration of carbon dioxide in the atmosphere (Janetos et al. 2008). Biodiversity within ecosystems is itself an important resource that maintains the ability of these systems to function. Many factors affect biodiversity including: climatic conditions, influences of competitors, predators, parasites, and diseases disturbances such as fire; and other physical factors. A rapidly changing climate, in conjunction with other stressors, is exerting major influences on natural environments and biodiversity, and these influences are generally expected to continue into the future.

Climate trends will be important to NCDE grizzly bears with respect to how these trends affect denning behavior, foraging habitat availability, and fire-regimes. Earlier snowpack melt off may shorten the denning season and make food available later in the fall and earlier in the spring. Spring and fall encounters between grizzly bears and people may therefore increase, escalating the mortality risk to bears during these times. An additional effect of climate change could be changes in the availability of and distribution of foraging areas due to increasing temperatures and seasonal changes in precipitation. The extent and rate to which plant species and communities would be affected is difficult to predict. Changes in vegetative distributions may also influence other mammal distributions, including prey species like ungulates.

Grizzly bears are habitat generalists and opportunistic omnivores, able to find resources in a wide variety of habitat conditions. It is difficult to predict how this large, wide-ranging species would respond to environmental changes associated with climate change. At this time, the scope and scale of such changes are unknown, and the effects (positive or negative) on grizzly bears would likely be variable across the landscape. If climate change affects the status of the NCDE grizzly bear population such that we have new information relevant to our effect analysis below, reinitiation of the consultation may be necessary.

C. ENVIRONMENTAL BASELINE

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Environmental baseline is defined as "…the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process." (50 CFR 402.02)

The proposed action will provide the framework under which NFS lands administered by the FNF will be managed to support the continued recovery of the NCDE grizzly bear population. This BO considers the effects of implementation of the Revised Forest Plan, as well as the effects of the Revised Forest Plan specific to the conservation of grizzly bears and grizzly bear habitat. This section provides current information on grizzly bear population and habitat dynamics in the action area.

1. Action Area

The action area is the FNF. This has been discussed previously in Chapter 1 of this biological opinion, as well as in Section A.1 of this chapter.

2. Status of the Species on the Flathead National Forest

Grizzly bear habitat on the FNF comprises 37 percent of the NCDE grizzly bear recovery zone/PCA (USFWS 2013a). This habitat is distributed across six geographic areas of the FNF (see Figure 1). Table III-3 displays the approximate acreage in each geographic area on the Flathead National Forest within grizzly habitat management zones, totaling about 2.4 million acres. On the FNF, a total of about 1.6 million acres inside the primary conservation area is currently designated as wilderness, inventoried roadless areas (IRAs), or other backcountry management areas that contribute to high levels of habitat security for grizzly bears (Figure 14).

Table III-3. Grizzly bear management zones within geographic areas (GAs) on the Flathead National Forest.

Grizzly Habitat Classification	North Fork Flathead River GA	Middle Fork Flathead River GA	South Fork Flathead River GA	Hungry Horse GA	Salish Mountains GA	Swan Valley GA	Total Forest
Primary Conservation Area	319,998	370,156	789,074	286,229	6,781	364,297	2,136,534 (90%)
Zone 1: Salish Demographic Connectivity Area	0	0	0	0	95,840	0	95,840 (4%)
Zone 1 outside DCA	43	0	0	5	135,516	143	135,702 (6%)

Grizzly bear habitat on the FNF includes a variety of coniferous forests, deciduous forests, wetland and riparian areas, and grass/forb/shrub patches found in areas such as meadows, avalanche chutes, burned areas, and logged areas. The natural range of grizzly bear habitat variation has been affected by ecological processes in the past (e.g., fire, floods, avalanches, insects, and disease) and will continue to be affected by these processes in the future. Grizzly bears and their habitat are also affected by a variety of human activities, which are described further below.

Motorized Route Density and Security Core Inside the PCA/Recovery Zone

The moving window analysis method has been used to evaluate the effects of motorized route density on grizzly bears across the NCDE since 1995. The Interagency Grizzly Bear Committee (IGBC) established definitions and procedures for analyzing the effects of motorized use, delineating analysis areas that were equivalent to the average size of a female grizzly bear home range. In the NCDE, these are called bear management unit (BMU) subunits. The FNF's 12 bear management units in the recovery zone/primary conservation area have been further subdivided into 73 subunits (Figure 11). The IGBC recommended criteria for open and total road densities, as well as core habitat within a grizzly bear subunit, to support conservation and recovery of grizzly bears (IGBC 1998).

The existing FNF Forest Plan allows motorized use based upon Amendment 19 (A19), adopted in the 1995 Record of Decision (USFS 1995; USFWS 1995). In 54 BMU subunits where A19 applied, standards for grizzly bear specified that there would be no net increase in total motorized route density (TMRD) greater than 2 miles per square mile, no net increase in open motorized route density (OMRD) greater than 1 mile per square mile, and no net decrease in the amount of security core area. Additionally, A19 provided management objectives for 40 BMU subunits with greater than 75 percent NFS lands. In these subunits (40 out of 54 where A19 applied), A19 established management direction to reduce impacts of forest management activities on grizzly bears (especially females) by adopting the following for subunits where the USFS managed more than 75 percent of the acres in a subunit (calculations are done using a moving window analysis (USFS 1995):

- OMRD exceeding one mile per square mile is limited to less than or equal to 19 percent of a subunit;
- TMRD exceeding two miles per square mile is limited to less than or equal to 19 percent of a subunit; and
- Core habitat of 68 percent or greater within a subunit.

In 1995 there were many more miles of open and total roads than there are currently. At that time 16 of the Forest's subunits with greater than 75 percent NFS lands met or exceeded 68 percent security core habitat. From 1995 to 2015 another 11 subunits met or exceeded 68 percent security core, and four subunits met amended standards for security core. Further, a total of about 731 miles of roads have been decommissioned (USFS 2017). This effort has almost doubled the number of subunits exceeding (i.e., more favorable for grizzly bears) the standard for security core. Between 1995 and 2016, habitat conditions for grizzly bears on the FNF have become even more favorable. This has increased the availability of secure grizzly bear habitat and connectivity, benefitting the grizzly bear population.

On-the-ground conditions for grizzly bears continue to improve, but the reporting required under A19 has changed. The number of subunits with > 75 percent NFS lands has now changed because the FNF acquired more than 45,000 acres of former Plum Creek Timber Company lands through the Legacy Project and other land acquisitions (see Figures 25 and 26). The Nature Conservancy (TNC) and the Trust for Public Land agreed to purchase lands from Plum Creek Timber Company (PCTC) and then sell or donate these lands to Federal, State, and private owners. This land transfer is known as the Legacy Project. The majority of these lands have come under Federal (USFS) or State (DNRC) management, and any lands that were sold to private owners have safeguards (e.g., conservation agreements) attached to them so that the integrity of wildlife habitat is maintained. The Legacy Project transfer of lands to the Flathead NF was completed by 2016.

At the time A19 was adopted, 14 subunits had less than 75 percent NFS lands (USFS 1995). These 14 subunits were not required to meet the standards for OMRD, TMRD and security core presented above. Instead, these subunits were managed for "no net increase" in OMRD or TMRD and "no net loss" of security core.

As a result of the Legacy Project acquisitions and a district court decision related to the Glacier Loon and Buck Holland subunits, the FNF is now reporting conditions in relation to A19 motorized access objectives for 47 rather than 40 subunits where NFS lands are greater or equal to 75 percent of the subunit (USFWS 2016). The seven subunits with Legacy Project acquired lands are: Buck Holland, Cold Jim, Glacier Loon, Hemlock Elk, Lion Creek, Meadow Smith, and Piper Creek. In these subunits, roads on acquired lands are now classified as NFS roads, effectively increasing the miles of roads managed by the Flathead National Forest. Because these lands are still relatively new NFS lands, the FNF does not have complete knowledge of all roads on the acquired lands. Currently, FNF staff are working to complete field road logs in an effort to obtain to complete information such as the type and location of closure devices.

The status of all grizzly bear subunits on the FNF is summarized below and presented in Table III-4 (note: OMRD,TMRD, and core percentages presented in Table III-4 reflect signed decision that already undergone consultation) :

- 48 subunits with > 75 percent NFS lands meet or are less than 19 percent OMRD.
- 47 subunits with > 75 percent NFS lands meet or are less than 19 percent TMRD.
- 44 subunits with > 75 percent NFS lands meet or are greater than 68 percent Core.

Table III-4. Status of bear management unit (BMU) subunits on the FNF. Some subunits have had amended A19 objectives (shown here in red). Values in parentheses indicate subunit conditions once projects have been fully implemented. These projects have signed decisions and have undergone consultation, but on-the-ground implementation is still on-going. Shaded subunits have less than 75 percent NSF lands.

Subunit Name	OMRD Percentage	TMRD Percentage	Security Core Percentage
Albino Pendant	0	0	88
Big Salmon Holbrook	0	0	87
Black Bear Mud	0	0	84
Brushy Park	0	0	85
Buck Holland	24	41	45
Burnt Bartlett	0	0	92
Hungry Creek	0	0	88
Little Salmon Creek	0	0	98
Meadow Smith	20 (18)	54 (53)	42
White River	0	0	74
Big Bill Shelf	11	6	80
Bunker Creek	5	3	92
Goat Creek	23	59	39
Gorge Creek	0	0	90
Harrison Mid	1	0	95
Jungle Addition	19	19	68
Lion Creek	18	47	41

Subunit Name	OMRD Percentage	TMRD Percentage	Security Core Percentage
South Fork Lost Soup	25	47	37
Spotted Bear Mountain	19	18	68
Pentagon	0	0	94
Silvertip Wall	0	0	97
Strawberry Creek	0	0	100
Trilobite Peak	0	0	100
Coram Lake Five	30	46	14
Doris Lost Johnny	57	20	36
Emery Firefighter	19	20 (19)	58 (68)
Peters Ridge	52	25	34
Riverside Paint	18	16	71
Wounded Buck Clayton	28	30	65
Dickey Java	9	0	81
Moccasin Crystal	8	1	81
Stanton Paola	8	3	81
Canyon McGinnis	18	31	50
Cedar Teakettle	35	36	24
Lower Big Creek	18	19	71
Werner Creek	29	20	63
Beaver Creek	6	26 (25)	66
Cold Jim	18	57 (54)	43 (44)
Crane Mountain	28	53	25
Glacier Loon	22	41	48
Hemlock Elk	6	30	64
Piper Creek	19	45	55
Porcupine Woodward	27	74	15
Lazy Creek	68	62	10
Stryker	37	33	50
Upper Whitefish	34	57	54
Ball Branch	8	12	84
Jewel Basin Graves	20	19	68
Kah Soldier	19	19	68
Logan Dry Park	30	36	51
Lower Twin	9	2	92
Noisy Red Owl	20	13	59
Swan Lake	40	23	45
Twin Creek	0	0	100
Wheeler Quintonkon	25	19	68
Flotilla Capitol	0	0	99
Long Dirtyface	0	0	100
Plume Mtn Lodgepole	0	0	97
Skyland Challenge	20	17	65
Tranquil Geifer	0	2	85
Coal & South Coal	15	19	73
Frozen Lake	10	4	86
Hay Creek	25	16	55
Ketchikan	14	3	73
Lower Whale	36	17	50
Red Meadow Moose	25	17	68
State Coal Cyclone	29	25	58

Subunit Name	OMRD Percentage	TMRD Percentage	Security Core Percentage
Upper Trail	14	4	88
Upper Whale Shorty	12	11	86
Basin Trident	0	0	85
Gordon Creek	0	0	82
Jumbo Foolhen	0	0	89
Youngs Creek	0	0	92

Ten of the 73 subunits on the FNF are comprised of less than 75 percent NFS lands (indicated by shading in Table III-4). Of these subunits, 10 are managed under a strategy of "no net increase" in road densities (i.e., OMRD and TMRD) and "no net decrease" in security core. The remaining three do not have the same strategy because the FNF administers a very small percentage of lands within the subunit. In the biological opinion on the effects of the revised implementation schedule for A 19 (USFWS 2014), the Service concluded, "In summary, the existing access management conditions are good to very good for grizzly bears in the NCDE, with a few site specific exceptions. It is our opinion that motorized access is managed across the NCDE at levels that are evidently conducive to grizzly bear population growth and conserve grizzly bear habitat."

The existing Forest Plan (via A19) aka the current condition, also addresses administrative use of closed routes in the grizzly bear recovery zone (i.e., PCA) by describing allowable levels of administrative use. The direction states that outside of security core areas, motorized administrative use is acceptable at low intensity levels as defined by either (1) existing cumulative effects analysis models (which defined low-intensity levels as one to six vehicles/week) or (2) minor activities that do not exceed 30 days duration. Administrative use of reclaimed roads may not occur during the non-denning season other than over-snow vehicle use, which can occur during the period of time when public over-snow vehicle use is allowed.

Swan Valley Grizzly Bear Subunits

The Swan Valley provides habitat for grizzly bears as well as habitat connectivity from the Mission Mountains to the Swan Mountain Range. The Swan Valley Grizzly Bear Conservation Agreement (SVGBCA) is a collaborative document that has guided management of multiple-use lands managed by the Forest Service, Montana Department of Natural Resources and Conservation (DNRC), and lands formerly owned and managed by Plum Creek Timber Company. The purpose of the agreement is to "establish an ecosystem-based management plan throughout the Conservation Area which allows affected Parties to realize economic and recreational benefits of their ownership while helping conserve the bear and other species." Under the agreement, motorized access and timber harvest in 11 Swan Valley grizzly bear subunits were cooperatively managed.

The SVGBCA set an active/inactive rotation schedule for grizzly bear subunits in the Swan Valley. This rotation schedule designates select subunits to be "active" during the non-denning period (defined in the agreement as April 1-November 15). Under the schedule, 4 subunits can be active for 3 years while the other 7 subunits are inactive for a minimum of 3 years. Within an "active" subunit, unlimited commercial use (major forest management activities such as road construction and timber harvest) may occur during the non-denning season, but there are some activity restrictions in spring habitat from April 1-June 15. This provision of the agreement limits disturbance to grizzly bears during the spring when habitat availability is limited by snowpack that remains at higher elevations.

Within an "inactive" subunit, salvage harvest may occur between June 16 and August 31 but is restricted to two consecutive weeks with no more than 30 days in aggregate. Post and pole collection is also allowed in inactive subunits if the activity is less than two weeks in duration. Concentrating commercial activities in active subunits and limiting the scope and timing of activities in the inactive subunits is designed to reduce the risk of disturbance to grizzly bears from human activities in subunits where multiple landowners could be engaging in land management activities.

The SVGBCA also provides guidelines to maintain visual screening along open forest roads and maintain hiding cover throughout the subunit area. SVGBCA guidelines include providing 40 percent cover within each subunit. Retention of vegetative screening and hiding cover are intended to reduce potential effects from noise and human activity on open forest. During the two decades from 1996-2015, Plum Creek Timber Company, in conjunction with the "fiber agreement" with the Nature Conservancy (TNC) that was enacted during the Legacy land transfer, harvested a large portion of its lands in the agreement area. The "fiber agreement" between Plum Creek Timber Company and the Nature Conservancy has now ended, and Plum Creek Timber Company has now been acquired by Weyerhaeuser. Table III-5 displays the acres of harvest in the 11 Swan Valley grizzly bear subunits managed under the SVGBCA.

Table III-5. Acres of timber harvest from 1996 to 2015 in Swan Valley grizzly bear subunits by landowner[1]

Swan Valley Grizzly Bear BMU Subunit	Timber Harvest DNRC 1996-2005 (acres)	Timber Harvest DNRC 2006-2015 (acres)	Timber Harvest PCTC/TNC1996-2005 (acres)	Timber Harvest PCTC/TNC2006-2015 (acres)	Timber Harvest USFS 1996-2005 (acres)	Timber Harvest USFS 2006-2015 (acres)	Total Timber Harvest 1996-2015 (acres)
Goat Creek	1,345	501	4,369	0	0	10	6,215
Lion Creek	778		1,249	524	0	796	3,347
Piper Creek		120	2,620	2,141	16	19	4,786
Porcupine Woodward	485	2,000	3,690	0	0	0	6,175
South Fork Lost Soup	1,587	3,097	66	0	0	0	4,750
Meadow Smith			518	2,631	256	2,262	5,667
Buck Holland			110	984	450	2,247	3,791
Cold Jim			1,045	4,459	149	0	5,653
Hemlock Elk			1,007	1,843	252	523	3,625

Swan Valley Grizzly Bear BMU Subunit	Timber Harvest DNRC 1996-2005 (acres)	Timber Harvest DNRC 2006-2015 (acres)	Timber Harvest PCTC/TNC1996-2005 (acres)	Timber Harvest PCTC/TNC2006-2015 (acres)	Timber Harvest USFS 1996-2005 (acres)	Timber Harvest USFS 2006-2015 (acres)	Total Timber Harvest 1996-2015 (acres)
Glacier Loon			1,543	376	717	104	2,740
Beaver Creek			1,044	546	303	5	1,898

[1] PCTC/TNC = Plum Creek Timber Company/The Nature Conservancy;
DNRC = Department of Natural Resources and Conservation.
The DNRC data has the following qualifiers:

- Harvested acres were sorted by sale date, not actual harvest date. Harvest date unknown.
- Does not include Plum Creek lands acquired in the Swan through the Legacy Project. This data is not known.
- No major timber sales occurred in the DNRC Swan River State Forest between 1996 and 2002.
- Does not include most small-volume timber permits or small-scale thinning/salvage projects.

Conditions in the Swan Valley have changed since A19 and the SVGBCA were adopted. The acquisition of former Plum Creek Timber Company lands by state and federal agencies totals approximately 66,000 acres checkered throughout the 230,000-acre Swan River watershed (Figures 25 and 26). This acquisition limits permanent human development and fragmentation of private lands in the Swan Valley and helps to maintain or improve habitat quality for grizzly bears and other wildlife species. Land acquisition is also expected to reduce the risk of grizzly bear food conditioning and habituation associated with private land development. Acquisition of the Legacy Project lands has reduced the need for coordination of timber harvest activities because Plum Creek Timber Company and The Nature Conservancy are no longer managing lands in 11 grizzly bear subunits.

The NCDE grizzly bear population is stable to increasing and expanding in distribution, even with a high level of timber harvest activity and road use by the multiple land managers in the intermingled ownership in the Swan Valley from 1995 to 2015. Because there are many acres of young forest that will not be suitable for additional harvest for many decades, and because PCTC/TNC no longer manage lands in the eleven subunits shown in Table III-5, the level of harvest and harvest-related activities (including road use) is likely to be much lower in the near future. Cover is becoming established in the areas that were harvested in the past.

The only remaining parties to the SVGBCA are the USFS and the DNRC. The DNRC manages blocks of lands in four grizzly bear subunits: Goat Creek, Lion Creek, Porcupine Woodward, and South Fork Lost Soup. This totals about 55,900 out of 124,362 acres in these subunits, or about 45 percent. In these four subunits, about 32,090 acres, or about 51 percent of lands managed by the FNF are in IRAs. Other private lands in these subunits total less than 2 percent of the subunit acreage. Table III-6 displays OMRD, TMRD, and security core for these four shared subunits. Because the DNRC manages very little land in the Piper Creek grizzly bear subunit it is not included in the table. Further, DNRC manages land in the Lion Creek subunit but it is still greater than 75 percent NFS lands so it is not included in Table III-6.

Table III-6. Open motorized route density (OMRD), total motorized route density (TMRD), and security core habitat for subunits shared by USFS and DNRC with less than 75% NFS lands.

Subunit Name	OMRD %	TMRD %	Security Core %
Goat Creek	23	59	39
Porcupine Woodward	27	73	15
South Fork Lost Soup	25	47	37

Ruby (2014) studied grizzly bear habitat use along Montana Highway 83 in the Swan Valley and found that grizzly bears exhibited little negative selection for high open road densities within the Swan Valley study area. Ruby (2014) used location data from 24 grizzly bears instrumented with GPS collars using the Swan Valley of the Forest from 2000 to 2011 to characterize grizzly bear movement and habitat-use patterns. Use of GPS collars enabled grizzly bears to be tracked on a 24-hour basis. Ruby found that grizzly bears use high-quality habitats around human development and are not completely displaced. Rather, bears adopted movement patterns in close proximity to open roads and homes so that they were active during night time-periods when human activity was lowest. Although human activity associated with human site development in the rural landscape of the Swan Valley did not affect habitat selection, Ruby (2014) noted that it can result in human encounters resulting in grizzly bear mortality or management-related removals from the population. Where resources are not limiting, grizzly bear movement patterns that avoid periods of human activity may be an important strategy for limiting mortality risk to grizzly bears. Even though road density parameters in the Swan Valley do not meet 19 percent OMRD, 19 percent TMRD, and 68 percent security core, based on location data from Ruby (2014), grizzly bears continue to use Swan Valley habitats.

Motorized Route Density and Security Core Outside the PCA/Recovery Zone

Outside the recovery zone/primary conservation area, the 1986 forest plan identified geographic units and a range of public open road densities for each (see alternative A discussion) (USFS 2016). Table III-7 shows the linear density of roads open to public motorized use (during all or a portion of the non-denning season) within the portions of zone 1 under management authority of the Flathead National Forest. This level of motorized access has supported expansion of the grizzly bear population, including females, into zone 1, including the Salish demographic connectivity area (Figure B-5) (USFWS 2012a). In all geographic units, linear densities of roads open to public motorized use are at levels that support occupancy and survival of both males and females (Boulanger and Stenhouse 2014) and are below the upper thresholds established by the 1986 forest plan.

Table III-7. Density of roads open to the public motorized use outside the grizzly bear recovery zone/PCA by geographic unit of the FNF.

Geographic Unit[1]	Density of roads open to public motorized vehicle use (avg. linear mile/mile^2 of NFS lands)
Swan Lake Ranger District	
Island Geographic Unit	1.7
Tally Lake Ranger District	
Olney-Martin Creek Geographic Unit	1.6

Geographic Unit[1]	Density of roads open to public motorized vehicle use (avg. linear mile/mile^2 of NFS lands)
Upper Good Creek Geographic Unit	1.3
Sylvia Lake Geographic Unit	1.0
Star Meadow-Logan Creek Geographic Unit	1.5
Tally Lake-Round Meadow Geographic Unit	1.8
Mountain Meadow-Rhodes Draw Geographic Unit	1.6
Upper Griffin Geographic Unit	0.9
Ashley Lake Geographic Unit	1.9

Motorized Over-Snow Use During the Den Emergence Period

As discussed in Section C.3 above, motorized over-snow vehicle can have adverse effects on grizzly bears during the crucial den emergence period. The existing Forest Plan allows motorized over-snow use based upon Amendment 24 (A24), adopted in the Winter Motorized Recreation Plan Record of Decision in 2006 (USFS 2006). A24 was implemented to provide management direction regarding over-snow motorized use on the FNF by establishing a Winter Motorized Recreation Management Plan that clarified where, when, and under what conditions over-snow vehicles were allowable on the FNF. A24 identified areas suitable and not suitable to motorized over-snow vehicle use, including four "late-season areas" within the recovery zone/PCA. The four designated "late-season areas" are: Canyon Creek groomed route corridor (open until April 15); Six Mile (open until April 30); Skyland Challenge (open until May 15); and Lost Johnny (open until May 31).

Table III-8 presents current areas and routes open to motorized over-snow vehicle use in the recovery zone/PCA according to season (i.e., denning season and den emergence time period). Note that miles and acres displayed in this table reflect the implementation of A24. During the denning season, about 22 percent of the recovery zone/PCA on the FNF is suitable for motorized over-snow vehicle use. During the non-denning season, which includes the time period when grizzly bears may be emerging from their dens, motorized over-snow vehicle use is suitable on approximately two percent of the acreage within the FNF's portion of the recovery zone/PCA (see Figures 19 and 20). The USFS and MTFWP have monitored motorized over-snow use as well as known den locations and bears emerging from their dens and reported this information to the USFWS. The agencies have not detected any conflicts due to over-snow use on the Flathead National Forest (USFS 2017).

Table III-8. Miles/acres suitable for motorized over-snow vehicle use within the primary conservation area (PCA)

Area	Motorized Over-Snow Vehicle Routes Open Dec. 1 to March 31[1]	Motorized Over-Snow Vehicle Areas Open Dec. 1 to March 31[1]	Motorized Over-Snow Vehicle Routes Open April 1 to Nov. 30)[2]	Motorized Over-Snow Vehicle Acres Open April 1 to Nov. 30)[2]
PCA	872 miles	516,134 acres	661 miles	59,017 acres

[1] This includes all routes and areas open during this time period.

[2] This includes all routes and areas open during this time period.

Non-Motorized Trails Inside the PCA

The FNF has about 2,041 miles NFS trails in the PCA, and about 275 miles of this total are considered to be "high use" using the IGBC criteria. Figure 16 shows the distribution of trails modeled as "high use" in the NCDE. As this data shows, the majority of trails that have been modeled as "high use" are in Glacier National Park.

Strategies recommended to reduce the risk of sudden encounters between grizzly bears and people include (1) visitor education regarding safe practices in bear country (e.g., expect to meet bears, look ahead, slow down, make lots of noise), (2) managing recreation to occur more predictably in space and time, and (3) designing or locating recreation trails to increase the distance at which bears can detect people and to avoid habitats with concentrated bear food resources (Fortin et al., 2016; J. Herrero and Herrero, 2000; Quinn and Chernoff, 2010).

Although a variety of methods can be used to reduce the risk of grizzly bear-human conflicts due to non-motorized uses, Herrero and Herrero (2000) emphasized that none of them can entirely remove the risk of hiking or mountain biking in grizzly bear habitat. When grizzly bear-human conflicts do occur in the NCDE (whether associated with non-motorized trail use, off-trail backcountry use, developed recreation sites, or private or other agency lands), MTFWP, in cooperation with land management agencies and the USFWS, monitors the conflict situation and determines the appropriate conflict response based on established Interagency Grizzly Bear Guidelines. No population-level effects of non-motorized trails have been demonstrated, and there are relatively few "high intensity use" trails on NFS lands. Because of the lack of studies demonstrating population-level impacts associated with non-motorized trails, the subjective method of establishing the threshold value of 20 parties per week and their influence zone, and the lack of available objective data to quantify non-motorized use levels, the NCDE conservation strategy team recommended removing consideration of high-intensity use non-motorized trails to define core habitat effectiveness (USFWS 2013).

Developed Recreation Sites

On the FNF, there are 63 campgrounds, 63 recreation residences, and 20 lookouts/cabins/lodges designed for overnight use on NFS lands in the PCA (see Tables III-9 and III-10 for the number of sites their respective capacities). The FNF also has one developed resort on NFS lands in the PCA, the Whitefish Mountain Resort, as well as an unknown number of dispersed recreation sites. The FNF has consulted with Service on the effects of various resort expansion projects since 1989 (USFS-USFWS 2016; USFWS 1989, 1995a, 2007b, 2011d, 2012b, 2013d, 2015). The FNF also has one developed ski resort that operates during the grizzly bear denning season - Blacktail Mountain. This resort is in zone 1 outside the Salish DCA. Currently, food storage orders are implemented at these resorts and have been effective in reducing the risk of grizzly-bear human conflicts at these sites.

Table III-9. Number of developed recreation sites designed for overnight use in the primary conservation area on the Flathead National Forest

Area	Number of Developed campgrounds	Number of cabins, lodges, lookouts with overnight use	Recreation Residences
PCA	63	20	63

Table III-10. Capacity of developed recreation sites designed for overnight use in the primary conservation area on the Flathead National Forest

Area	Capacity of Developed campgrounds	Capacity of cabins, lodges, lookouts with overnight use	Capacity Recreation Residences
PCA	552	48	63

Livestock Allotments

No sheep grazing and very limited cattle grazing occurs on the FNF. The Forest currently has seven active cattle allotments—four in the Salish geographic area outside the recovery zone/PCA and three in the Swan Valley geographic area inside the recovery zone/PCA (see Figures 4 and 21). Current allotment acreage represents approximately 3 percent of NFS lands, consisting of about 81,500 acres. Authorized grazing on the FNF has declined over the last several decades. Current animal unit months authorized for grazing totals about 1,078. Because livestock grazing has been declining, the risk of conflicts on the FNF has also declined.

There have been no known livestock-related grizzly bear mortalities on the FNF. According to the draft GBCS, "Indirect impacts on grizzly bears due to attractants associated with livestock can be effectively minimized with requirements to securely store and/or promptly remove attractants associated with livestock operations (e.g., livestock carcasses, livestock feed, etc.)" (USFWS 2013a). Livestock carcasses are promptly removed and livestock feed is properly stored on FNF lands, as required by the attractant storage orders that are in place (USFS 2011).

In addition to cattle, there are permitted grazing operations for horses and mules on FNF lands. These are primarily associated with outfitter and guide operations, or Forest Service administrative use. The food storage order addresses attractants associated with horses or mules, and there is no evidence of conflicts with bears due to depredation, attractants, or forage competition related to horse and mule grazing permits. Honeybees, classified as livestock in Montana (MCA 15-24-921), can be attractants to some grizzly bears. However, there are no permitted honeybee operations on the FNF.

Vegetation Management

Commercial timber harvest has affected a total of approximately 17 percent of the NFS lands on the FNF. In total, about 46 percent (304,750 acres) of the suitable land base on the FNF has been affected by commercial timber harvest since the 1940s. Though some harvest records date back to 1918, it wasn't until the early 1940s that harvesting on NFS lands became more prevalent and accurate record-keeping began. Table III-11 presents the approximate forest-wide acres and trend of timber harvest from 1960 through 2012 (USFS 2017). Table III-12 displays the approximate acres harvested for each of the six geographic areas on the FNF from 1960-2012. The majority of the Salish geographic area, where the highest amount of timber harvest has occurred, is outside of the grizzly bear recovery zone/PCA.

The Interagency Grizzly Bear Guidelines addressed vegetation management activities, and these guidelines were incorporated into the existing Forest Plan for timber management in grizzly bear management situations 1 and 2. These adopted guidelines have guided vegetation management on the FNF for the last 30 years. The draft GBCS (USFWS 2013a) includes many similar strategies for vegetation management that are designed to increase grizzly bear foods, limit the impacts of road use associated with projects, and protect seasonally important habitats.

Table III-11. Acres of NFS lands affected by commercial harvest activity by decade.

Decade of Harvest	Intermediate Harvest[1] (acres)	Regeneration Harvest[2] (acres)	Total Acres
< 1950	854	4,721	5,575
1950-1959	6,567	21,626	28,193
1960-1969	15,943	63,162	79,105
1970-1979	32,530	67,729	100,259
1980-1989	19,538	64,296	83,834
1990-1999	10,318	33,107	43,425
2000-2012	28,176	25,679	53,855
Total	113,927	280,320	394,247

[1] Intermediate harvest = removal of portion of the trees in a stand (e.g., commercial thin, overstory removal cut, salvage cut)
[2] Regeneration harvest = removal of nearly all the trees in the stand (e.g., clearcut, seedtree cut, shelterwood cut)

Table III-12. Approximate acres and percent of NFS lands affected by commercial harvest activity by geographic area (GA) 1960-2012

GA	Total NFS lands in GA (acres)	Sum of Harvest Acres (percent)
Hungry Horse	286,234	67,943 (24%)
South Fork	789,074	14,287 (2%)
Middle Fork	370,156	7,367 (2%)
North Fork	320,044	82,219 (26%)
Salish Mountains	262,859	122,016 (46%)
Swan Valley	364,440	100,415 (28%)
Total	2,392,807	394,247 (16%)

Mineral and Energy Development

The three systems that govern federal mineral and energy resources from NFS lands include the mining, salable and leasing laws and regulations. The mineral or energy resources falling within each system are known as locatable, salable, and leasable. The Forest Service has management authority over the surface resource impacts resulting from locatable mineral activity and has full discretionary authority over disposal of salable mineral material. For leasable commodities on NFS lands, the BLM issues all leases with Forest Service consent. Locatable mineral development refers to surface and underground hardrock mining of metallic minerals and nonmetallic minerals. Salable minerals include materials such as common varieties of sand, stone, and gravel. Leasable mineral development includes the production of materials such as oil and natural gas.

Locatable Minerals

Currently, there are no authorized locatable mineral activities such as exploration or development operations for locatable minerals within the boundaries of the FNF. Based on the results of a query of the BLM mining claim database, one active mining claim (MMC195448) is located within the planning area (USFS 2017). The Mary Dee II lode claim is located in the Hungry Horse geographic area. The FNF has low potential for locatable minerals as displayed in Figure 5.

Saleable Minerals

The FNF's use of mineral material, such as gravel, riprap, and crushed aggregate includes maintenance and/or new construction of roads, recreation sites, and trailheads. Other uses include Forest contract work (i.e., timber sales), culvert replacement, and repair of damage caused by fire, floods, and landslides. The mineral material utilized by the Forest is primarily derived from Forest Service pits and quarries located on the FNF. The type, volume, and source location of in-service mineral material varies year by year according to need. In addition, free use permits (FUPs) can be issued to state or federal agencies, municipalities, county road districts, nonprofit associations, or individuals (36 CFR 228.57). For example, the Forest has issued free-use permits to Flathead County for maintenance and improvement of the North Fork Road.

Leasable Minerals

The production of oil and natural gas is conducted through a leasing process. Existing FNF Forest Plan standards and guidelines provide guidance for authorizations and stipulations that are determined at the project level. At this time, there is no leasable mineral exploration or development on the Forest. The BLM suspended the oil and gas leases in 1985 after the Conner v. Burford district court decision (Conner v. Burford, 605 F.Supp. 107 [D.Mont.1985]) (Figure B-36). The court found the environmental "effects analysis" supporting lease issuance on the FNF to be inadequate, and specified that no activity could take place on the leases until an environmental impact statement (EIS) was completed. The 9th Circuit Court of Appeals upheld the district court decision to require an EIS prior to any post-leasing activities in a January 13, 1988, decision, as amended July 1, 1988.

The Forest has low potential for locatable minerals and low to high potential for leasable minerals. However, most NFS lands on the FNF are withdrawn from mineral entry (Figure 5). The type of lands withdrawn from mineral entry and leasing on the FNF include:

- administrative sites such as campgrounds;

- Forest lands within the boundaries of a ski area permit;
- the Bob Marshall, Great Bear, and Mission Mountains Wilderness Areas;
- sections of the North, South and Middle Forks of the Flathead River;
- portions of the Forest withdrawn from mineral development by the North Fork Watershed Protection Act of 2013.

Withdrawal of these large areas reduces the risk of grizzly bear habitat loss, disturbance, displacement, and mortality. All withdrawals are subject to valid existing rights. The USFS does not have the discretion to deny the exercise of an outstanding mineral right. However, the developer does not have unrestricted rights, as the developer's rights are limited to use only as much of the surface as is reasonably necessary to explore, develop, and transport materials. The developer must provide an operating plan to the FNF, and the FNF has some ability to manage surface resources.

D. EFFECTS OF THE ACTION

Effects of the action are "…the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline." [50 CFR §402.02] These effects are considered along with the predicted cumulative effects to determine the overall effects to the species for purposes of preparing a BO on the proposed action. Direct effects are defined as those that result from the proposed action and directly or immediately impact the species or its habitat. Indirect effects are those that are caused by, or will result from, the proposed action and are later in time, but still reasonably certain to occur.

This section considers the effects to grizzly bears from implementation of the FNF's Revised Forest Plan, which includes incorporating habitat-related direction from the draft Northern Continental Divide Ecosystem (NCDE) Grizzly Bear Conservation Strategy (USFWS 2013a). Effects to grizzly bears are discussed in a general fashion, followed by an action area-specific break-down.

This biological opinion does not provide an analysis for effects of specific actions. Rather, analysis is a broad-scale examination of the types of activities that can be conducted the Revised Forest Plan that could potentially occur in grizzly bear habitat and result in effects on grizzly bears. Because of the broad-scale analysis, the FNF will remain responsible for project-specific section 7 consultation on all future projects that may affect the grizzly bear or its habitat, even if those projects are consistent with the Revised Forest Plan.

1. General Effects

Access Management

The IGBC Taskforce provided standardized definitions for roads and standardized methods to measure road densities and define analysis areas as a result of grizzly bear research information on open and total road densities and grizzly bear core areas (IGBC 1994, 1998). The Service considers the management of roads one of the most important variables in grizzly bear habitat conservation. This section provides a general discussion of direct and indirect effects of motorized access management on grizzly bears and on the environmental baseline as affected by road densities.

Research has confirmed adverse impacts of roads on grizzly bears (Mace et al. 1996, Mace et al. 1999). Negative impacts associated with roads and excessive road densities influences grizzly bear population and habitat use patterns in numerous, widespread areas. These impacts are summarized in the following section, and some can be found in detail in The Grizzly Bear Compendium (IGBC 1987). Impacts reported in this document including:

- Direct mortality from vehicle strikes and illegal harvest (i.e., misidentification, poaching);
- Indirect mortality resulting from habituation to humans;
- Avoidance/displacement of grizzly bears away from roads and road activity; and
- Core habitat modification and/or fragmentation due to roads and road construction (including vegetative and topographic disturbances).

<u>Grizzly Bear Mortality</u>
Mortality is the most serious consequence of roads in grizzly bear habitat. Mortalities can occur from illegal shooting, collisions with vehicles, or indirectly through habituation to human presence (resulting in management removal or other lethal outcome). The specific relationship between roads and the mortality risk to grizzly bears is difficult to quantify, but the level of human use is one of several factors influencing the mortality risk associated with any road. Forest roads facilitate human access into grizzly bear habitat, which directly or indirectly increases the risk of mortality to grizzly bears. Historically, increasing road networks on the landscape resulted in grizzly bears becoming increasingly vulnerable to illegal and legal harvest in Montana (Mace et al. 1987) and in the Yellowstone region (Mattson et al. 1992). In southeastern British Columbia, McLellan and Shackleton (1988) reported roads increased access for legal hunters and poachers, the major source of adult grizzly mortality. McLellan (1989b) reported that 7 of 13 successful legal hunters interviewed had been on a road when they harvested their grizzly bear, and McLellan and Mace (1985) found that a disproportionate number of mortalities occurred near roads. In the Yellowstone ecosystem, Mattson and Knight (1991) reported that areas influenced by secondary roads and major developments were most lethal to grizzly bears. Aune and Kasworm (1989) reported 63 percent of known, human-caused grizzly bear deaths on the eastern front of the Rocky Mountains occurred within 1 kilometer (0.6

miles) of a road, including 10 of 11 known female grizzly bear deaths. In Montana, Dood et al. (1986) reported that 48 percent of all known, non-hunting mortalities during the period of 1967 through 1986 occurred within 1 mile of roads. Grizzly bears were also killed by vehicle collision, the most direct form of road-related mortality (Greer 1985, Knight et al. 1981, Palmisciano 1986).

The presence of roads alone does not necessarily result in direct mortality of grizzly bears, but the proximity of the roads to human population centers, and dispersed recreation in habitat around roads, can pose considerable risks to grizzly bears. Social values and attitudes also contribute to the level of mortality risk to grizzly bears. Incidental or accidental human-caused grizzly bear mortality, combined with a few individuals intent on illegally shooting grizzly bears, can collectively result in detrimental effects to grizzly bear populations. Access management can be instrumental to reducing mortality risk to grizzly bears by managing the present and anticipated future road use-levels resulting from the increasing human population in western Montana.

Displacement

Some grizzly bears, particularly sub-adults, may readily habituate to humans and consequently suffer increased mortality risk. However, many grizzly bears under-use or avoid otherwise preferred habitats that are frequented by humans. This represents a modification of normal grizzly bear behavior that results in detrimental effects. Negative association with roads arises from the fear of vehicles, vehicle noise, and other human-related activities around roads. These associations can also stem from human scent along roads, and hunting and shooting along or from roads. Grizzly bears that experience these negative consequences learn to avoid the disturbance generated by roads and may not choose to use these habitats even long after road closures.

All factors contributing to direct links between roads and displacement from habitat have not been quantified. As with mortality risk, the level of road-use by people is likely an important factor in assessing the potential displacement caused by any road. However, research indicates that grizzly bears consistently were displaced from roads and habitat surrounding roads, often despite relatively low levels of human use (Mattson et al. 1987, McLellan and Shackleton 1988, Aune and Kasworm 1989, Kasworm and Manley 1990, Mace and Manley 1993, Mace et al. 1996).

Avoidance behavior is often strongest in adult grizzly bears, with males selecting for high quality habitats and absence of humans (Gibeau et al. 2002). Males that were found using high quality habitat near roads, did so during the night where hiding cover was available (Ibid.). In contrast, adult females were more likely to avoid humans and roads all together, rather than seek out the highest quality habitats (Gibeau et al. 2002). Mueller et al. (2004) reported all age and sex classes used habitats closer to high-use roads and development when humans were least active. Not surprisingly, they also found that bears showed a considerably greater avoidance of high-use roads and development during periods of high human activity. The study also found that, regardless of the time of day, sub-adult bears were found closer to high-use roads than adult bears. This trend was also documented by Gibeau et al. (2002), who demonstrated that sub-adult grizzly bears were almost always closer to human activity than adults.

In Montana, Aune and Stivers (1982) reported that grizzly bears avoided roads and adjacent corridors even when the area contained preferred habitat for breeding, feeding, shelter and reproduction. McLellan and Shackleton (1988) found that grizzly bears used areas near roads less than expected in southeastern British Columbia, and estimated that 8.7 percent of the total area was rendered incompatible for grizzly bear use because of roads. Mace and Manley (1993) reported use of habitat by all sex and age classes of grizzly bears was less than expected where total road densities exceeded two miles per square mile. They also found that adult grizzly bears used habitats less than expected when open motorized access density exceeded one mile per square mile. Further, female grizzly bears in the study area tended to use habitat more than 0.5 mile from roads or trails greater than expected.

Mace et al. (1996) and other researchers have used 500 meters as the zone of influence around roads. Waller and Servheen (2005) also documented avoidance of areas within 500 meters of US-2 in Montana. Benn and Herrero (2002) set zones of influence of 500 meters and 200 meters around roads and trails, respectively. They reported that all 95 human-caused grizzly bear mortalities with accurate or reasonable locations that occurred in Banff and Yoho National Parks between 1971 and 1998 occurred within these zones of influence along roads and trails or around human settlements.

Conversely, grizzly bears can become conditioned to human activity and in some instances show a high level of tolerance especially if the location and nature of human use are predictable (Mattson 1993). In Glacier National Park, Jope (1985) suggested grizzly bears in parks habituate to high human use and showed less displacement, even in open habitats. Yonge (2001) found that grizzly bears near Cooke City, Montana, were willing to consistently forage in very close proximity to high levels of human use if cover was sufficient and energetically efficient feeding opportunities were present. In Montana's Swan Valley, Ruby (2014) used location data from 24 collared grizzly bears to show nocturnal use of highly roaded habitat.

Both Mattson (1993) and Yonge (2001) postulated that areas with higher levels of human activity might have a positive effect for bears by serving as a kind of refugia for weaker population cohorts (subadults and females with cubs) seeking to avoid intra-specific competition (i.e., conflict with adult males). However, Mattson qualified this observation by adding that the beneficial effects vary as to whether hunting is allowed, and how closely the human population is regulated. Further, food conditioned grizzly bears were much more likely to be killed by humans.

<u>Core Habitat Fragmentation</u>
The IGBC Taskforce (IGBC 1994) recognized the importance of secure areas to grizzly bears. The Taskforce defined "core areas" as those areas with no motorized access (during the non-denning period) or heavily used foot/livestock trails, providing some level of secure habitat for grizzly bears. Motorized use, such as snowmobiling, or that associated with timber harvest, could occur within core areas during the denning (winter) period. The Taskforce recommended

the establishment of core areas in all subunits, the size of core area should depend on ecosystem-specific habitat conditions, and that a core area remain intact on the landscape for at least 10 years.

Mace and Manley (1993) reported adult females used habitat further than 0.5 mile from roads or trails more than expected. They also found that 21 percent of the composite home range had no trails or roads and 46 percent was unroaded (greater than 0.5 mile from a road). Substantive blocks of unroaded habitat were components of all adult female home ranges. Of the adult female locations within unroaded polygons, 83 percent occurred within 7 polygons that exceeded 2,260 acres in size. Based on grizzly bear habitat use data from the GYE, Mattson (1993) recommended that micro scale security areas in that region be an absolute minimum of 6 kilometers (3.6 miles) in diameter or 28 square kilometers (10 square miles) and should be secure for a minimum period of 5, or preferably 10, years.

These large blocks of secure "core" habitat are vital to grizzly bears, providing areas that are free from human influence. Grizzly bear security core habitat allows bears to exist under natural, free-ranging conditions. In most grizzly bear ecosystems in the lower U.S. roads are the primary threat to large blocks of grizzly bear security core habitat by facilitating human presence, or by fragmenting large swaths of habitat into smaller blocks.

Attractants and Habituation to Humans

Continued exposure to human activity without negative consequence can result in habituation, which is a loss of a grizzly bear's natural wariness of humans. Habituated grizzly bears may safely adjust to noise and activity and can demonstrate a high degree of tolerance. Tolerance is especially likely if the location and nature of human use are predictable, and do not result in overtly negative impacts for grizzly bears (Mattson 1993).

Improperly stored food, garbage, livestock or pet foods can lure grizzly bears to areas near people and pose a significant risk of habituating bears to human presence and/or conditioning grizzly bears to seek out anthropogenic foods and attractants. Food conditioned grizzly bears may enter unsecured garbage receptacles, sheds and other buildings in search of a reward. Accessibility to human related attractants and conditioning to those rewards can lead to management removal of grizzly bears and additionally, mortality of grizzly bears by people defending their life and property.

Grizzly bears are particularly susceptible to anthropogenic foods and attractants during years of poor natural production. Information and education programs, and food storage orders are particularly important during years of poor natural food production, and in seasons of high nutritional and energy needs for bears. MTFWP has stated that perhaps the greatest advancement in the management of problem bears has been the development of bear management specialist positions (USFWS 2011). The combination of shortened response time to reports of grizzly bear conflicts, preventative actions to remove attractants, the deterrent effects of local law enforcement, and perhaps most important, building community involvement in the management and conservation of grizzly bears, has been invaluable. These efforts assist in dealing with nuisance bears, preventing habituation of bears, and fostering local public support of grizzly bear conservation (MTFWP 2005, Wenum 2011).

Recreation

Effects during the Non-Denning Season

Several studies have investigated the behavioral response of bears to non-motorized trails. These studies vary considerably in study design, trail use levels, grizzly bear sample sizes, and conclusions as to the impacts of non-motorized trails on bears. In Glacier National Park, bears more than 500 feet away from trails generally did not respond to hikers by fleeing (Jope 1985), and in 45 percent of all cases bears showed no movement in response to hikers. Hiker group size did not significantly affect initial bear behavior, and the relationship between group size and subsequent behavior was similarly weak. The higher presence of bear bells among larger groups may have influenced bear response.

McLellan and Shackleton (1989) reported that bears showed a stronger response to people on foot than in motor vehicles in "low human-use" areas. However, less than half of bears showed any response (walked or ran away) to stimulus greater than 250 feet away. McLellan and Shackleton also reported that grizzlies fled further in response to unexpected off-trail foot travel than to motorized use. Similarly, Mace and Waller (1996) reported that bear response to off-trail hikers was greater than that observed for other types of disturbances.

White and others (1999) documented grizzly bear displacement from feeding sites in Glacier National Park in response to hikers. Kasworm and Manley (1990) reported that grizzly bears used habitats within 100 meters (328 feet) of trails less than expected but used habitats 100-1,000 meters (3,281 feet) from trails in proportion to their availability.

Grizzly bear response to human disturbance may differ between seasons or habitats. Jope (1985) noted that grizzly bears were more likely to respond to hikers through flight or charges in spring and early summer than later in the year, possibly due to habituation once human use became more common during the summer season. Kasworm and Manley (1990) found that bears used habitat within 400 feet of trails less than expected in spring and fall. Conversely, Mace and Waller (1996) found that distance to trails and/or lakes with campsites were significant variables only in summer and autumn.

Non-motorized recreation uses (hiking, horseback riding, mountain biking) also affect the risk of grizzly-bear human conflicts (Herrero and Higgins 1999). These conflicts can pose risks to human safety, as well as, safety to grizzly bears. Herrero (1985) was one of the first researchers to report on the causes of bear attacks and how to avoid them. Based upon his study of bear attacks in Canadian national parks, Herrero reported that 68 out of 135 grizzly bear incidents in which the party's activity prior to the bear attack was known, hiking was the most common activity. Herrero reported that 75 percent of encounters he classified as "sudden" were known to involve bear mothers, with females and cubs of the year being most dangerous. Sudden encounters are the most likely situation to result in a grizzly bear-inflicted injury (Herrero 1985).

Attacks by bears on humans in North America are disproportionately more frequent in national parks, most being the result of sudden encounters between hikers and grizzly bears that react defensively to protect young or a food source (MacHutchon 2014). Fortin and others (2016) reported that most defensive attacks result from surprise encounters involving humans hiking off-trail, in the backcountry, and in areas of natural food abundance for grizzly bears. Various studies have analyzed the contribution of human behavior in bear attacks and concluded that activities where people may be moving quickly and/or quietly enough to surprise a bear before the bear detects them is an important factor. This can include activities such as mountain biking (if cyclists are traveling quietly at high speed) or hiking while hunting (if an individual is moving quietly through the forest or is in close proximity to an animal carcass).

Quinn and Chernoff (2010) conducted a literature review of the ecological effects of mountain bikes. A database of 33 grizzly bear-bicyclist encounters or confrontations within western North America revealed that in 95 percent (20 of 21) of encounters where the distance apart was estimated, the bear was 165 feet or less away. Schmor (1999) interviewed 41 mountain bikers in the Calgary region who cycled in the Rocky Mountains and concluded that the speed and relative silence of mountain bikes, especially when combined with environmental factors (e.g., dense vegetation, hilly terrain, running water), likely contributed to mountain bikers approaching bears closer than 50 meters (164 feet) before being detected by the bear. These factors make it less likely that an encounter can be avoided. MacHutchon (2014) stated that an alert mountain biker making sufficient noise and traveling at slow speed (e.g., uphill) would be no more likely to have a sudden encounter with a bear than would a hiker.

In Glacier National Park, conflicts and grizzly bear mortalities are rare and are related almost exclusively to campgrounds and other developed human-use areas (White et al. 1999). In the Swan Mountains, Mace and Waller (1996) reported there were no historic or recent records of grizzly bear-human conflict in their study area. The authors suggested that avoidance by bears of heavily used human trails may increase grizzly bear survival.

Effects during the Denning Season

The effects of winter recreation activities on denning grizzly bears are not well studied, but there is no evidence to indicate that current levels of non-motorized or motorized over-snow vehicle use are inhibiting the recovery of the grizzly bear population in the NCDE (Mace, pers. comm). In the fall of 2000, the science and resource management staff of the Biological Resources Management Division of the National Park Service and the Rocky Mountains Cooperative Ecosystem Studies Unit at the University of Montana organized an expert workshop to summarize the state-of-science on monitoring the effects of snowmobiles on wildlife in national parks and surrounding lands. Graves and Reams (2001) edited the output of this expert workshop for protocols to monitor snowmobile effects on wildlife. The participating scientists and biologists developed a flow-chart depicting possible impacts and prioritized research to address these impacts. They prioritized the need to develop techniques that would demonstrate and measure actual impacts on bear individuals and populations in the field, and addressed physiological/behavioral responses, mortality and displacement from habitat.

The group concluded that the evidence was inadequate to predict impacts on grizzly bears, but the possible effects were identified: den abandonment, loss of young, increased energetic costs while bears were in dens or displaced away from suitable habitat if outside dens, death, and learned displacement from suitable habitat resulting from exposure to disturbance (Graves and Reams 2001). Several issues to monitor were identified, including the effect of presence on emerging animals and the effect of noise on hibernating bears. Impacts to emergent bears were identified as a higher concern than impacts to denning bears.

Some indications of bear species responses to human disturbance are available from the distances of dens from centers of human activity. The fact that some bear dens were documented within 1 kilometer (0.6 mile) of human activity centers (Linnell et al. 2000) indicates that bears do not totally avoid denning habitat based on its proximity to human disturbance. Caution should be used when making inferences with this information, however. Just because some bears were found denning close to human activities does not mean that all bears can or will do so. Likewise, such data usually do not include the long-term productivity or survival of the study animals. Linnell et al. (2000) summarized distances of bear dens to various centers of human activity as documented by nine studies of brown and black of bears; distances ranged from 0.1 to 6.5 km (~109 yards to 4 miles) and did not account for differences in altitude or other factors such as den characteristics, snow depth or activity levels. Harding and Nagy (1980) noted successful grizzly bear dens from 1.6 to 6.4 km (~1 to 4 miles) from active mining camps, although no dens were found within 1 km (~0.6 mile) of active drilling and staging camps. Although Schoen et al. (1987) noted that brown bears in Alaska gradually, from year-to-year, located their annual dens away from an area of increasing mining activity, the short distances to disturbance sources reported for the European brown bear dens were reportedly in proximity to long-established sources (Linnell et al. 2000), which suggests that some bears may become habituated to disturbance sources.

The draft NCDE Grizzly Bear Conservation Strategy (USFWS 2013a) indicates that the available data about the potential for grizzly bear disturbance or den abandonment from nearby snowmobile use is extrapolated from studies examining the impacts of other human activities and is identified as “anecdotal” in nature, with sample sizes so small they cannot be legitimately applied to assess population level impacts. There are no reports of den abandonment by grizzlies in the lower 48 states due to snowmobiling activity.

Effects during the Den-Emergence Period

The effects of winter recreation are likely most consequential shortly before or after den emergence of a female with cubs. Most emerging bears move immediately to a known, reliable spring food source, such as a big game winter range (Reinhart and Tyers 1999). Females with cubs have high energetic needs, and cubs have limited mobility for several weeks after leaving the den, therefore they remain in the den site area for several weeks after emergence from dens (Haroldson et al. 2002; Mace and Waller 1997). Researchers involved in the Delphi assessment of snowmobile impacts (Graves and Reams eds. 2001) indicated higher concerns with emergent females with cubs as they are likely the most sensitive to disturbance (Haroldson et al. 2002).

Disturbance levels that cause a female to prematurely leave the den in spring or move from the den area could impair the fitness of the female and safety of the cubs. If cubs attempt to follow their mother, they would likely experience decreased fitness and the family group may be pushed to less suitable habitat. A disturbance would have to be severe for a sow to abandon her cubs (Linnell et al. 2000). In the judgment of the Service, winter recreation-related impacts on post-den emergence females with cubs are more likely to impart serious consequences than any potential impacts to denning grizzly bears.

Vegetation Management

Vegetation management may impact grizzly bears in the short-term by displacing grizzly bears from important food sources and/or displacing grizzly bears to less secure habitat, if treatment units are located within or near key habitat types. Long-term effects to grizzly bears may result from vegetation alteration, impacting both grizzly bear cover and forage. A decrease in the amount of cover may result in different effects on grizzly bears and their habitat. If cover is limiting in the project area, either by the amount or distribution, timber harvesting would likely result in negative impacts (Ruediger and Mealy 1978). Reduced cover may increase the visibility of grizzly bears, which may potentially increase their vulnerability to illegal human-caused mortality and/or contribute to displacement from preferred habitats. However, if cover is not limited in a project area, timber harvesting may have either no effect or a positive effect in those situations where food abundance or distribution is improved. By removing or reducing overstory vegetation through harvesting, slashing and/or burning, sunlight reaches the forest floor or clearing and grizzly bear food production may be increased (Ruediger and Mealey 1978). This includes foods such as berries and succulent forbs.

In a study on use of harvested stands, Waller (1992) found that use of these stands increased during the berry season, due to some harvested stands having high berry production. If food production or distribution is improved but human activity is not controlled after the completion of harvest activities, negative impacts on grizzly bears may occur due to an increase in the potential for conflicts between humans and grizzly bears (Ruediger and Mealey 1978). Waller (1992) found that of the harvested stands that he studied, those with the highest grizzly bear use had limited access for people due to closed gates and/or over-grown roads. Grizzly bears within his study area that used harvested stands were found at higher elevations and spent little time in lower elevation stands where harvest was most common. Waller attributed this to human use of those lower, more accessible harvested stands. Waller also found that grizzly bears avoided stands where the vegetation had not recovered enough to provide security cover and preferred to use stands that were 30 to 40 years post-harvest.

Zager (1980) found that differences of shrub responses depended on the type of treatment that occurred post-harvest. Among the key shrub grizzly bear foods on clearcut sites where slash was bulldozer-piled before burning, Zager found a consistent decline in canopy coverage when compared to old burns. This is likely due to the extreme heat created by burning slash piles which may kill rhizomes and root crowns and bulldozer use which may also destroy rhizomes and root crowns. In those areas where slash was either broadcast burned or not treated, key grizzly bear shrub foods were generally found throughout the sites, except on skid roads and other severely disturbed areas. On relatively mesic sites, globe huckleberry, mountain-ash and serviceberry generally increased in cover.

Timber harvest activities that would occur during the grizzly bear denning season are not likely to impact grizzly bears. Snow is an excellent sound barrier (Blix and Lentfer 1992) and impacts to denning bears would likely be less in deep snow situations than in shallow snow conditions. It is likely that hibernating bears exposed to meaningless noise, with no negative consequences to the bear, habituate to this type of disturbance (Knight and Gutzweiler 1995).

Helicopters may also be used in vegetation management projects, and in general reduce impacts to grizzly bears where they reduce or eliminate the need for new roads. Helicopter use may elicit a response in grizzly bears. Effects may range from a simple awareness of the helicopter, short-term disturbance or flight response or displacement from an area. In timbered habitats, McLellan and Shackleton (1989) found that an overt avoidance or displacement response required high intensity helicopter activity, such as carrying equipment within 200 meters of a grizzly bear. Helicopter use that is short in duration and low in frequency, would not likely result in significant affects to grizzly bears.

Extended use with multiple passes could interfere with the normal behavior patterns of grizzly bears. However, when considering long-term habitat effects, helicopter use does not use or require roads and may not pose the same chronic displacement effects or mortality risks that roads-based operations do. Helicopter use is a temporary event, whereas roads are typically chronic features on the landscape that facilitate access for people into bear habitat long after a project is complete. Consequently, while short-term helicopter activities may impact grizzly bears, they do not impart the same chronic habitat effects as roads. If repeated, low altitude flights continue into multiple seasons, the effects upon grizzly bear behavior (i.e., avoidance and more than just temporary displacement) may become more substantial.

The effects to grizzly bears of repeated, low altitude flight paths that follow open roads may be partially offset by the existing under-use of habitat in the immediate vicinity of the roads due to the "avoidance" by grizzly bears of habitat in close proximity to open roads. In many cases, the effects of helicopter logging that occurs in roaded habitat would have insignificant effects to grizzly bears as long as all roaded areas and roadless habitat effectiveness provide adequate secure habitat for grizzly bears. However, helicopter logging in areas that are not highly roaded could result in adverse effects to grizzly bears adapted to the use of more secure habitat. Thus, the effects of helicopter use on grizzly bears can vary significantly; effects will be determined through an analysis of site-specific activities and conditions in the area.

2. Effects Specific to the Proposed Action

This section considers the effects to individual NCDE grizzly bears and their habitat as guided by components of the Revised Forest Plan (i.e., desired conditions, objectives, standards, and guidelines applied forestwide, to management areas and/or to geographic areas). This analysis addresses how the specific components targeted for grizzly bear (Appendix 3 of this document, or Appendix D of the biological assessment), as well as key plan components not targeted for the grizzly bear, have the potential to affect individual grizzly bears.

The Revised Forest Plan does not prescribe site-specific actions, so this document does not provide an analysis of site-specific projects. Because this is a broad-scale analysis of actions that could potentially result in effects on the grizzly bear and its habitat, the FNF will remain responsible for future project-specific section 7 consultation as appropriate.

Under the existing Forest Plan, the Interagency Grizzly Bear Guidelines (1986) are applied to the portion of the FNF located within the NCDE recovery zone. About 99 percent of the acres within the recovery zone on the FNF are management situation 1 or 2, which gives the most stringent protection to grizzly bear habitat. The remaining acres are in management situation 3, which gives more consideration to human uses and development (USFS 2017).

Under the Revised Forest Plan, the recovery zone would become the PCA. This totals about 90 percent of the total FNF area. Areas that were previously outside the recovery zone/PCA would be designated as zone 1 (totaling about 10 percent of the total Forest area). Zone 1 includes the Salish demographic connectivity area (see Figures 10-12).

With implementation of the proposed action, specific reference to the Interagency Grizzly Bear Guidelines, including the delineation of management situations, would no longer be part of the revised forest plan. However, much of the existing forest plan management direction that is based on the Interagency Grizzly Bear Guidelines would be retained, as shown in Appendix D of the biological assessment (USFS 2017) and Appendix 3 of this biological opinion. Similarly, previous amendments to the forest plan (e.g., amendments 19 and 24) would no longer be part of the Revised Forest Plan. However, these past actions have created the current environmental baseline that would be maintained over the long-term. These include the attractant storage orders, standards for “no net change” to the baseline (see NCDE glossary in appendix D) for open and total motorized access density and secure core habitat, temporary changes in access conditions for projects, linear road density in zone 1, motorized over-snow use, and administrative use of restricted roads.

The Revised Forest Plan will also contain additional desired conditions, standards, guidelines, and monitoring items pertaining to developed recreation, livestock grazing, vegetation management, and minerals development. In summary, the Revised Forest Plan would provide management direction aimed at maintaining conditions that contribute to supporting recovery of the NCDE grizzly bear population, and providing connectivity with other grizzly bear recovery zones (e.g., CYE). Effects of the proposed action are described in detail in the following sections. The proposed Revised Forest Plan elements pertaining to grizzly bear were developed to be consistent with the draft NCDE Grizzly Bear Conservation Strategy (USFWS 2013a).

Management Area Designation

As described in chapter one of this biological opinion, the Revised Forest Plan includes designation of all lands administered by the FNF into certain management areas (MAs). This provides a management framework under which allowable uses may occur for the life the plan

(15 years). Since these designations were discussed previously, we will not provide further details related to each MA in this section.

Under the Revised Forest Plan, the majority of lands within the PCA (about 66 percent) are in non-motorized MA designations (MA1a, MA1b, MA5a, as well as some of MA2a, MA2b, and MA3b)(Table III-13). These areas will continue to provide an interconnected network of habitat with high levels of security. There would be no commercial timber harvest in wilderness or recommended wilderness. Timber management opportunities are also expected to continue to be limited within inventoried roadless areas that are outside of recommended wilderness (in management areas such as MA5) due to the high cost of harvesting timber where there are no roads. These areas will continue to provide high levels of habitat diversity, primarily provided by wildland or prescribed fire.

Table III-13. Distribution of Revised Forest Plan management areas for the grizzly bear management zones. Note: Percentages are displayed as the percent of the individual management zone in a particular management area.

Management Area	Primary Conservation Area	Zone 1, Salish DCA	Zone 1, Outside DCA
1a Designated wilderness	50%		< 1%
1b Recommended wilderness	9%		
2a Designated wild and scenic rivers	1%		
2b Eligible wild and scenic rivers	1%	< 1%	1%
3a Administrative areas	< 1%		< 1%
3b Special areas	< 1%	< 1%	< 1%
4a Research natural areas	< 1%	6%	
4b Experimental and demonstration forests	< 1%	5%	
5a Backcountry nonmotorized year-round	7%		
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	2%		
5c Backcountry: motorized over-snow vehicle use	5%		< 1%
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	< 1%		
6a General forest low	6%	1%	3%
6b General forest medium	13%	21%	1%
6c General forest high	4%	65%	83%
7 Focused recreation areas	2%	1%	12%

In zone 1, the majority of lands (87 percent) are in general forest Management area 6 (Table III-13). These areas would have high levels of successional stage and habitat diversity, primarily provided by timber harvest, fuels reduction, pre-commercial, and commercial thinning. In order to place more emphasis on demographic connectivity, a continuous area of MA6b is designated in the Salish DCA along the north and west boundary of the Tally Lake Ranger District, contiguous with an unroaded research natural area (MA3b). In zone 1, forestwide and geographic area standards would apply that would reduce indirect effects of timber harvest, as described above. Timber harvest, salvage harvest, fuels reduction, and precommercial thinning would be subject to forest-wide desired conditions, standards and guidelines which would reduce effects of grizzly bears, regardless of management area designation. These plan components will be discussed further below.

Non-Motorized Trails Inside the PCA/Recovery Zone

As part of the proposed action, the definition of secure core used in the draft NCDE grizzly bear conservation strategy (USFWS 2013a) will be incorporated into the Revised Forest Plan. This new definition does not include a deduction from secure core percentages for high use non-motorized trails. The lack of demonstrable effects and the difficulty in determining what constitutes a "high use" non-motorized trails led to the decision by the grizzly bear conservation strategy team to eliminate this from the definition of secure core. This change in methodology will result in a calculated change in core habitat in 28 subunits on the FNF. Table III-14 displays these 28 subunits along with the existing security core percentage, and the secure core percentage that will be part of the proposed action. These secure core percentages will be considered baseline conditions.

Table III-14. Comparison of existing conditions for security core versus secure core under the proposed action. Note: Only subunit that have a change in percentage due to the new methods are presented here.

Subunit Name	Security Core Percentage	Secure Core Percentage
Albino Pendant	88	100
Big Salmon Holbrook	87	100
Black Bear Mud	84	100
Brushy Park	85	100
Buck Holland	40	49
Burnt Bartlett	92	100
Hungry Creek	88	100
Little Salmon Creek	98	100
White River	74	100
Big Bill Shelf	80	87
Gorge Creek	90	100
Harrison Mid	95	99
Lion Creek	41	51
Pentagon	94	100
Silvertip Wall	97	100
Wounded Buck Clayton	65	66
Dickey Java	81	85
Stanton Paola	81	83
Glacier Loon	48	52
Jewel Basin Graves	68	75

Subunit Name	Security Core Percentage	Secure Core Percentage
Swan Lake	45	46
Flotilla Capitol	99	100
Plume Mtn Lodgepole	97	100
Tranquil Geifer	85	90
Basin Trident	85	100
Gordon Creek	82	100
Jumbo Foolhen	89	100
Youngs Creek	92	100

The number of subunits that do or do not provide at least 68 percent secure core habitat does not change as a result of the proposed change in secure core calculation. As shown in Figure 16, many of the high-use non-motorized trails in the NCDE are in Glacier National Park or in designated wilderness areas. This change in methodology does not constitute a change in effects to grizzly bears. Rather, this is a reflection of altered analytical techniques. When assessing temporary decreases in secure core (as allowed under the Revised Forest Plan) each subunit will undergo the same process when calculating pre-project secure core percentages. Therefore, any changes in secure core conditions resulting from the omission of high use non-motorized trails will also be reflected in baseline percentages.

Motorized Route Density and Secure Core Inside the PCA

Desired condition NCDE-DC-IFS-01 would establish the intent to manage open motorized route density, total motorized route density, and secure core in a manner that contributes to sustaining the recovery of the NCDE grizzly bear population. Three key standards and two key guidelines would implement this desired condition.

Forest-wide standard FW-STD-IFS-02 would maintain on-the-ground conditions that have contributed to the growth and expansion of the NCDE grizzly bear population. FW-STD-IFS-02 states, "In each bear management subunit within the NCDE primary conservation area, there shall be no net decrease to the baseline (see glossary) for secure core and no net increase to the baseline for open motorized route density or total motorized route density on National Forest System lands during the non-denning season (see NCDE glossary in appendix D)." This standard has an associated monitoring component (MON-NCDE-01) that requires the Forest Service to monitor OMRD, TMRD, and security core in each bear management subunit and to compare those conditions to the baseline. The results of this monitoring are to be reported biennially.

As discussed in the Section A.2 *Description of the Proposed Action* newly implemented Forest Plan direction considers "baseline" as a subunit's access condition as of December 31, 2011, or as modified by changes evaluated through separate section 7 consultation with the Service and other conditions listed in Standard FW-STD-IFS-02. These baseline conditions are presented below in Table III-15. Conditions are similar to what was presented in Table III-4 in Section C.2 (*Environmental Baseline*), except that core habitat is calculated and presented using the methods associated with the proposed action. This method was discussed in detail above, and is consistent with the draft NCDE Grizzly Bear Conservation Strategy (USFWS 2013a). Further, management situation 3 (MS-3) lands are also not considered in Table III-15 because management situations are no longer designated under the Revised Forest Plan. These changes in methodology change percentages in some subunits, but these changes are not reflecting a change in on-the-ground conditions.

Management direction would apply to NFS lands in all 73 subunits. Thus, it is likely that existing conditions would generally be maintained, with no requirement for future reductions of OMRD, TMRD, or increases in secure core. We expect that conditions in 32 subunits on the FNF will continue to contribute adverse effects to individual grizzly bears since route densities are greater than those known to adversely affect grizzly bears (19% for OMRD and TMRD), or the percentage of secure core is less than the threshold also known to adversely affect grizzly bears (at least 68%). We expect these adverse effects to continue, but these conditions are consistent with conditions in the action area during a time when the NCDE grizzly bear population was known to be increasing in size and expanding in distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012). Therefore, we do not expect the management direction presented above to preclude recovery of the NCDE grizzly bear population.

Table III-15. Status of bear management unit (BMU) subunits on the FNF. Shaded subunits have less than 75 percent NSF lands. These conditions will be considered "baseline" for the purposes of implementing Revised Forest Plan Standards FW-STD-IFS-02 and FW-STD-IFS-03.

Subunit Name	OMRD Percentage	TMRD Percentage	Secure Core Percentage
Albino Pendant	0	0	100
Big Salmon Holbrook	0	0	100
Black Bear Mud	0	0	100
Brushy Park	0	0	100
Buck Holland	24	41	49
Burnt Bartlett	0	0	100
Hungry Creek	0	0	100
Little Salmon Creek	0	0	100
Meadow Smith	18	53	42
White River	0	0	100
Big Bill Shelf	11	6	87
Bunker Creek	5	3	92
Goat Creek	23	59	39
Gorge Creek	0	0	100
Harrison Mid	1	0	99
Jungle Addition	19	19	68
Lion Creek	18	47	51
South Fork Lost Soup	25	47	37
Spotted Bear Mountain	19	18	68
Pentagon	0	0	100
Silvertip Wall	0	0	100
Strawberry Creek	0	0	100
Trilobite Peak	0	0	100
Coram Lake Five	30	46	14
Doris Lost Johnny	57	20	36

Subunit Name	OMRD Percentage	TMRD Percentage	Secure Core Percentage
Emery Firefighter	19	19	68
Peters Ridge	52	25	34
Riverside Paint	18	16	71
Wounded Buck Clayton	28	30	66
Dickey Java	9	0	85
Moccasin Crystal	8	1	81
Stanton Paola	8	3	83
Canyon McGinnis	18	31	50
Cedar Teakettle	35	36	24
Lower Big Creek	18	19	71
Werner Creek	29	20	63
Beaver Creek	6	25	66
Cold Jim	18	54	44
Crane Mountain	28	53	25
Glacier Loon	22	41	52
Hemlock Elk	6	30	64
Piper Creek	19	45	55
Porcupine Woodward	27	74	15
Lazy Creek	68	62	10
Stryker	37	33	50
Upper Whitefish	34	57	54
Ball Branch	8	12	84
Jewel Basin Graves	20	19	75
Kah Soldier	19	19	68
Logan Dry Park	30	36	51
Lower Twin	9	2	92
Noisy Red Owl	20	13	59
Swan Lake	40	23	46
Twin Creek	0	0	100
Wheeler Quintonkon	25	19	68
Flotilla Capitol	0	0	100
Long Dirtyface	0	0	100
Plume Mtn Lodgepole	0	0	100
Skyland Challenge	20	17	65
Tranquil Geifer	0	2	90
Coal & South Coal	15	19	73
Frozen Lake	10	4	86
Hay Creek	25	16	55
Ketchikan	14	3	73
Lower Whale	36	17	50
Red Meadow Moose	25	17	68
State Coal Cyclone	29	25	58
Upper Trail	14	4	88
Upper Whale Shorty	12	11	86
Basin Trident	0	0	100
Gordon Creek	0	0	100
Jumbo Foolhen	0	0	100
Youngs Creek	0	0	100

The proposed action will also include a standard that will allow temporary changes in OMRD, TMRD, and secure core during project activities (IFW-STD-IFS-03). Changes to OMRD, TMRD, or secure core are considered temporary because they can only occur while a project is being implemented, and the proposed action also contains direction that does not allow a net increase in OMRD or TMRD in any subunit, and does not allow a net decrease in secure core in any subunit. Further, changes in OMRD, TMRD or secure core are considered temporary because project cannot exceed five years of on-the-ground implementation (discussed further below). The standard will allow projects to temporarily increase OMRD by five percent, temporarily increase TMRD by three percent, and temporarily decrease secure core by two percent. Changes in motorized access conditions will be measured using a ten year running average, and will be compared against the baseline (see Appendix 2 for this procedure and a hypothetical example). These allowances are based on analyses and ESA section 7 consultations on six timber harvest and road management projects affecting 18 bear management subunits on the Flathead and Lolo National Forests (USFWS 2013a). These projects occurred between 2003 and 2010, a period during which the NCDE grizzly bear population is known to have been increasing in size and distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012). Therefore, the duration of these projects and the associated increases in OMRD and TMRD, and decreases in secure core are believed to be compatible with an increasing grizzly bear population in the NCDE. During the life of these six federal projects, the OMRD temporarily increased an average of 5.4 percent, the TMRD temporarily increased an average of 2.9 percent, and the secure core temporarily decreased by 2 percent.

Temporary increases in OMRD or TMRD, or temporary decreases in secure core, resulting from project implementation will likely result in adverse effects to individual grizzly bears. These effects will occur in subunits that are below, or relatively close to, the research benchmarks described in detail above. In these subunits, temporary project changes in OMRD or TMRD could result in densities going above 19 percent. Likewise, in these subunits temporary project changes could result in secure core percent dropping below 68 percent. In total, temporary changes in TMRD, OMRD and secure core allowed under the Revised Forest Plan may result in adverse effects to individual grizzly bears in up to 39 of the 73 subunits on the FNF. However, we do not expect that these adverse effects to individual grizzly bears will preclude recovery of the NCDE grizzly bear population. This conclusion is based on the fact that the extent of temporary changes allowed under the Revised Forest Plan is consistent with temporary changes made within subunits during a time when the NCDE grizzly bear population was known to not only be stable, but also expanding in distribution and increasing in size.

The Revised Forest Plan will also provide direction that each project will be planned so that it does not exceed five years of on-the-ground implementation (with certain exceptions, see details in FW-GDL-IFS-01). Further, guideline FW-GDL-IFS-02 ensures that pre-project access conditions (i.e., OMRD, TMRD, secure core) would be restored within one year of project completion. While projects meeting these guidelines may result in some adverse effects to grizzly bears as a result of displacement from preferred habitat, they would provide limits on the amount and duration of the disturbance so that bears are not permanently displaced by human activities.

Although the Revised Forest Plan would allow temporary changes in habitat security due to projects, including some activities in secure core, there would be no temporary decreases in secure core due to vegetation management projects throughout most of the PCA. The FNF has nearly 1.7 million acres of security core habitat, only about 12 percent of which is likely to have temporary changes in access conditions. This is because the vast majority of this habitat occurs in wilderness or inventoried roadless areas. Changes in access conditions will not occur in these areas because road construction is not allowed. As a result, high levels of habitat security would continue to be maintained. In addition, with the proposed action, some of the inventoried roadless areas would be added as recommended wilderness where timber harvest would not be allowed (see discussion in management area section below). The temporary changes to OMRD, TMRD, or security core will be monitored by the Forest Service for its projects (see MON-NCDE-05 in Appendix 4).

The proposed action also addresses administrative use of roads within the PCA. Standard FW-STD-IFS-01 states, "Within the NCDE primary conservation area, motorized use of roads with public restrictions shall be permitted for administrative use (see glossary), as long as it does not exceed either 6 trips (3 round trips) per week or one 30-day unlimited use period during the non-denning season (see glossary and full text of the standard in Appendix 4). During the time period that the NCDE grizzly bear population was growing and expanding in distribution, administrative use was allowed on gated roads. Under the Revised Forest Plan FW-STD-IFS-01 would allow administrative use on gated roads and also on roads in secure core habitat (e.g., road rehabilitation work that cannot be done during the denning period). Mace et al. (1996) found that grizzly bears in the Swan Valley selected areas near roads traveled by fewer than 10 vehicles per day. The six trips per week as allowed under administrative use is below this level, so we expect disturbance to grizzly bears to be minor. Unlimited use for one 30-day time period could disturb bears or cause avoidance in the affected area if it exceeded 10 vehicles per day, but this level of administrative use would be restricted to a short period of time to minimize effects to individual grizzly bears.

The Revised Forest Plan also addresses temporary use of closed roads by the public. Standard FW-STD-IFS-04 states, "within the NCDE primary conservation area, a restricted road may be temporarily opened for public motorized use to allow authorized uses (such as firewood gathering), provided the period of use does not exceed 30 consecutive days during one non-denning season and occurs outside of spring and fall bear hunting seasons. However, temporary public use of a restricted road shall not be authorized in secure core (see glossary)." This standard would allow temporary use of restricted roads for motorized use by the public for purposes such as firewood gathering as long as it was not in secure core. There would be some increase in disturbance to grizzly bears in areas outside of secure core, but the risk is minimized by limiting the duration and season when this could occur. Further, gated roads on the FNF have been temporarily opened for periods of up to 30 days to allow firewood gathering during the time period when the NCDE grizzly bear population was increasing in size and distribution, with no apparent population-level effects.

Although the Revised Forest does not contain grizzly bear standards that would require road closures, the Revised Forest Plan will contain an objective to decommission, or place into intermittent stored service, 30-60 miles of road over the life of the plan (about 15 years). This target of this objective is improved aquatic/riparian ecosystem function, but these road closured will likely benefit grizzly bears by further decreasing road densities and improving riparian habitats that provide cover and forage opportunities.

It should be noted that the existing Forest Plan, OMRD and TMRD are calculated based on MS-1 and MS-2 lands and do not include MS-3 lands. However, because management situations will not be retained in the Revised Forest Plan, roads and route densities for MS-3 areas will be included in OMRD and TMRD calculations. This will result in minor changes in the percentages in some subunits, but these changes are a result of differing methodology rather than on-the-ground changes in road densities.

Overall, the set of Revised Forest Plan components discussed above is intended to limit OMRD and TMRD and to maintain sufficient habitat security in the PCA. Proposed maintenance of baseline conditions and temporary changes are largely consistent with "on-the-ground" conditions for grizzly bears during a period (i.e., 2004-present) when the NCDE grizzly bear population was known to be increasing in both population size and distribution. Where differences occur, they would be limited to a small portion of grizzly bear habitat. As a result, we expect that the components of the proposed action described above may result in adverse effects to individual grizzly bears. However, we also expect to maintain recovery of the NCDE grizzly bear population. Over the long term, the proposed action would maintain baseline levels of OMRD, TMRD, and secure core in the primary conservation area during the non-denning season that would support continued recovery of the NCDE grizzly bear population.

Motorized Route Density and Security Core Inside the Salish DCA and Zone 1

As discussed above, areas on the FNF outside the PCA are designated as zone 1. Within zone 1, certain lands will be designated as the Salish DCA (see Figure 10). The goal in zone 1 is to maintain grizzly bear occupancy but at a lower density than in the PCA. This goal is consistent with what is being developed in the NCDE draft Conservation Strategy (USFWS 2013a). Zone 1 is not intended to provide core habitat for the NCDE grizzly bear population. Instead, desired conditions for zone 1 emphasize connectivity and limiting the density of roads open to motorized public use. Within the portion of zone 1 defined as the Salish DCA, the goal is to provide for female grizzly bear occupancy and facilitate genetic interchange with the CYE. These goals are also consistent with those of the NCDE draft Conservation Strategy (USFWS 2013a). Under the Revised Forest Plan these goals are supported by the following desired conditions:

- GA-SM-DC-03: Within the Flathead National Forest portion of NCDE zone 1 (including the Salish demographic connectivity area), roads provide for public and administrative access to National Forest System lands. Grizzly bear habitat in zone 1 contributes to sustaining recovery of the grizzly bear population in the NCDE. The demographic connectivity area provides habitat that can be used by female grizzly bears and allows for bear movement between grizzly bear ecosystems.

- GA-SM-DC-04: In areas between the primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. *See also FW-DC-LSU-01*. NFS lands in the Swift Creek-Stillwater connectivity area (see Forest Plan figure B-30) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges.

Given the differing grizzly bear management objectives for Zone 1 and the Salish DCA, a different method for analyzing the effects of motorized use during the non-denning season was used. The analysis of effects on bears relied on recent work by Boulanger and Stenhouse (2014), who studied 142 grizzly bears monitored in Alberta from 1999-2012. They modeled grizzly bear sex and age class survival as it related to linear road density. A summary of the modeled threshold values, and how they were used in the analysis of effects for Zone 1, is shown in Table III-14 below.

Base on the findings of Boulanger and Stenhouse (2014), open road densities less than or equal to 2.4 linear mi/mi^2 appeared to be a threshold for grizzly bear occupancy, and an open road density less than or equal to 2.0 mi/mi^2 appeared to be a threshold for female grizzly bear occupancy in their Alberta study area (Table III-16). If both roads and motorized trails are included, the Salish DCA has an open linear motorized route density of 1.5 mi/mi^2 (Table III-17). In the portion of zone 1 outside the Salish DCA, the density of motorized routes open to public use is 1.9 mi/mi^2 (Table III-17). While some areas of the Salish DCA and remainder of zone 1 may have linear road densities that are high enough to adversely affect individual grizzly bear, we expect that they will still support occupancy of female grizzly bears because densities are less than the values described by Boulanger and Stenhouse (2014) (see Table III-16). Thus, we conclude that existing road densities in the Salish DCA and remainder of zone 1 are consistent with the goals of the NCDE draft Conservation Strategy. Further, the route density calculation should be considered conservative (i.e., more protective for bears) since the analysis of Boulanger and Stenhouse (2014) did not include motorized trails.

Table III-16. Linear road density analysis for zone 1 and the Salish DCA

Objective described in the Alberta study (Boulanger & Stenhouse, 2014)	Reported density km/km^2	Converted to mi/mi^2	Where applied in the analysis
Grizzly bear presence – Distribution of collared bears shows most bears occurred in areas with road densities of 1.5 km/km^2 or less (p. 10)	1.5 km/km^2	2.4 mi/mi^2	Used to evaluate the ability to support occupancy and movement by grizzly bears of any age, sex, or reproductive status in zone 1.
Occupancy by females – Modeling results suggested that the threshold of road density depended heavily on assumptions. Adult females occupied habitat with road densities of 2.0 mi/mi^2 or less, unless higher mortality of females with dependent young is assumed.	1.25 km/km^2	2.0 mi/mi^2	Used to evaluate the ability of the Salish demographic connectivity area to support occupancy and movement by female grizzly bears. The Salish demographic connectivity is not intended to provide core habitat.

Objective described in the Alberta study (Boulanger & Stenhouse, 2014)	Reported density km/km^2	Converted to mi/mi^2	Where applied in the analysis
For core habitat, which has a goal of occupancy by females with dependent young, the threshold road density recommended is reduced to 1.2 mi/mi^2 (p. 15)			Density calculation included both roads and trails open for public motorized use in the non-denning season.

Table III-17. Public open motorized access for all roads/trails on NFS lands (includes highways and county/city and private roads/trails) from the 2015 calendar year roads/trails dataset.

NCDE Management Zone	Open Roads (miles)	Motorized Trails (miles)	Total Miles	NFS Square Miles	Miles/Mile^2 Public Open Motorized Roads only	Miles/Mile^2 Public Open Motorized Roads and Trails
Zone 1, Salish DCA	217	14	231	150	1.4	1.5
Zone 1, outside DCA	338	64	402	212	1.6	1.9

The Revised Forest Plan includes standard GA-SM-STD-01. This standard will require the FNF to maintain baseline levels for the linear density of motorized routes open to public use during the non-denning season within the Salish DCA over the long-term (as indicated in Table III-17 above). The standard also states that in the portion of zone 1 outside the Salish DCA, baseline levels for the linear density of roads open to public use during the non-denning season would be maintained over the long-term, but the density of motorized trails could increase. We expect these adverse effects to continue since the Revised Forest Plan contains direction (standard GA-SM-STD-01) that will maintain these conditions. However, while we recognize that motorized routes in the Salish DCA and zone 1 may be adversely affecting individual grizzly bears, these densities remain low enough to support occupancy be females. Additionally, these conditions were present on the landscape while the NCDE grizzly bear population has continued to increase in size and distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012). As a result, we do not expect these adverse effects to preclude recovery of the NCDE grizzly bear population.

Motorized Over-snow Use During the Den Emergence Period

The Revised Forest Plan contains standard FW-STD-REC-05, which states, “Within grizzly bear denning habitat modeled by MTFWP in the NCDE primary conservation area, there shall be no net increase in percentage of area or miles of routes designated for motorized over-snow vehicle use on NFS lands during the den emergence time period (see glossary)”. The standard would provide additional assurance that potential impacts to bears, particularly females with cubs, would not increase over time. The proposed action does not include restrictions in motorized over-snow use during the den emergence period outside of the PCA, but most of this area is currently open.

We discussed the potential for late-season over snow vehicle use to adversely affect grizzly bears (primarily females with cubs) in Sections B.7 and C.2. Areas on the FNF open to motorized over-snow vehicle use during the den emergence time period occur on about 3 percent of modeled grizzly bear denning habitat within the PCA on the FNF. In addition, there are 19 miles of routes open to motorized over-snow use in modeled denning habitat during the den emergence period (i.e., open after March 31st). In these areas motorized over-snow vehicle use can potentially overlap temporally and spatially with females with cubs of the year that have recently emerged from the den. This would result in late-season over-snow vehicle use having an adverse effect on individual grizzly bears within the PCA. However, we do not expect these potential adverse effects to have an effect on the NCDE grizzly bear population. This is because the spatial overlap of denning habitat and area suitable for late-season over-snow use occurs on only three percent of modeled denning habitat on the FNF. Further, the currently existing spatial overlap cannot increase in the future due to standard FW-STD-REC-05 in the Revised Forest Plan, and this current level of spatial overlap is what was occurring on the FNF during a time period when the NCDE grizzly bear population was known the be increasing in size and distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012).

Developed Recreation Sites

As presented above, there are two developed resorts on the FNF (Big Mountain and Blacktail). Standard FW-STD-REC-04 of the Revised Forest Plan would require that new or reauthorized ski area permits include mitigation measures to reduce the risk of grizzly bear-human conflicts, and this would continue to decrease the potential for detrimental effects to the NCDE grizzly bear population. Further, guideline GA-SM-MA7-Big Mtn-GDL-01 states, “To reduce grizzly bear-human conflicts the Whitefish Mountain Resort during the non-denning season, existing mitigation measures for grizzly bears regarding food/garbage handling, odor control, and grizzly bear education at the summit house should be retained.” These plan components would benefit the grizzly bear by limiting the risk of grizzly-bear human conflicts resulting from the resorts. Blacktail Ski Area is outside the PCA, but within zone 1. This ski area is not currently operated during the non-denning season, but forestwide standard FW-STD-REC-04 would apply to this area as well.

Developed recreation sites are of concern because frequent or prolonged human occupancy may result in increased bear attractants, increasing the risk of grizzly bear-human conflicts or grizzly bear mortality. The proposed action includes standard FW-STD-WL-01 which states that within the NCDE PCA and zone 1 (including the Salish DCA), food/wildlife attractant storage special order(s) shall apply to all NFS lands. Food storage orders are currently in effect across the FNF and are very effective in reducing grizzly bear-human conflicts on NFS lands. The orders are updated over time as new information and new technologies become available, but would continue to be guided by the Interagency Grizzly Bear Committee or a similar group of experts.

The draft NCDE Conservation Strategy stated that the main concern with developed recreation sites has to do with overnight use. As a result, the proposed action will include two desired conditions and one standard to address developed recreation sites designed and managed for overnight use. Within the PCA, the number, capacity, and improvements of developed recreation sites will provide for user comfort and safety while minimizing the risk of grizzly bear–human conflicts on NFS lands (FW-DC-REC-01). Increases in the number and capacity of developed recreation sites on NFS lands that are designed and managed for overnight use during the non-denning season will be at levels that contribute to sustaining the recovery of the grizzly bear population in the NCDE (FW-DC-REC-02). Standard NCDE-STD-REC-01 would set a limit of one increase above baseline conditions in the number or the overnight capacity of developed recreation sites designed and managed for overnight use per bear management unit per decade on NFS lands in the PCA (see NCDE-STD-REC-01 in Appendix 3). Guideline FW-GDL-REC-01 states that if these increases occur, the project should include measures to reduce the risk of grizzly bear-human conflict. Further, guideline FW-GDL-REC-06 states that new developed recreations sites should not be located within the inner riparian management zone (with certain exceptions). This plan component will provide some indirect benefit to grizzly bears my maintaining key riparian habitats that provide cover and forage. This set of plan components is consistent with what has occurred on the FNF through consultation during the time period when the NCDE grizzly bear population was stable to increasing and expanding in distribution (Costello et al. 2016).

These proposed plan components may increase the likelihood of grizzly bear conflicts with humans. However, the proposed components were developed to be consistent with what has occurred on the FNF while the NCDE grizzly bear population was stable to increasing. Although there may be an increased risk of grizzly bear-human conflicts as a result of some increase in developed recreation sites with overnight use in the future, the risk of mortality to grizzly bears would be limited under the proposed action through the measures stated above. Implementation and monitoring of food storage orders, public education, and increases in the availability of bear-resistant food storage devices will also help to reduce the number of grizzly bear-human conflicts on the FNF.

An increase in developed recreation during the non-denning season may represent adverse effects to individual grizzly bears. However, the effects of such increases are difficult to consider at this time. While the proposed action will limit the volume and rate of increase (1 site per BMU per decade), new developed recreation sites may occur in a variety of manners. For example, the effects of installing a new developed recreation site near valuable grizzly bear habitat (e.g., riparian areas, meadows) will likely be much different than the effect of increasing the capacity of an already heavily used campground.

Future increases in developed recreation sites available for use during the non-denning season will undergo a separate section 7 consultation, as appropriate. Give the difficulty in forecasting details associated with these increase, we have determined that it would be more appropriate to assess potential adverse effects to grizzly bears during project-specific consultation or other environmental review, rather than at the programmatic level.

Livestock Allotments

In Section C.2 we discussed current livestock allotments on the FNF. Cattle grazing is a relatively minor use of NFS lands on the FNF, and there are no sheep grazing allotments. Existing cattle grazing allotments have been compatible with an NCDE grizzly bear population that is stable to increasing and expanding in distribution (Costello et al. 2016). Based on the lack of history of conflicts, the risk of grizzly bear mortality associated with livestock grazing is low. Desired conditions for grazing support continued recovery of the grizzly bear.

A number of Revised Forest Plan components address livestock allotments on the FNF heading into the future. Guideline FW-DC-GR-01 indicates that within the PCA, the number of, capacity of, and improvements on grazing allotments support ecologically sustainable grazing, and temporary grazing permits are used for effective management of noxious weeds, while minimizing the risk of human-bear conflicts on National Forest System lands.

Although the FNF has not had conflicts between cattle and grizzly bears, the proposed action, includes the following standards which would result in reduced risk of future conflicts. FW-STD-GR-01 states, “Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), new or reauthorized grazing permits and annual operating plans shall incorporate requirements to reduce the risk of grizzly bear–human conflicts (e.g., food/wildlife attractant storage special order). New or reauthorized permits shall include a clause providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflicts.” The Revised Forest Plan will also contain a standard (FW-STD-GR-03) that requires permits for livestock within the PCA and zone 1 (including the Salish DCA), permits for livestock grazing shall include a provision that requires reporting livestock carcasses within 24 hours of discovery. The standard also requires proper disposal of the carcass, and ensures that bone yards shall not be established on National Forest System lands.

Further, standard FW-STD-GR-04 of the Revised Forest Plan states that there shall be no net increase above baseline conditions (as described in the glossary of Appendix D in the BA) in the number of active sheep grazing allotments within the PCA, zone 1 and the Salish DCA. Standard FW-STD-GR-05 of the Revised Forest Plan states that there shall be no net increase above baseline conditions (as described in the glossary of Appendix D in the BA) in the number of active cattle grazing allotments within the PCA, zone 1 and the Salish DCA. As previously mentioned, the FNF does not have any sheep allotments and very few cattle allotments, but this will ensure that no increase occurs in the future. The Revised Forest Plan will also include standard FW-STD-GR-06. This standard states, “Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), temporary permits for grazing by small livestock for purposes such as controlling invasive exotic weeds or reducing fire risk, or for trailing of small livestock across NFS lands, shall not result in an increase in bear/small livestock conflicts.” The Revised Forest Plan components discussed here, along with the expectation that current use levels would be maintained, reduce the likelihood of grazing allotments resulting in conflicts with grizzly bears.

We do not anticipate that implementation of the Revised Forest Plan will result in habituation of grizzly bears leading to conflicts because relatively few acres are subject to livestock grazing, current use levels are expected to be maintained and not substantially increase, the Revised Forest Plan includes measures to address potential habituation risks to bears from livestock grazing, and there is no history of grizzly bear management actions on the FNF. Further, Revised Forest Plan states that sheep and cattle grazing allotments within the PCA cannot increase beyond baseline conditions. This will ensure that grazing allotments occurring on the FNF in future remain consistent with what was occurring on the landscape during a time period when the NCDE grizzly bear population was known the be increasing in size and distribution (Costello et al. 2016, Kendall et al. 2009, Mace et al. 2012). Hence, we do not consider this type of land use, at its current or anticipated levels, to result in adverse effects to individual grizzly bears.

Vegetation Management

Grizzly bears are habitat generalists that can adapt to a variety of changing vegetative conditions (see Section C.3 above). The proposed action provides for grizzly bear habitat diversity, considering the modeled effects of climate change that are anticipated to occur over the next 50 years. Because the grizzly bear uses a wide variety of habitats across the Forest, a specific model was not developed for this species. Rather, the discussion below is a summary of all modeled vegetation changes on the Forest. Grizzly bear habitat and its use by grizzly bears would vary across time and space due to natural processes (e.g., succession, wildfires, insects/disease) and vegetation management activities (e.g., timber harvest, fire, planting, precommercial thinning). On the heavily forested Flathead National Forest, changes in successional stages and other vegetation characteristics are indicative of bear foods, cover, and connectivity. Changes in vegetation would be monitored at a forestwide and ecosystem-wide scale, and vegetation management activities would also continue to be assessed through project-specific analyses as conditions change.

The Revised Forest Plan will contain direction pertaining to vegetation management in grizzly bear habitat. The proposed direction is similar to the Interagency Grizzly Bear Guidelines (IGBC, 1986) in encouraging a mosaic of successional stages; placing spatial and temporal restrictions on logging activities; designing projects to maintain or improve grizzly bear habitat; and retaining cover as needed along grass/forb/shrub openings, riparian wildlife habitat, or wetlands. Inside the PCA, desired conditions for the grizzly bear include:

- FW-DC-TE&V-01. Within the NCDE primary conservation area, the amount, type and distribution of vegetation provides for the ecological, social, and economic sustainability of NFS lands while also providing habitat components that contribute to sustaining the recovery of the grizzly bear population in the NCDE. See also FW-DC-WL-02.

- FW-DC-TE&V-02. Within the NCDE primary conservation area, there is a mosaic of successional stages to provide for grizzly bear habitat needs over the long term.

Inside the PCA, the following guidelines, similar to the IGBC guidelines, would apply:

- FW-GDL-TE&V-01. Within the NCDE primary conservation area, measures to reduce the risk of disturbance to the grizzly bear population should be incorporated into vegetation and fuels project design criteria, which vary on a site-specific basis (e.g., some activities should be restricted in spring habitat during the spring time period; areas with low levels of human activity should be provided adjacent to areas with high levels of disturbance). Note:

Management activities such as precommercial thinning, burning, weed spraying, and implementation of road best management practices may need to be completed during the spring time period in order to meet resource objectives (especially if needed to prevent resource damage), in which case other measures should be used to reduce the risk of disturbance (e.g., limiting the duration of the activity or limiting use of closed roads).

- FW-GDL-TE&V-02. Within the NCDE primary conservation area, vegetation management activities should be designed to avoid detrimental effects on the grizzly bear population and to include one or more measures to protect, maintain, increase, and/or improve grizzly habitat quantity or quality (e.g., promoting growth of berry-producing shrubs, forbs, or grasses known to be bear foods) in areas where it would not increase the risk of grizzly bear–human conflicts.

- FW-GDL-TE&V-03. Within the NCDE primary conservation area, measures to retain cover (where present) along a portion of grass/forb/shrub openings, riparian wildlife habitat, or wetlands should be incorporated in project design criteria (this varies on a site-specific basis).

- FW-GDL-TE&V-04. Within the NCDE primary conservation area, vegetation management projects (including timber sales and other non-commercial vegetation management contracts) should include a clause providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation.

- FW-GDL-TE&V-05. To reduce the risk of grizzly-bear human conflicts within the NCDE primary conservation area, vegetation management activities designed to enhance grizzly habitat (e.g., increased huckleberry production) should not occur in or next to campgrounds, administrative facilities, or other developed recreation sites that operate during the non-denning season.

These guidelines would benefit grizzly bears because they promote a mosaic of successional stages; restrict logging activities in time and space as needed; design projects to maintain or improve grizzly bear habitat quality or quantity where it would not increase the risk of grizzly bear-human conflicts; and retain cover as needed along grass, forb, and shrub openings.

In addition to grizzly bear-specific vegetation guidelines for the PCA, other standards and forest-wide plan components would benefit the grizzly bear. FW-DC-TE&V-11 states that the forest groundcover consists of a variety of grass, forb, and shrub species, including berry-producing species that provide forage for grizzly bears and other wildlife species (e.g., huckleberries, serviceberries, mountain ash, and buffaloberry. This desired condition may be met in wildfire areas, prescribed burn areas, or areas managed to produce timber.

Canada lynx management standards VEGS1, VEGS2, VEGS5, and VEGS6 in the Northern Rockies Lynx Management Direction are being carried forward into the Revised Forest Plan (with one FNF-specific exception), and apply across about 1.8 million acres of the FNF. These standards would limit vegetation treatments in each lynx analysis unit (LAU) on the FNF as well as in three adjacent LAUs (a complete description of these standards can be found in the Canada lynx chapter of this biological opinion). Because there is a great deal of overlap in the Forest's LAUs and grizzly bear subunits, these limitations on vegetation management would also provide cover for grizzly bears. Forest-wide, riparian management zones (RMZs) total about 427,320 acres and are not suitable for timber production, although timber harvest may occur under specific conditions, so key wetland and riparian habitats used by grizzly bears would be managed to continue to support their needs (a complete description of RMZs can be found in the bull trout chapter of this biological opinion).

The vegetation management components in the Revised Forest Plan would continue to provide diverse cover and foraging conditions for grizzly bears. The new components would also continue to reduce the potential for disturbance to grizzly bears through the timing of timber sale activities. Vegetation management activities may present short-term effects to individual grizzly bears due to disturbance from increased activities or temporary habitat changes. However, we do not anticipate that these effects will be adverse to grizzly bears.

Mineral and Energy Development

The Flathead National Forest currently has no leasable or locatable mineral activity, and there is a very low risk of effects due to mineral activities. Standards FW-STD-E&M-01 through 08 in the Revised Forest Plan will reduce the risk that any future developments would have adverse effects on grizzly bears. The Revised Forest Plan will require that new or reauthorized permits, leases, or plans of operation in the PCA and zone 1 include a provision for modification or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation (FW-STD-E&M-02). Additionally, the Revised Forest Plan will include standards that would require the following: measures for mitigation of mineral development impacts (FW-STD-E&M -03); proper storage and handling of wildlife attractants (FW-STD-E&M -04); mitigation measures or stipulations such as timing restrictions for ground-disturbing activities in spring habitat and seismic activity in denning habitat (FW-STD-E&M-05); mitigation measures if needed regarding motorized access, such as management of motorized traffic, helicopter use, noise reduction (FW-STD-E&M -06); and worker safety training for employees living and working in grizzly bear habitat (FW-STD-E&M -07).

In addition to the measures described above, the Revised Forest Plan will include NCDE-STD-MIN-08. This standard would require that new leases for minerals and/or energy development in the PCA include a no surface occupancy stipulation. With a no surface occupancy stipulation, access to oil and gas deposits would require horizontal drilling from outside the boundaries of the no surface occupancy areas. This prevents the loss of grizzly bear habitat through displacement and limits the potential for habituation and conflict with humans. In addition to this standard, the proposed action includes a monitoring component (MON-NCDE-04) that pertains to mineral and energy leases in the PCA and zone 1 (including DCAs). If there is potential for adverse effects to grizzly bears and/or their habitat, MON-NCDE-04 requires the development of a monitoring plan that will be implemented for the life of the mineral activity. Specifically, the monitoring plan must document how effects to bears will be monitored, and identify appropriate mitigation measures and funding sources for those measures. As a result, we anticipate that effects of the proposed action associated with mineral and energy development on grizzly bears will be insignificant.

Food/Attractant Storage

As previously described, habituation and food conditioning of grizzly bears is a serious concern in all grizzly bear populations. Food storage orders substantially reduce the potential for adverse effects to bears as a result of food conditioning and habituation. The measures in food storage order help to reduce the potential for or eliminate human-grizzly bear conflicts and the potential for adverse effects to grizzly bears. The Revised Forest Plan includes standard FW-STD-WL-02 that requires a Food/Wildlife Storage Special Order be applied to all NFS lands within the PCA and zone 1 (including the Salish DCA). Based on the lack of conflicts and management removals associated with food/attractant storage, adverse effects to individual grizzly bears related to food storage issues on the FNF are not expected.

Actions Specific to Geographic Areas (GAs)

Swan Valley

In Section C.2 we described the history of land ownership in the Swan Valley geographic area, and discussed how it has changed substantially since the existing Forest Plan and the Swan Valley Grizzly Bear Conservation Agreement were adopted. As a result, the FNF now proposes to manage all subunits with the same forest-wide direction, superseding the previous agreement. Nevertheless, the FNF has stated its intention to continue to coordinate with others to support continued recovery of threatened and endangered species. As stated in desired condition FW-DC-P&C 03, “Recovery of threatened and endangered species is accomplished through cooperation with the U.S. Fish and Wildlife Service (including section 7 consultation, as required), state agencies, other federal agencies, tribes, counties, interested groups, and interested private landowners.”

In addition to forest-wide plan components, additional plan components in the Revised Forest Plan would provide benefits for grizzly bears in the Swan Valley. The Revised Forest Plan will include the following components pertaining to the Swan Valley:

- GA-SV-DC-09: The portion of the Seeley Clearwater connectivity area from Condon south to the boundary of the Swan Valley geographic area and from the south end of Swan Lake to Lost and Porcupine Creeks (see figure B-30 in Revised Forest Plan) provides habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, and wolverine) moving between the Swan and Mission Mountain Ranges.

- GA-SV-OBJ-04: Decommission or place into intermittent stored service 10 to 30 miles of roads. Priorities are roads causing resource damage in priority watersheds, roads on acquired lands in the Swan Valley that are not needed for fire protection or other resource management, and/or roads within desired non-motorized recreation opportunity spectrum settings and/or roads within bull trout watersheds.

As explained above, most of the Legacy Project land acreage was regenerated prior to being acquired by the Forest and would not be large enough to be merchantable for decades. As a result, the level of timber harvest and associated road use that occurred on these lands over the last decade would not be expected to occur in the near future. Some road access would continue to be needed for activities such as restoration work, access to other ownerships, or fire protection but the high density of roads in the former Plum Creek Timber Company sections would be reduced. The FNF has made an estimate of the range of miles of road that could be decommissioned or placed into intermittent stored service, but specific roads would be assessed during site-specific project planning.

While there would continue to be adverse effects to individual grizzly bears from high road densities, these plan components would benefit grizzly bears in the Swan Valley by continuing to emphasize connectivity in management of the linkage zone south of Condon and improving habitat security on lands acquired through the Legacy Project.

Salish Mountains

The Salish Mountains geographic area has specific grizzly bear management direction that applies to zone 1, including the Salish SDC (see section on zone 1 above). Additional Salish Mountains-specific components in the Revised Forest Plan would provide benefits for grizzly bears in the Salish Mountains:

- GA-SM-DC-04: In areas between the primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. NFS lands in the Swift Creek-Stillwater connectivity area provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges.

- GA-SM-GDL-01: In order to provide elk habitat security, access management actions should not result in a decrease in total acres of NFS lands within the geographic area that are at least 250 contiguous acres and at least one half mile from roads open to wheeled motorized use by the public. If vegetation management occurs in elk security habitat, a mosaic of cover and forage should be provided, in consideration of the site-specific topography and vegetation types. Roads may be temporarily opened, after consultation with a forest wildlife specialist, for up to 30 days during July and August to allow for activities such as firewood gathering.

These plan components would benefit grizzly bears in the Salish Mountains by emphasizing linkage of habitat in the Salish DCA and providing elk habitat security in zone 1, which would indirectly benefit the grizzly bear population.

3. Species' Response to the Proposed Action

As discussed in Section D.2 (*Effects Specific to the Proposed Action*), the proposed action will implement forest plan components that will be beneficial to the NCDE grizzly bear population. However, the proposed action will also maintain conditions in certain circumstances that are adversely affecting individual grizzly bears. The proposed action also includes forest plan components that will result in additional, temporary adverse effects to grizzly bears beyond those resulting from existing conditions. The overwhelming majority of adverse effects from forest management arise from roads and associated high road densities and motorized access resulting in disturbance and displacement of grizzly bears. Additional adverse effects may result from premature displacement or disturbance of a female grizzly bear with cubs by snowmobile activities during the den emergence period. As characterized in the effects analysis above, there is a low likelihood of effect on three percent of the denning habitat on the FNF. Further, the risk of effect would be limited to the period of time from female and cub den emergence (2nd week of April) through spring snow melt (these dates would vary year to year). While the proposed action will result in adverse effects to individual grizzly bears, the proposed action will ensure the about 63 percent of the FNF remains in a management area designation that would continue to provide high levels of habitat security, and limit or prevent motorized access in the future (e.g., designated and recommended wilderness, non-motorized backcountry).

Regarding the Interagency Grizzly Bear Guidelines: The proposed action would no longer specifically reference the Interagency Grizzly Bear Guidelines, including the delineation of management situations. However, much of the existing forest plan management direction that is based on the Interagency Grizzly Bear Guidelines would be retained (see discussion in Section D.2).

The NCDE grizzly bear population is robust and growing. The most recent population data indicate that the NCDE population is greater than 1,000 grizzly bears and is growing at a rate of more than two percent annually (Costello et al. 2016). As discussed throughout this document, a draft NCDE Grizzly Bear Conservation Strategy has been created by an interagency team consisting of representatives from the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, U.S. Geological Service, Montana Department of Fish, Wildlife and Parks, Montana Department of Natural Resources and Conservation, Bureau of Land Management, the Confederated Salish and Kootenai Tribes, and the Blackfeet Nation. Members of this team are considered the leading experts on grizzly bears in the NCDE. The draft strategy was developed by combining grizzly bear knowledge and expertise with the best available scientific research relative to grizzly bear conservation and management.

The proposed action will implement a Revised Forest Plan that contains direction related to grizzly bears with standards and application rules consistent to that developed for the draft NCDE Grizzly Bear Conservation Strategy. This will lead to management approaches on the

FNF that will contribute to a stable and expanding population of grizzly bears, as evidenced by the population status and trend under these conditions to date. Thus, the proposed action is expected to maintain high levels of grizzly bear survival within the action area.

The expectation of the NCDE Conservation Strategy is that the signatories will incorporate plan components consistent with each agency's respective requirements. Adopting direction consistent with what is being drafted in the NCDE Conservation Strategy would limit motorized access, developed recreation sites, late-season motorized over-snow use, livestock grazing allotments and mineral/energy development within the NCDE PCA on NFS lands. Some of these parameters would not exceed the 2011 baseline levels as described in the draft NCDE conservation strategy. Others will follow a trend similar to what was happening during the time when the NCDE grizzly bear population was growing and expanding its distribution across the landscape (i.e., 2004 to 2011). While these conditions may present a low level of adverse effects to NCDE grizzly bears, evidence suggests that management of NFS lands in accordance with the proposed Revised Forest Plan will support a sustainable and increasing NCDE grizzly bear population.

E. CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Future activities will occur on non-federal land within the action area. Such activities could include residential and recreational development and use, timber harvest, fuel reduction around private developments, livestock grazing, and other actions. However, at this time, specific future actions being considered or proposed on non-federal land that could have cumulative effects with the proposed action are not known. To some degree, motorized routes, developed sites, and livestock grazing on private lands (where known) were incorporated into the 2011 baseline figures for grizzly bear habitat measures in the draft NCDE conservation strategy. However, future motorized route construction and use, increases in developed sites, and changes in livestock management on private land do not count against the habitat standards imposed.

While future non-federal actions are difficult to anticipate, these effects may be limited due to the large extent of federally-administered land in the NCDE recovery zone/PCA. The action area (i.e., lands administered by the FNF) contains approximately 2.1 million acres within the PCA. An additional 2.3 million acres is administered by other federal agencies not associated with this biological opinion (i.e., other National Forests, Glacier National Park). In total, approximately78 percent of the NCDE recovery zone/PCA is administered by a federal entity. As such, actions on these areas would be subject to separate section 7 analysis. The remaining acres occur on other land ownerships including state (four percent), tribal (seven percent) and private lands (nine percent). Note that one percent of the recovery zone/PCA is comprised of large water bodies (i.e., Flathead Lake).

While some activities on non-federal land may contribute to cumulative effects at the project level at some point in the future, the large extent of the PCA under NFS and large blocks of wilderness within which human access is restricted by regulation and topography would serve to reduce the impacts of larger residential human populations on grizzly bears. While federal land management cannot entirely compensate for impacts on private land, management would continue to provide high quality habitat for grizzly bears on lands within the NCDE administered by federal agencies.

Since the proposed action is programmatic in nature (i.e. provides direction for future actions that may be authorized, funded, and/or carried out by the Forest) it does not in itself mandate or approve future implementation of activities on the FNF. Therefore, any future projects proposed and designed to implement the Revised Forest Plan would undergo separate consultation related to the effects of listed species. Any site-specific information on future activities that will occur on non-federal land that might contribute to cumulative effects would be considered at that time.

F. CONCLUSION

After reviewing the current status of the grizzly bear, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the effects of the proposed FNF Revised Forest Plan are not likely to jeopardize the continued existence of the grizzly bear. No critical habitat has been designated for this species therefore none will be affected. Regulations implementing section 7 of the Act define "jeopardize the continued existence of" as: "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Our conclusion that implementation of the proposed FNF Revised Forest Plan would not jeopardize the continued existence of grizzly bears is based on the literature and information referenced in this document, the information in the biological assessment prepared for the Revised Forest Plan (USFS 2017), meetings and discussions with USFS, discussions with grizzly bear experts, and information in our files. The *Effects of the Action* section analyzed and summarized key factors in detail.

The Service's section 7 handbook explains that adverse effects on individuals of a species generally do not result in jeopardy determinations unless that loss when added to the environmental baseline, is likely to result in an appreciable reduction of the likelihood of both survival and recovery of a listed species in the wild by reducing the reproducing, numbers, or distribution of that species. In our analysis for grizzly bears, we first conduct such an analysis relevant to the NCDE grizzly bear population, and then determine the impact of the proposed action on the species.

Implementation of the proposed action may result in adverse effects to individual grizzly bears over the life of the Revised Forest Plan (15 years), particularly as a result maintaining conditions on the landscape that are adversely affecting grizzly bears and new access management direction including temporary reductions in secure core habitat, and increases in open and total motorized route densities. These effects are likely to be greatest in grizzly bear subunits that do not meet recommended open and total route densities and/or secure core percentages. Although the proposed action provides direction that allows temporary changes in access conditions in a subunit, the extent of such projects would be limited by management area allocations discussed in Section D.2. Additionally, future projects that will result in these changes will still be subject to project level analysis. The process will ensure that a site-specific analysis of effects will occur if a project is proposed within the PCA.

Based on the best available scientific information reviewed in this consultation, adverse effects on individual grizzly bears as a result of the proposed action will not negatively impact the recovery of the NCDE grizzly bear population. Further, we expect that direction in the Revised Forest Plan will result in conditions that support grizzly bear use of NFS lands in the NCDE. It is our opinion that the proposed action would not appreciably reduce the likelihood of both the survival and recovery of the NCDE grizzly bears. Below we summarize key factors related to the effects of the proposed action on grizzly bears as detailed and analyzed in this biological opinion. Key points of our rationale for this non-jeopardy conclusion include the following factors:

Factors related to the proposed action:

- The Revised Forest Plan would replace existing direction related to grizzly bears and incorporate direction consistent with draft NCDE Grizzly Bear Conservation Strategy. This direction was developed by an interagency team of grizzly bear experts using the best available scientific data.

- Because the draft NCDE Grizzly Bear Conservation Strategy was created to provide direction which will maintain a recovered NCDE population, we anticipate that incorporating consistent direction into the Revised Forest Plan will contribute to high levels of grizzly bear survival within the action area.

- Under the proposed action, existing Forest Plan language will be superseded by new elements that will retain similar on-the-ground management direction, in the form of newly designated standards and guidelines. This update will ensure that desired conditions, standards and guidelines applicable to the PCA are consistent among all National Forests that manage lands within the NCDE.

- The majority (41 of 73) of the bear management subunits on the FNF currently meet the research thresholds for OMRD (< 19 percent with > 1 mi/mi2), TMRD (< 19 percent with > 2 mi/mi2), and security core (> 68 percent), providing excellent quality and availability of habitat for grizzly bears, including females with cubs. Further, 20 of these subunits are entirely within designated wilderness.

- Thirty two subunits do not meet one or more of the research thresholds presented above. The proposed action would incorporate direction to maintain baseline levels in these subunits, which would allow adverse effects to individual bears to continue. While some adverse effects to individual grizzly bears will continue to occur, they are not expected to have an effect on the survival and recovery of the NCDE population since these conditions were on the landscape during a time when the NCDE grizzly bear population was increasing in size and distribution.

- The Revised Forest Plan will require projects to results in no net increase above baseline conditions in OMRD or TMRD in each bear management subunit within the PCA (as specified in FW-STD-IFS-02). The best available science indicates that baseline conditions (see glossary for baseline definition) provided adequate habitat conditions inside the NCDE recovery zone/PCA to support a stable to increasing grizzly bear population.

- The Revised Forest Plan will require projects to result in no net decrease below baseline conditions in percent secure core in each bear management subunit within the PCA (as specified in FW-STD-IFS-02). Temporary decreases in secure core during the non-denning season may occur to facilitate other multiple uses and desired conditions, but the extent would be limited.

- In each subunit, the Revised Forest Plan would require projects to result in no more than a five percent temporary increase in OMRD, a three percent temporary increase in TMRD, and a two percent temporary decrease in secure core. These temporary changes would be calculated using a 10-year running average for each grizzly bear subunit (as specified in FW-STD-IFS-03). Allowable deviations to access condition within the PCA are consistent with project-level section 7 consultations done elsewhere in the NCDE. These projects resulted in temporary changes to motorized route densities and security core in 18 grizzly bear subunits, but all occurred during a period of time when the NCDE grizzly bear population was growing (2004 to 2011).

- The Revised Forest Plan would allow no more than one increase in the number or capacity of developed recreation sites that are designed and managed for overnight use (e.g., campgrounds, cabin rentals, huts, guest lodges, recreation residences) during the non-denning season per BMU per decade. Impacts to grizzly bears from these increases would be mitigated by the conditions specified in FW-STD-REC-01 and FW-GDL-REC-01. This rate of increase is consistent with increases during a time period (2004 to 2011) when the NCDE grizzly bear population was increasing in numbers and distribution.

- The Revised Forest Plan requires no net increase above the baseline in cattle or sheep grazing allotments on NFS lands within the PCA (as specified in FW-STD-GR-04 & 05.

- The Revised Forest Plan requires no net increase above the baseline in the percentage of area, or miles of routes, open to motorized over-snow use in denning habitat during the den-emergence period within the PCA (as specified in FW-STD-REC-05).

- The Revised Forest Plan requires that any new mineral and/or energy leases on NFS lands within the PCA include a no surface occupancy stipulation (as specified in FW-STD-E&M-08.

- Eight monitoring components are included in the Revised Forest Plan. These require biennial reporting of habitat conditions within the action area (see MON-NCDE-01 through MON-NCDE-08 in Appendix 4).

- The effect on grizzly bears from many of the Revised Forest Plan components is expected to be neutral to insignificant and/or discountable. Much of the direction related to grizzly bears is procedural and/or duplicative and in general the removal of this direction would have minor, insignificant effects on grizzly bears relative to habitat management procedures currently in place. In addition, some direction consists of changes in methods, terminology, or clarifications of the direction that are expected to have little to no effect on the design or implementation of projects on the ground, and thus would have little to no effects to grizzly bears.

- The proposed action will maintain habitat connectivity within the FNF, and linkage areas for movement of grizzly bears between recovery zones. This will be accomplished through desired conditions, guidelines and standards that will provide large, remote areas with low levels of human disturbance that contribute to movement in migratory corridors within and between ecosystems, as well as female occupancy in zone 1 (both inside and outside the Salish DCA). This will facilitate genetic exchange between ecosystems, as well demographic exchange by allowing the NCDE to serve as a “source” population for smaller ecosystems (CYE). Connectivity among ecosystems will support a more robust grizzly bear population in the lower U.S. as a whole.

- Finally, the FNF’s Revised Forest Plan is a framework programmatic action. This proposed action does not authorize, fund, or carry out an action but provides direction for future actions that may be authorized, funded, or carried out by the USFS. Therefore, any action subsequently authorized, funded, or carried out under the Revised Forest Plan, will be addressed in subsequent section 7 consultations, as appropriate.

Factors related to the NCDE grizzly bear population:

- In 1993, the Grizzly Bear Recovery Plan articulated the conservation needs for the recovery of grizzly bears. The plan stated that recovery zones include areas large enough and of sufficient habitat quality to support recovered grizzly bear populations, and that although grizzly bears are expected to reside in areas outside the recovery zones, only habitat within the recovery zone is needed for management primarily for grizzly bears.

- The Recovery Plan strategy has been successful and resulted in growth of the NCDE grizzly bear population since listing. Mace et al. (2012) estimated that the NCDE population has surpassed 1,000 individuals, and the most recent data from Costello et al. (2016) indicate that the population is continuing to grow at a rate of 2.3 percent annually. Based on the best available information, the Service concludes that the status of the NCDE grizzly bear population is robust.

- In addition to increased population size and a positive growth rate, the NCDE grizzly bear population has greatly expanded its distribution on the landscape. Costello et al. (2016) used verified grizzly bear locations to create a current distribution map for the NCDE. This map estimated that grizzly bears occupy an area of about 13.6 million acres, more than double the size of the recovery zone/PCA (5.7 million acres). These data serve to reinforce the Service's conclusion that the NCDE grizzly bear population is robust.

- Efforts to keep human food, garbage, and other attractants unavailable to grizzly bears will remain intact. Forest-wide food/wildlife attractant storage orders are in place across the whole FNF.

- Other federal agencies have also used their authorities to provide for proper storage of food and attractants in an effort to reduce grizzly bear conflicts with humans. Within Glacier National Park, food storage regulations (pursuant to 36 CFR 2.10 (d)) prohibit anyone from leaving food unattended or stored improperly where it could attract or otherwise be available to wildlife. The National Bison Range complex (administered by the Service) is day-use only, with no overnight camping allowed. Users are expected to pack out their trash; there are no garbage receptacles available anywhere on the refuges. On BLM lands within the NCDE recovery zone, food storage guidelines are incorporated into their contracts. The BLM also incorporates food storage guidelines into contracts in areas that are outside the recovery zone but in areas known to be occupied by grizzly bears

- Montana Fish, Wildlife and Parks' bear specialist program is expected to continue to work with the public to reduce risks to grizzly bears on private and public lands, both inside and outside the boundaries of the recovery zone. In cooperation with other agencies, this program has made notable strides toward an informed public and reduced the availability of attractants to grizzly bears on private and public lands.

- The NCDE encompasses approximately 5.7 million acres (8,926 square miles), of which more than 3.4 million acres (61 percent of the total) are managed by the USFS and nearly 1 million acres (17 percent of the total) are managed by Glacier National Park. Further, nearly 68 percent of all lands within the NCDE PCA are considered "protected." These lands include congressionally designated Wilderness Areas, and other designations that do not allow roads and/or motorized use (e.g., Inventoried Roadless Areas). These areas contain the highest quality grizzly bear habitat and will continue to contribute significantly to reducing the number of human bear encounters and increasing security for grizzly bears.

Recovery zones were established to identify areas necessary for the recovery of a species and are defined as the area in each grizzly bear ecosystem within which the population and habitat criteria for recovery are measured. The NCDE recovery zone/PCA has been managed to provide and conserve grizzly bear habitat, and best available scientific information indicates this been successful. As anticipated in the Recovery Plan, the NCDE grizzly bear population has responded to these conditions, and has stabilized and increased. In addition, the NCDE grizzly bears have been expanding beyond the PCA and will likely continue to expand into the future. In response, the proposed action provides land management direction to areas outside the original recovery zone/PCA (e.g., DCAs, zone 1) that will facilitate grizzly bear occupancy, especially females with cubs.

The proposed action may result in adverse effects on some individual grizzly bears using the action area now and into the future. However, considering the large size of the NCDE recovery zone, favorable land management direction within the recovery zone/PCA, and the robust status of this grizzly bear population, adverse effects on grizzly bears as a result of implementing the Revised Forest Plan would not have negative effects on the status of the NCDE grizzly bear population. Therefore, we conclude that the proposed action is not reasonably expected to reduce appreciably the likelihood of both the survival and recovery of NCDE grizzly bears.

G. INCIDENTAL TAKE STATEMENT

Section 9 of the Act, and Federal regulations pursuant to section 4(d) of the Act, prohibit the take of endangered and threatened species, respectively without special exemption. "Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined by the Service as an intentional or negligent act or omission that creates the likelihood of injury to listed wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. “Incidental take” is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with this Incidental Take Statement.

The measures in an incidental take statement are non-discretionary and must be undertaken by the action agency so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The action agency has a continuing duty to regulate the activity that is covered by this incidental take statement. If the action agency (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the action agency must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR 402.14(i)(3)].

1. Amount or Extent of Take Anticipated

This biological opinion considered the effects to grizzly bears from implementation of the Revised Forest Plan direction as guided by the Revised Forest Plan components (e.g., management area allocation, suitability, desired condition, standards, and guidelines). It includes specific components for the conservation of grizzly bears and grizzly bear habitat, but does not authorize specific actions. Our analysis of the Revised Forest Plan is a broad-scale examination of the types of projects and activities conducted under the Revised Forest Plan that could potentially occur in grizzly bear habitat and result in effects on grizzly bears. The Revised Forest Plan contains sufficient specificity to determine that the extent of adverse effects does not rise to levels that are likely to jeopardize the NCDE grizzly bear population.

In this biological opinion, we documented how the proposed action reduces the potential for adverse effects and incidental take to occur as a result of Forest management. However, the potential remains for specific projects and activities to result in adverse effects and incidental take of grizzly bears. The mere potential for future take from these actions is not a legitimate basis for providing an exemption for take. The FNF is responsible for section 7 consultation on all future projects (conducted under the Revised Forest Plan) that may affect the grizzly bear or its habitat, even if those projects are consistent with Revised Forest Plan. Subsequent consultation, as appropriate, on the specific actions developed pursuant to the Revised Forest Plan will serve as the basis for enumerating the incidental take and determining if an exemption from the section 9 take prohibitions is warranted. If so, the Service will provide Reasonable and Prudent Measures and Terms and Conditions, as appropriate, to minimize the impacts of the taking on the grizzly bear in accordance with 50 CFR 402.14(i).

Two exceptions to this approach are related to the effects of motorized access route densities and over-snow motorized use on grizzly bears. For motorized route densities, the science is clear that above certain densities, bears suffer adverse effects that can lead to significant impairment of the ability to feed, breed, or shelter. The FNF has examined, monitored and reported motorized access route densities in all grizzly bear subunits of the PCA. In the Salish DCA the FNF examined, monitored and reported the linear density of roads and motorized trails open to public use during the non-denning season. In the remainder of zone 1 the FNF has examined, monitored and reported the linear density of roads open to the public during the non-denning season. Hence, we are able to ascertain the level of adverse effects and provide surrogate measures of incidental take of grizzly bears related to road densities in both the PCA and zone 1 (including the Salish DCA).

For over-snow motorized use the FNF analyzed and reported the amount of modeled denning habitat that was impacted by late season over-snow vehicle use. The best available science and information suggests that recently emerged females with cubs could be vulnerable to adverse disturbance effects of snowmobile use near den sites during the den emergence period. The FNF provided both acres of modeled denning habitat and an estimate of late season motorized over-snow vehicle use in denning habitat. Thus, we are able to ascertain the level of adverse effects and provide surrogate measures of incidental take of grizzly bears related to snowmobile use during the den emergence time period.

It should be noted that this biological opinion also considered the effects of increased developed recreation sites on grizzly bears. The Revised Forest Plan will allow one increase in the number or the overnight capacity of developed recreation sites designed and managed for overnight use per bear management unit per decade on NFS lands in the PCA (as specified in FW-STD-REC-01). While we maintain that increases have the potential to adversely affect grizzly bears (primarily through increased risk of conflict with humans), we also discussed how the details in site development and effects to bears can vary. Since this proposed action does not authorize any particular projects, future actions that will affect grizzly bears will be subject to additional section 7 consultation with the Service while the grizzly bear remains listed. We have determined that if increased developed recreation opportunities on any of the FNF were to result in adverse effects to grizzly bears, project-specific consultation (as required) would be the appropriate time to exempt any such take. As a result, incidental take associated with increased developed recreation will not be discussed further in this incidental take statement.

The amount or extent of incidental take resulting from access management and motorized over-snow vehicle use is examined below:

Access Management

As described in the accompanying biological opinion, the effect of roads with high use upon grizzly bear behavior and habitat use has been well documented in the scientific literature. We anticipate that incidental take of grizzly bears is likely to occur in the form of harassment of adult female grizzly bears in highly roaded areas (through displacement caused by road-related disturbance in areas of high open road densities). We also anticipate harm of adult female bears (through significant habitat modification or degradation caused by high open or total road densities). Both harassment and harm can cause actual injury to female grizzly bears by significantly disrupting normal behavioral patterns, including breeding, feeding, or sheltering.

The take we anticipate would be caused by displacement (i.e. significant underuse) of female grizzly bears from key habitat areas in highly roaded areas, which may result in decreased fitness that impairs a female's inherent reproductive potential. In other words, some adult female grizzly bears wary of humans and human-generated disturbance may fail to breed at their potential frequency or they would fail to complete gestation due to decreased fitness. We do not expect all adult female grizzly bears affected by displacement or by alteration of habitat caused by the proposed action to suffer impairment of breeding, feeding and/or sheltering. We do not anticipate incidental take of male and subadult grizzly bears, which are independent and thus more mobile and do not have the physiological or nutritional requirements of pregnant or lactating females.

Currently, the Service is unaware of scientific or commercial information that could be used to quantify the exact level of incidental take of female grizzly bears as a result of such impacts to or degradation of their habitat, or displacement. Reduced reproductive success of females as a result of displacement effects could include grizzly bear cub injury or mortality, but it is more likely to occur through failure to breed or complete gestation. The amount of take is difficult to quantify for the following reasons:

1. The amount of take would depend on the number of adult female grizzly bears impacted by high road densities. We lack specific information on the precise number of adult female grizzly bears that use the action area, but due to the amount of habitat meeting acceptable habitat parameters, we reasonably assume very few adult females would be affected.

2. Individual grizzly bears would react differently to the disturbance. Not all adult female bears that are exposed to disturbances from roaded areas would be adversely impacted to the point of take.

3. Individual female grizzly bears that initially may be sensitive to disturbances may over time become accustomed to the routine disturbances generated by routine forest road use. Therefore, determining the precise amount of take, as defined by impaired reproductive potential, is difficult.

Therefore, as detailed in this biological opinion, the Service anticipates some low level of incidental take of female grizzly bears would occur in the form of harm or harassment from the displacement effects of road densities. The amount of take would be also difficult to detect for the following reasons:

1. Grizzly bears are not easily detected or observed in the wild.

2. Reproductive rates of individual female grizzly bears vary naturally due to environmental and physiological causes.

3. A reduction in "normal" reproductive success of an individual female is not easily discernible in the wild.

4. The reasons a grizzly bear fails to breed and/or failure to complete gestation are not discernible in the wild.

In instances where incidental take is difficult to quantify or detect, the Service uses surrogate measures of take. Here, we use the research benchmark levels of OMRD, TMRD, and secure core as our surrogate measure of incidental take. These benchmarks were discussed in detail in this biological opinion. Where individual subunit road densities are higher than benchmark levels of OMRD or TMRD, or where core is less, we conservatively anticipate some level of impaired habitat use, resulting in impaired breeding or feeding for some adult female grizzly bears. Based on the best available research and information, we anticipate that some level of incidental take of female grizzly bears will occur within individual subunits as long as: (1) OMRD exceeds one mile per square mile in more than 19 percent of a subunit; (2) TMRD exceeds two miles per square mile in more than 19 percent of a subunit, and/or (3) secure core area makes up less than 68 percent of a subunit.

There are 32 subunits on the FNF that do not meet one or more of the research benchmarks described above (see Table III-15 in Section C.2). Seven subunits meet the research benchmarks, but are close enough that temporary changes to access conditions (as allowed under the proposed action and specified in FW-STD-IFS-03) may result in incidental take of grizzly bears (see Table III-15 in Section C.2). This will occur when temporary changes to access condition cause OMRD or TMRD to increase above the research benchmarks, or when secure core decreases below the research benchmark. Changes are calculated using a 10-year running average as described above and in Appendix 3 of this biological opinion, or Appendix D or the biological assessment. While changes in road density and/or secure core will be temporary, adverse effects and incidental take will occur while these changes are implemented on the ground. Within those subunits achieving the research benchmarks, incidental take of grizzly bears is unlikely to occur. Project resulting in changes to OMRD, TMRD, or secure core beyond those permitted by the Revised Forest Plan and analyzed in this biological opinion will result in levels of take that exceed the amount of incidental take we anticipate here, and reinitiation or project-specific consultation would be required.

Additionally, we use spatial and temporal surrogates for incidental take that will occur in grizzly bear subunits within the PCA. The proposed action indicates that on-the-ground implementation of each project will not exceed five years within any one subunit. Therefore, we use a maximum of five years of on-the-ground project work (as specified in FW-GDL-IFS-01) as a surrogate for take. Further, we assume that on-the-ground project implementation on NFS lands will not concurrently impact OMRD, TMRD, or secure core in more than three adjacent grizzly bear subunits on the FNF. This will provide grizzly bears within a project subunit the opportunity to move away from activities into undisturbed subunits. If on-the-ground implementation of a project exceeds five years, or if a project concurrently impacts OMRD, TMRD, or secure core in more than three adjacent subunits, the level of take exempted under this biological opinion would be exceeded and reinitiation or project-specific consultation would be required (as appropriate).

In the zone 1 (including the Salish DCA), we anticipate some level of incidental take of female grizzly bears. We base our opinion on the fact that linear densities of road s and motorized trails open to the public during the non-denning season. Thus, we anticipate that road and motorized trail densities in these areas are likely causing incidental take of grizzly bears and this will continue. This is a conservative conclusion since grizzly bears moving into these areas did so under prevailing conditions, it is also possible that incidental take is not occurring for every female. Grizzly bears are known to tolerate a range of conditions; some apparently adjust to high levels of human activity without apparent consequence. Further, because few grizzly bears occupy this area, intraspecific competition is probably not significant. Those grizzly bears using zone 1 and the Salish DCA likely have options related to home range selection and use. Similar to the incidental take likely occurring within subunits inside the PCA, we anticipate a low level of incidental take of female grizzly bears in the form of harassment, and /or harm through significant habitat modification or degradation as a result of high road densities and associated disturbance, which causes actual injury to grizzly bears by significantly disrupting normal behavioral patterns, to the extent that a female's normal reproductive potential is impaired.

In the Salish DCA, we use the linear density of roads and motorized trails open to the public during the non-denning season (as specified in GA-SM-STD-01) as a surrogate measure of take (see Table III-17 in Section D.2). In the remainder of zone 1 (i.e., outside the Salish DCA), we use we use the linear density of roads open to the public during the non-denning season (as specified in GA-SM-STD-01) as the surrogate measure of take (also see Table III-17 in Section D.2). In the Salish DCA and zone 1, permanent increases in linear densities beyond the levels shown in Table III-17 of this biological opinion will result in levels of take that exceed the amount of incidental take we anticipate here, and reinitiation or project-level consultation would be required.

Motorized Over-Snow Vehicle Use During Den Emergence

In Sections C.2 (*Environmental Baseline*) and D.2 (*Effects of the Action*), we discuss the potential impacts of motorized over-snow vehicles on grizzly bears as they emerge from their dens. We anticipate the proposed action to result in incidental take where late season (after March 31) motorized over-snow vehicle uses overlaps with grizzly bear denning habitat. The incidental take is expected to be in the form of harassment to individual female grizzly bears and/or cubs caused by premature displacement from the den site area, resulting in reduced fitness of females and cubs. We expect the amount and extent of take would be very low. Late season motorized over-snow use would affect very few individual females with cubs over the life of the plan, as adult females with cubs occur at very low numbers compared to the amount of denning habitat available. As spring season ends, the amount of motorized over-snow use decreases. Finally, an individual female would not likely be affected for more than one denning season. Grizzly bears typically do not reuse den sites. Thus, if a female grizzly bear suffers significant disturbance at or near her den site, it is probable that she would locate a new site to den in the future and would have options for denning elsewhere.

The difficulty in detecting or quantifying this incidental take is the same as presented above, and just as above we are using a surrogate measure of incidental take. We use the following two surrogates for take: (1)The amount of potential denning habitat within the PCA currently overlapped by known late-season motorized over-snow vehicle use (three percent); and (2) The miles of routes within the PCA open to late-season motorized over snow vehicles (19 miles). If late season motorized over-snow vehicle use (i.e., after March 31) occurs on more than three percent of modeled denning habitat within the PCA on the FNF, or more than 19 miles of routes are open to late season motorized over snow vehicles in modeled denning habitat, then the amount of take we anticipated in this biological opinion would be exceeded, and reinitiation or project-specific consultation would be required.

2. Effects of Take

In the accompanying biological opinion, the Service determined that the level of anticipated take is not likely to result in jeopardy to grizzly bear within the NCDE recovery zone. The best scientific information indicates a robust NCDE grizzly bear population of more than 1,000 individuals. Further, the latest trend data show that the population is growing at a rate of 2.3 percent annually and now occupies an area of roughly 13.6 million acres, more than twice the size of the original NCDE recovery zone (5.7 million acres). Impacts on the grizzly bear population, including anticipated levels of incidental take as a result of the proposed action will not appreciably reduce survival or the recovery of the species. We anticipate no mortality of adult or subadult grizzly bears, but rather some low level of effect on the normal reproductive potential of a relatively low number of adult female bears inhabiting the FNF. Critical habitat has not been designated for the grizzly bear, therefore none would be affected.

3. Reasonable and Prudent Measures

Biological opinions provide reasonable and prudent measures that are expected to reduce the amount of incidental take. Reasonable and prudent measures are those measures necessary and appropriate to minimize incidental take resulting from proposed actions. Reasonable and prudent measures are nondiscretionary and must be implemented by the agency in order for the exemption in section 7(o)(2) to apply.

1. Minimize or reduce the potential for mortality and displacement of grizzly bears due to the proposed action.

4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest Service must comply with the following terms and conditions that implement the reasonable and prudent measure described above and outline reporting and monitoring requirements. These terms and conditions are non-discretionary:

To implement the reasonable and prudent measure:

1. The Forest Service shall comply with standards FW-STD-IFS-01 , FW-STD-IFS-02, FW-STD-IFS-03, FW-STD-IFS-04 and FW-STD-REC-05 in the Flathead Forest Plan.

2. The Forest Service shall comply with guideline FW-GDL-IFS-01 and FW-GDL-IFS-02 in the Flathead Forest Plan. If projects will be unable to comply with the above guidelines, the Forest Service shall contact the Service immediately to determine further consultation needs.

3. Concurrent, temporary increases in OMRD or TMRD, or concurrent temporary decreases in secure core for new projects (*as described in the glossary in Appendix 3*) on NFS lands shall not occur in more than 3 adjacent bear management subunits on the FNF.

4. The Forest Service shall continue to implement food/attractant storage and handling programs in the action area. This includes ensuring all Forest Service employees and contractors adhere to appropriate protocols, and providing educational material to the public on measures to avoid conflicts and/or food conditioning of grizzly bears.

5. **Reporting Requirements**

To remain in compliance with the terms and conditions, and to demonstrate that the USFS is adequately reducing the potential for and minimizing the effect of any incidental take of grizzly bears, the USFS shall adhere to the reporting requirements stipulated in the "Monitoring" components of the proposed action. Specifically, these components are presented as MON-NCDE-01 through MON-NCDE-08 in Appendix 4 of this biological opinion, and in Appendix D of the biological assessment (pages 318-319). The stipulated biennial monitoring reports shall be provided to the Service's Ecological Services Office in Helena, Montana.

If a human-caused grizzly bear mortality is discovered on NFS lands, the Service's Grizzly Bear Recovery Office in Missoula, Montana shall be notified within 24-hours. Reporting human-caused grizzly bear mortalities on NFS lands may be done by MTFWP, but the USFS remains responsible for ensuring that the Service has received all appropriate information.

H. CONSERVATION RECOMMENDATIONS

Sections 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibilities.

During the course of this consultation, the Service noted several elements of the FNF's Revised Forest Plan that will contribute to the conservation of endangered, threatened, proposed, and candidate species. The Revised Forest Plan will provide habitat conditions on the FNF that supported a stable to increasing population of grizzly bears in the NCDE. The Revised Forest Plan will be beneficial to grizzly bears by requiring food/attractant storage order(s) on NFS lands, limiting motorized access, limiting new developed recreation sites, limiting new grazing allotments, and requiring a "no surface occupancy" stipulation for new oil and gas leases in the recovery zone/primary conservation area. These and other plan components for minerals, recreation, livestock grazing, lands, and vegetation management activities will ensure that grizzly bear habitat needs are provided for in future site-specific projects. Additional plan components for zone 1 will be beneficial to the NCDE grizzly bear population by supporting grizzly bear occupancy in areas beyond the original recovery zone/PCA. The ongoing efforts by the Forest Service to cooperate with other federal, state, local, and tribal agencies and private landowners in the NCDE also are important in supporting coordinated grizzly bear conservation efforts.

This biological opinion identifies the following conservation recommendations that, in addition to the proposed action and other ongoing conservation actions, will support recovery of listed species. As discussed above, these conservation recommendations are discretionary agency activities meant to minimize or avoid adverse effects to listed species. The conservations recommendations are:

1. Maintain and/or install grizzly bear informational signs at major access points that provide the public with the following information: potential grizzly bear presence; proper sanitation/food storage techniques; and distinguishing characteristics between grizzly bears and black bears.

2. Participate in ongoing interagency efforts to identify, map, and manage linkage areas that may be important in providing landscape connectivity within and between grizzly bear ecosystems, across all land ownerships for grizzly bears.

3. Plan recreational development, and recreational/operation uses in a manner that facilitates grizzly bear movement and maintains habitat effectiveness.

4. Plan and manage developments on NFS lands in a manner that allows for grizzly bear use of key habitats in the PCA and zone 1.

5. In cooperation with other agencies, identify areas where grizzly bears concentrate during specific time periods to take advantage of concentrated and/or diverse food sources. Where grizzly bear use is known or likely to occur and where practicable, plan activities in a fashion that minimizes displacement of grizzly bears.

6. The USFS continues to plan recreational development, and manage recreational and operational uses to provide for grizzly bear and Canada lynx movement, and to maintain effectiveness of these species' habitats.

7. The USFS continues to identify and prioritize roads for rehabilitation or seasonal restrictions within watersheds with relatively high road densities so as to improve habitat quality and/or security for grizzly bears, Canada lynx, and bull trout, as well as other listed and non-listed fish and wildlife species.

In addition to management direction that will contribute to the recovery of grizzly bears, direction relative other listed species (i.e., bull trout, Canada lynx, water howelia) is also contained in the FNF's Revised Forest Plan. These elements are documented in the biological assessment (USFS 2017) or species-specific chapters of this biological opinion. Upon review the Service concludes that the FNF's Revised Forest Plan demonstrated a commitment to conservation of threatened and endangered species, and will continue to contribute to the recovery of these species.

Upon review of Forest Plan components that will be carried forward, and components that are being proposed, we conclude that the features of the FNF's Revised Forest Plan can be considered elements of a program for the conservation of endangered species and threatened species, as described in section 7(a)(1) of the Act. Further, we conclude that this proposed action demonstrates the USFS's commitment to conservation of threatened and endangered species on NFS lands in the action area.

I. REINITIATION NOTICE

This concludes consultation on the effects of the FNF's Revised Forest Plan on grizzly bears. As provided in 50 C.F.R. § 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (2) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (3) a new species is listed or critical habitat designated that may be affected by the action.

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CHAPTER IV. BIOLOGICAL OPINION FOR CANADA LYNX AND CANADA LYNX CRITICAL HABITAT

Table of Contents

A. CONTEXT OF THE PROPOSED ACTION FOR CANADA LYNX

The proposed action is described in detail in Chapter I of this biological opinion. This chapter identifies and describes the relationship of the action area to Canada lynx habitat, explains the relationship of the proposed action to existing management, and then describes elements of the Revised Forest Plan that provide for the conservation of Canada lynx and Canada lynx critical habitat. Further, this chapter describes the components of the Revised Forest Plan intended to conserve Canada lynx and lynx habitat, and specific measures proposed to avoid, reduce, or minimize potential adverse effects of forest management activities at the project level.

This biological opinion will consider the effects of implementation of the proposed framework of the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

1. Description of the Proposed Action

As discussed in Chapter I of this biological opinion, the action area for the proposed action is the entirety of the FNF. The action area lies within the Northern Rocky Mountain/Cascade region of the contiguous United States distinct population segment (DPS) of Canada lynx. Lynx habitat within the Northern Rocky Mountain/Cascade Geographic Area was delineated into lynx analysis units (LAUs) for analysis and management purposes. A LAU is intended to provide the fundamental unit for evaluating and monitoring the effects of management activities on lynx. Lynx analysis units do not depict actual lynx home ranges but are approximately the size of a female's home range (25-50 mi^2 or 16,000-32,000 acres), contain at least 10 mi^2 (6,400 acres) of primary vegetation capable of supporting lynx, and encompass year-round foraging and denning habitat components (ILBT 2013).

LAUs were delineated for the Flathead National Forest (FNF) in accordance with the guidance provided in the Lynx Conservation Assessment and Strategy and the Northern Rockies Lynx Management Direction and have not been changed since they were originally delineated (Figure 27). The area covered by the lynx analysis units on the FNF is the primary area used for analysis under the Endangered Species Act. The area selected is large enough to include the effects of activities on adjoining non-federal lands but not so large so as to obscure effects on a biologically meaningful unit.

Within the FNF there are 109 LAUs that are either wholly or partially on NFS lands. Of these LAUs approximately 1,795,000 acres are mapped as lynx habitat (i.e., boreal forest habitat types) and approximately 598,000 acres are mapped as non-lynx habitat (i.e., low elevation, scree slopes, cliff faces, lakes, and dry habitat types) (Figure 27). Because resident lynx may make exploratory or breeding movements into new areas, though typically returning to their original home range, and males in particular may travel long distances during these episodes, the action area is considered to be the entire FNF.

Relationship of Proposed Action to Existing Management

In 2007, the FNF amended the existing Forest Plan with the Northern Rockies Lynx Management Direction amendment (NRLMD) (USFS 2007). In addition to the FNF's Forest Plan, the NRLMD amended existing plans for17 other National Forests. The Service prepared a biological opinion on the effects of the amendment on lynx and determined that the NRLMD was not likely to jeopardize lynx (USFWS 2007). Thus, the existing FNF Forest Plan manages lynx habitat under the direction in the NRLMD. This direction applies to projects and activities in lynx habitat, and it is used along with the biological opinion during section 7 consultation to help evaluate and document the effects of individual proposed projects on lynx. The NRLMD applies to all areas designated by the Forest Service as "lynx habitat" within LAUs on NFS lands within the 18 National Forests, including the FNF.

At the time the NRLMD was prepared and the biological opinion was completed (2007), critical habitat had not been designated for lynx on NFS lands. Critical habitat was designated in 2009 (February 25, 2009, 71 FR 8616) and later revised in 2014 (September 12, 2014, 79 FR 54782). Since that time, the NRLMD has been applied to lynx critical habitat on the FNF.

The NRLMD includes standards and guidelines intended to "incorporate management direction in land management plans that conserves and promotes recovery of Canada lynx, by reducing or eliminating adverse effects from land management activities on National Forest System lands…" (USFS 2007). As analyzed in our 2007 biological opinion, the NRLMD is intended to avoid or reduce the potential for projects proposed under Forest Plans to adversely affect lynx through a suite of objectives, standards, and guidelines that promote and conserve the habitat conditions needed to produce adequate snowshoe hare (lynx primary prey) densities to sustain lynx home ranges, and thus sustain lynx populations. The biological opinion concluded that the programmatic objectives and project-level standards, and guidelines in the amended Forest Plans provide comprehensive conservation direction adequate to reduce adverse effects to lynx from forest management on NFS lands and do not result in jeopardy to the lynx DPS. Because critical habitat for lynx was not designated on NFS lands in 2007, the opinion did not address the effects of Forest Plan direction, as amended by the NRLMD, on lynx critical habitat. However, the USFS initiated consultation with the Service on the NRLMD and lynx critical habitat, and a biological opinion was rendered on October 18, 2017 (USFWS 2017a).

This biological opinion re-examines the effects of implementation of the NRLMD under the Revised Forest Plan in light of the most recent science available for lynx. This biological opinion will also address the effects of the Revised Plan, including the NRLMD as carried forward in the plan, on lynx critical habitat in the action area.

Proposed Action Description

As described in Chapter I of this biological opinion, the Revised Forest Plan direction is organized by desired conditions, objectives, standards and guidelines (see Appendices in BA and this biological opinion). The Revised Forest Plan will provide the FNF with forest-wide direction for the next 15 years, and it describes the framework under which lands will be managed.

The Revised Forest Plan designated all lands managed by the FNF as a certain management area (MA). Management area plan components and delineation provides the on-the-ground framework guiding which allowable uses may occur. Table IV-1 summarizes approximate acres and the percentage of management areas in lynx habitat. The following section characterizes the MAs in Canada lynx habitat and discusses the effects of the resulting management direction on the species. A more detailed description of the MA designations can be found in Chapter I of this biological opinion, or in the biological assessment (USFS 2017).

Management direction from the NRLMD will be retained in the Revised Forest Plan forest plan through standard FW-STD-WL-04. As such, the Revised Forest Plan will carry forward the objectives, standards, and guidelines that were developed to conserve lynx. The use of the terms “goals,” “standards,” and “guidelines” in the NRLMD is consistent with the definitions of these terms found the Revised Forest Plan (USFS 2017). The definition of “objectives” in the NRLMD is consistent with the definition of “desired conditions” in the Revised Forest Plan. As a result, the Revised Forest Plan defines the NRLMD “objectives” as “desired conditions.” The NRLMD plan components are being incorporated by reference throughout the Revised Forest Plan (e.g., in the terrestrial ecosystems and vegetation, wildlife species, recreation, and infrastructure sections).

Forest-specific modifications to VEG S6 (to add an exception category aimed at protecting mature rust-resistant whitebark pine trees) and HU G11 (for areas identified as suitable for over-snow motorized recreational vehicle use) are being proposed as part of the Revised Forest Plan. These modifications will be addressed in more detail further in this biological opinion

Table IV-1. Canada lynx habitat and designated critical habitat in each Forest management area (MA).

Management Area (MA)	Canada Lynx Habitat Acres	Percentage of Potential Lynx Habitat	Canada Lynx Critical Habitat Acres	Percentage of Critical Habitat Acres
1a Designated wilderness	771,082	43	1,069,992	49
1b Recommended wilderness	155,820	9	189,705	9
2a Designated wild and scenic rivers	4,294	< 1	5,349	< 1
2b Eligible wild and scenic rivers	13,364	1	14,392	1

Management Area (MA)	Canada Lynx Habitat Acres	Percentage of Potential Lynx Habitat	Canada Lynx Critical Habitat Acres	Percentage of Critical Habitat Acres
3b Special areas	1,001	< 1	1,165	< 1
4a Research natural areas	4,673	< 1	5,544	< 1
4b Experimental and demonstration forests	8,782	< 1	9,357	< 1
5a Backcountry nonmotorized year-round	122,511	7	144,301	7
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	45,047	3	49,491	2
5c Backcountry: motorized over-snow vehicle use	95,822	5	109,973	5
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	8,583	< 1	9,668	< 1
6a General forest low	106,027	6	112,128	5
6b General forest medium	255,311	14	271,341	12
6c General forest high	166,672	9	166,542	8
7 Focused recreation areas	36,578	2	32,963	2
Total	**1,795,567**		**2,191,912**	

B. STATUS OF THE SPECIES & CRITICAL HABITAT

1. ESA Listing History

On March 24, 2000 the Service listed the contiguous United States DPS of the Canada lynx as threatened in fourteen States (65 FR 16052). Subsequently, the Service published a final rule designating critical habitat in November, 2006 (71 FR 66006); however, no federal lands (including NFS lands) were included in the 2006 final rule. In February of 2009, the Service published a final rule (74 FR 8616) that revised the 2006 designation and included designation of Canada lynx critical habitat on federal lands.

In September of 2014, the Service published a final rule (79 FR 54782) that again revised the previous (2009) designation of critical habitat and the distinct population boundary for the contiguous United States DPS for Canada lynx (USFWS 2014). The 2014 revised rule includes all or portions of ten National Forests that appended the NRLMD to their land management plans in 2007. The ten National Forests addressed in this assessment and included in the 2014 revised critical habitat designation are the Idaho Panhandle, Kootenai, Flathead, Lolo, Helena, Lewis & Clark, Gallatin, and Custer in Forest Service Region 1, the Shoshone in Forest Service Region 2, and the Bridger Teton in Forest Service Region 4. It should be noted that since 2014 the Helena and Lewis & Clark National Forests have been administratively combined into the Helena-Lewis & Clark National Forest, and the Custer and Gallatin National Forests have been combined into the Custer-Gallatin National Forest.

2. Species Description, Life History and Population Dynamics

The Canada lynx (lynx) is a medium-sized cat with long legs; large, well-furred paws; long tufts on the ears; and a short, black-tipped tail (McCord and Cardoza 1982). The winter pelage of the lynx is dense and has a grizzled appearance with grayish-brown mixed with buff or pale brown fur on the back, and grayish-white or buff-white fur on the belly, legs, and feet. Summer pelage of the lynx is more reddish to gray-brown (Quinn and Parker 1987). Adult males average 22 pounds in and 33.5 inches in length (head to tail), while females average 19 pounds and 32 inches (Quinn and Parker 1987). The lynx's long legs and large feet make it highly adapted for hunting in deep snow. The life expectancy for lynx is not very well known, but the oldest documented lynx was a 16 year old male in Montana (Kolbe and Squires 2006).

Lynx occur in mesic coniferous forests that have cold winters with deep, fluffy snow, and provide a prey base of snowshoe hare (Ruggiero et al. 2000). These forests are generally described as boreal forests that provide optimal habitat for snowshoe hares. In North America, the distribution of lynx is nearly coincident with that of snowshoe hares (Bittner and Rongstad 1982, McCord and Cardoza 1982). Lynx survivorship, productivity, and population dynamics are closely related to snowshoe hare density in all parts of its range. In the extensive boreal forests of Canada, snowshoe hare densities reach peak densities of roughly four to six hares per hectare (or 1.6 to 2.4 per acre) and decline to about 0.1 to 1 per hectare (0.04 to 0.4 per acre) during cyclic lows (Hodges 2000a). Ruggiero et al. (2000) found that a minimum density of snowshoe hares greater than 1.2 hares per acre distributed across a large landscape is necessary to support survival of lynx kittens, as well as recruitment and maintenance of a lynx population.

As mentioned above, snowshoe hares are the primary prey of lynx, comprising 35 to 97 percent of the diet throughout their range (Quinn and Parker 1987, Koehler and Aubry 1994). Other prey items can include various species of squirrels, porcupine, beavers, voles, and even ungulates (Saunders 1963, van Zyll de Jong 1966, Nellis et al. 1972, Brand et al. 1976, Koehler 1990, Staples 1995). During the cycle when hares become scarce, the proportion and importance of other prey species, especially red squirrel, increases in the diet (Brand et al. 1976, Apps 2000, Mowat et al. 2000). However, a diet of red squirrels alone might not be adequate to ensure lynx reproduction and survival of kittens (Koehler 1990). Most research has focused on the winter diet. Summer diets are poorly understood throughout the range of lynx. In their review of the literature, Mowat et al. (2000) reported that summer diets have less snowshoe hare and more alternate prey species, possibly because of a greater availability of other species.

In Canada and Alaska, lynx populations undergo extreme fluctuations in response to the cycling of snowshoe hare, enlarging or dispersing from their home ranges and ceasing the recruitment of young into the population after hare populations decline (Mowat et al. 2000). In the contiguous United States, the degree to which the lynx population fluctuations are influenced by local snowshoe hare population dynamics is unclear. Lynx in the lower U.S. are on the periphery of the species' range in North America, and are naturally limited by the low availability of snowshoe hares, as suggested by large home range size and high kitten mortality. These characteristics appear to be similar to those exhibited by lynx populations in Canada and Alaska during the low phase of the hare population cycle (Aubry et al. 2000). This is likely due to the inherently patchy distribution of lynx and hare habitat in the contiguous United States and correspondingly lower densities of hares.

Individual lynx maintain large home ranges, generally ranging between 12 to 83 square miles (Aubry et al. 2000, Squires et al. 2004, Vashon et al. 2005). The size of lynx home ranges varies depending on abundance of prey, the animal's gender and age, season, and the density of lynx populations (Koehler 1990, Poole 1994, Mowat et al. 2000). When densities of snowshoe hares decline, for example, lynx enlarge their home ranges to obtain sufficient amounts of food to survive and reproduce. Research supports the hypothesis that lynx home ranges at the southern extent of the species' range are generally large compared to those in the core of their range in Canada (Koehler and Aubry 1994, Squires and Laurion 2000).

Lynx are highly mobile and have a propensity to disperse long distances, particularly when prey becomes scarce (Mowat et al. 2000). Lynx also make long distance exploratory movements outside their home ranges (Aubry et al. 2000, Squires et al. 2001, Moen et al. 2010). Aubry et al. (2000) defined exploratory movements as long-distance movements beyond identified home range boundaries, in which the animal returned to its original home range. In Minnesota, exploratory movements were greatest for males during the breeding season in March (Burdett et al. 2007). In Montana, Wyoming, and southern British Columbia, exploratory movements during the summer months by resident lynx have been documented in numerous studies (Apps 2000, Squires and Laurion 2000, Squires and Oakleaf 2005). Distances of these exploratory movements in Montana ranged from 9 to 25 miles, and lasted anywhere between one week to several months (Squires and Laurion 2000).

Breeding typically occurs through March and April (Quinn and Parker 1987), and kittens are usually born between April and June depending on the region (Slough and Mowat 1996). In Montana, the average litter size in the Seeley Lake study area was 2.3 kittens and 3.2 kittens in the Purcell Mountains (Squires et al. 2006). The male lynx does not help with rearing young (Eisenberg 1986) and den use typically ends between late June and late July (Olson et al. 2011). In northwestern Montana, females stayed at natal dens an average of 21 days, and the time spent at subsequent dens decreased with time since parturition (ibid.). The natural fluctuation in hare populations appears to greatly impact lynx breeding and kitten survival. In northern study areas during the low phase of the hare cycle, few if any live kittens are born, and few yearling females conceive (Poole 1994, Slough and Mowat 1996).

3. Habitat Requirements

The primary factor driving lynx behavior and distribution is the distribution of snowshoe hare, their primary prey. Snowshoe hares prefer boreal forest stands that have a dense horizontal understory to provide food, cover, and security from predators. Snowshoe hares feed on conifers, deciduous trees, and shrubs, and density is correlated to understory (horizontal) cover between approximately 3 to 10 feet above the ground or snow level (Hodges 2000b). Habitats most heavily used by snowshoe hares are stands with shrubs, stands that are densely stocked with trees, and stands at ages where branches have more lateral cover at a height used by hares (Hodges 2000b). Generally, earlier successional forest stages support a greater density of horizontal understory and more abundant snowshoe hares (Wolfe et al. 1982, Koehler 1990, Homyack et al. 2007). Mature, multistoried stands in boreal forests also have adequate dense understory to support abundant snowshoe hares (Griffin 2004, Squires et al. 2006).

Lynx are associated primarily with upper elevation coniferous forests dominated by mixtures of the following vegetation types: Douglas-fir, spruce-fir, fir-hemlock, and on drier sites, lodgepole pine (Aubry et al. 2000). In extreme northern Idaho, northeastern Washington, and northwestern Montana, cedar-hemlock habitat types may also be considered primary vegetation. Secondary vegetation interspersed within subalpine forests may also contribute to lynx habitat. Dry forest types (e.g. ponderosa pine) do not provide lynx habitat.

In the United States, lynx inhabit conifer and conifer-hardwood habitats that support their primary prey, snowshoe hares. Both timber harvest and natural disturbance processes (e.g., fire, insect infestations, catastrophic wind events) can provide foraging habitat for lynx when resulting understory stem densities and structure provide the forage and cover needs of snowshoe hare (Parker et al. 1983, Bailey et al. 1986, Koehler 1990, Agee 2000). These characteristics also include a dense, multi-layered understory that maximizes cover and browse at both ground level and at varying snow depths throughout the winter in order to provide cover and food for snowshoe hares. Despite the variety of habitats and settings, good snowshoe hare habitat typically has a common feature – dense, horizontal vegetative cover 1 to 3 meters (3 to 10 feet) above the ground or snow level (Hodges 2000b). Multi-story boreal forests usually provide this structure, as well as high levels of cover preferred by lynx.

Cover is important to lynx when hunting (Brand et al. 1976). Lynx have been observed (via snow tracking) to avoid large openings during daily movements within the home range, seeming to prefer to move through continuous forest, using the highest terrain available such as ridges and saddles (Koehler 1990, Staples 1995). Kesterson (1988) and Staples (1995) reported that lynx hunted along the edges of mature stands within a burned forest matrix, and Major (1989) found that lynx hunted along the edge of dense riparian willow stands. In Montana, lynx preferentially foraged in spruce-fir forests with high horizontal cover, abundant hares, and large diameter (greater than 11 inches dbh) trees during the winter (Squires et al. 2006). Lynx tended to avoid sparse, open forest and forest stands dominated by small-diameter trees during the winter.

Lynx use a variety of types of large woody debris, such as downed logs, root wads, and windfalls, to provide denning sites with security and thermal cover for kittens (McCord and Cardoza 1982, Koehler and Brittell 1990, Squires et al. 2006, Squires et. al. 2008). During the first few months of life, kittens are left alone at these sites when the female lynx hunts. Downed logs and overhead cover provide protection of kittens from predators, such as owls, hawks, and other carnivores during this period. The age of the forest stand does not seem as important for denning habitat as the amount of horizontal structure available (Mowat et al. 2000, USFWS 2007). This cover provides hiding cover and shelter for kittens. Den sites may be located within older regenerating stands (>20 years since disturbance) or in mature conifer or mixed conifer-deciduous (typically spruce/fir or spruce/birch) forests. In Montana, lynx selected den sites with higher horizontal cover than elsewhere in the animal's home range (Squires et al. 2006, Squires et al. 2008).

Denning habitat in or near foraging habitat is likely to be most functional and selected by females. The hunting range of females is restricted at the time of parturition, and their need to feed kittens requires an abundance of prey. Lynx, like other felids, frequently move their kittens until they are old enough to hunt with their mother. Multiple nursery sites are used that provide kittens with overhead cover and protection from predators and the elements. Downed logs and overhead cover throughout the home range provides security when lynx kittens are old enough to travel (Koehler 1990).

4. Range-Wide Status

Because of the limitations and uncertainty in the historical records of lynx occurrence in the contiguous United States, it is difficult to compare the current distribution and status of resident lynx populations in the DPS with what may have been the historical condition. However, research and surveys over the last 2 decades have significantly improved our understanding of the current distribution, habitats, and the status of resident populations compared to what was known when the DPS was listed in 2000. For example, although we knew there were some resident lynx in Maine (Unit 1), we lacked information on the quality and distribution of lynx and hare habitats and the potential number of lynx. We now know this unit currently has large areas of high-quality habitat created by the regeneration of areas of extensive clear-cutting in the 1970s and 1980s in response to a large spruce budworm outbreak, that there are probably more lynx in Maine now than was likely under historical natural disturbance regimes and habitat distributions, and that currently this unit probably supports the largest resident lynx population in the DPS. Similarly, when the DPS was listed, we were uncertain whether Minnesota (Unit 2) supported a resident population. We now know that a persistent population occupies the northeastern corner of the state. Research also suggests that lynx and habitats in the western United States (Units 3, 4, 5, and 6) are naturally less abundant and more patchily-distributed than was thought at the time of listing, and several areas thought to have historically supported small resident populations currently do not (the Greater Yellowstone Area [Unit 5], the Garnet Mountains in western Montana [Unit 3], and the Kettle Mountains of northeastern Washington). We also know that recent extensive wildfires in north-central Washington (Unit 4) have substantially reduced (probably temporarily) the amount of high-quality lynx habitat and likely caused a decline in lynx numbers there. Finally, as a result of the release of 218 Canadian and Alaskan lynx from 1999-2006 and the subsequent survival and reproduction of some of these lynx and some of their offspring, resident lynx currently occupy parts of western Colorado (Unit 6), although the current number of lynx there is uncertain. Table IV-2 below summarizes each of the six geographic units within the contiguous United States DPS.

Table IV-2. Lynx Geographic Units in the Contiguous United States DPS.

Unit No.	Name	Size (km^2)
Unit 1	Northern Maine	28,909
Unit 2	Northeastern Minnesota	21,101
Unit 3	Northwestern Montana/Northeastern Idaho	26,997
Unit 4	North-central Washington	5,176
Unit 5	Greater Yellowstone Area	23,687
Unit 6	Western Colorado	25,294

The following summarizes the status of the lynx DPS in the contiguous United States by geographic unit:

Unit 1 – Northern Maine

This geographic unit encompasses the northern hardwood and spruce-fir (Acadian) forest in roughly the northern half of Maine. Resident lynx in this unit represent the southern periphery of a larger and highly resilient population (Harrison 2017) that also occupies southern Quebec (where trapping is legal) and northern New Brunswick (where lynx are a provincially-endangered species and harvest is prohibited). Although the actual number of resident lynx in this unit is unknown, the Maine Department of Inland Fisheries and Wildlife believes this unit currently may be capable of supporting 750-1,000 lynx based on estimates of habitat distribution and lynx home range sizes (Vashon et al. 2012), which would make it the largest population in the DPS. This is many more resident lynx than likely occurred historically and many more than were suspected to occur in this unit when the DPS was listed, and it is the result of extensive clearcutting and herbicide application to salvage spruce-fir and encourage softwood regeneration following a severe spruce budworm outbreak in the 1970s and 1980s (Hoving et al. 2004, Vashon et al. 2008, Simons 2009). Those past treatments have created the current extensive distribution of young, regenerating softwood stands that provide optimal hare foraging habitat. Lynx responded to these conditions with high survival and reproduction, small home ranges, and the highest densities documented in the DPS. Historically, under a more natural disturbance regime, Maine typically had a greater proportion of mature forest and, therefore a patchier distribution of high-quality habitat that likely supported a smaller lynx population that may have been more dependent on immigration from Canada. State forestry regulations passed in 1989 caused landowners to shift to various forms of partial harvesting that have resulted in lower landscape hare densities across much of the unit. Hare populations do not seem to cycle in this region, but hare density estimates from 2008-2015 declined by over 50 percent compared to estimates from 2001-2006. Reproduction and adult survival declined in the low-hare environment after 2006, although kitten survival remained high.

Unlike other DPS units, lynx habitat in northern Maine occurs nearly entirely on private, industrial forest lands, most of which lack long-term commitments to lynx management. The majority of private lands in this unit are now owned by investment companies seeking to diversify income from their investments, which could result in forest practices less likely to maintain or conserve hare and lynx habitat. Other potential stressors to lynx in this unit include incidental trapping, road mortality, large-scale wind energy development, residential and resort development, and parcelization of forestlands from rapid turnover in investment company landowners. Another spruce budworm outbreak may be imminent, and forestry response by investment landowners is uncertain. Climate change is a concern because average annual snowfall and duration are currently at the minimum thresholds believed necessary to give lynx a competitive advantage over bobcats and other mesocarnivores. Although lynx regularly occur outside this unit in southeastern and southwestern Maine, and small numbers of reproducing lynx have also been documented recently in northern New Hampshire and northern Vermont, the ability of some of these peripheral areas to support persistent breeding populations is questionable. However, recent telemetry data in Maine suggest that resident lynx are expanding both east and south of the Northern Maine Geographic Unit, with home range maintenance and reproduction documented in both areas, which previously were considered outside the area capable of supporting resident lynx (Vashon 2017, pers. comm.).

Unit 2 – Northeastern Minnesota

This geographic unit contains a mix of upland conifer and hardwood interspersed with lowland conifer, alder (Alnus spp.) or willow (Salix spp.) shrub swamps, and black spruce (Picea mariana) or tamarack (Larix laricina) bogs. Despite uncertainty when the DPS was listed, it has become apparent that a reproducing resident population of roughly 50 to 200 lynx exists in northeastern Minnesota. This unit is directly connected to lynx habitats and populations in Canada, and lynx in this unit likely represent the southern extent of a larger cross-border population, most of which occurs in Ontario, where trapping of lynx is legal. Lynx in Minnesota select regenerating forest dominated by conifer with extensive forest edge; lynx beds (resting and hunting) and kill sites are associated with regenerating and mixed forest (Burdett 2008). Hare densities in parts of northeastern Minnesota appear to be sufficient to support a viable lynx population and are highest in regenerating forests (McCann and Moen 2011). The Superior National Forest continues to manage lynx habitats in accordance with its 2004 Forest Plan, which includes measures to minimize several risk factors and promote lynx conservation on the forest. Management of lynx habitat on State and private lands is voluntary and lacks long-term commitments to lynx management. Factors affecting current conditions in this unit primarily include forestry management, roads, and incidental trapping; other factors that could potentially impact resident lynx in this unit include mining development, snow compaction related to winter recreation, competition with bobcats, and lynx-bobcat hybridization. Since 2000, 45 lynx mortalities have been documented in Minnesota from unknown causes (16), incidental trapping (11), vehicle collisions (9 on roads and 2 on railroads), and illegal shooting (7). Six lynx radio-collared in Minnesota died after traveling north into Ontario, 4 from legal trapping/hunting, and 2 from unknown causes; some of these mortalities occurred years after the lynx was last located in Minnesota, indicating survival of Minnesota lynx in Ontario for extended periods is possible.

Unit 3 – Northwestern Montana/Northeastern Idaho

The historical and current sizes of the resident lynx population in this unit are unknown, but it is thought currently to be capable of supporting 200-300 lynx home ranges. Habitats capable of supporting resident lynx in this unit are naturally patchier and less-broadly distributed (Squires et al. 2006, 2013), and lynx therefore naturally rarer, than was thought when the DPS was listed

(ILBT 2013, Lynx SSA Team 2016). Minor genetic differences suggest 3 subpopulations in the northwest (Purcell Mountains), central (Seeley Lake), and southern (Garnet Mountains) parts of the unit. No lynx were detected in the Garnet Range from 2011 to 2015, prompting concerns about the potential loss of the small resident population (perhaps 7-10 lynx) documented there in the mid-1980s and again recently from 2002 to 2010. However, whether this absence indicates the extirpation of a previously persistent resident population or the temporary loss of an historically ephemeral population is uncertain. A single lynx was verified in the Garnet Range in February 2016, indicating that natural recolonization of the area is possible; however, subsequent surveys have failed to detect that lynx or other lynx, and there currently remains no evidence of lynx residency in this mountain range (Lieberg 2017, pers. comm.). Most (about 90 percent) of this unit is managed to conserve and restore lynx and hare habitats, including on federal, state, tribal, and some private lands. Past timber harvest and associated management (e.g., thinning, road construction, fire suppression) appear to have had localized impacts but not to have diminished the unit's ability to support resident lynx, with habitats in the Garnet Range being a possible exception. The size, frequency, and intensity of wildfires in this unit have increased over the past several decades, likely in response to climate warming, but population-level impacts to lynx have not been documented. Whether (and if so to what extent) other climate-mediated factors have influenced the current condition of lynx populations or habitats in this unit are also unknown. Regulations prohibit lynx trapping and require measures to reduce the likelihood of trapping lynx incidentally when legally trapping other species. Hare densities have not been estimated broadly throughout the unit but appear to be low or marginal even in what is considered the highest-quality habitat, suggesting that even small decreases in habitat quality/hare densities could influence its continued ability to support resident lynx. The role of past and recent immigration in maintaining the demographic and genetic health of current lynx populations in this unit is unknown, but peaks in cyclic lynx numbers in Canada have declined, especially when compared to the unprecedented irruptions of the early 1960s and 1970s, and there is no evidence of significant immigration into this unit since then.

Unit 4 – North-central Washington

This geographic unit encompasses extensive boreal forest vegetation types and is directly connected to lynx habitats and populations in British Columbia. It represents about 58 percent of the Okanogan Lynx Mangagement Zone (LMZ). Historical and current resident lynx numbers in northern Washington are unknown, but recent habitat and home range analyses for the larger Okanogan LMZ (summarized in Lewis 2016) suggest that this geographic unit may have been capable of supporting about 50 lynx prior to extensive wildfires over the past 2-3 decades (85-90 lynx in the entire LMZ). Those fires affected over a third of the LMZ, led to increased home range size, and may have reduced the carrying capacity of this unit to perhaps 30 lynx currently (50-55 in the entire LMZ). Additional extensive wildfire activity in the northern part of this unit in 2017 may result in further reduction of carrying capacity. The recent increases in wildfire frequency, size, and intensity in lynx habitat in this unit may have been influenced by climate change (Westerling et al. 2006). Burned habitats are expected to regenerate back into suitable lynx habitat, but this may take 10-40 years. However, additional wildfire activity in this unit before previously burned areas recover could substantially reduce the viability of the lynx population in this geographic unit (see section 5.2.4). Because of these habitat impacts and remaining stressors to lynx, the Washington Department of Fish and Wildlife recently submitted, and the State Fish and Wildlife Commission adopted, a proposal to uplist lynx from threatened to endangered within the State. Hare densities in Washington are generally at the low end of the range thought necessary to support lynx persistence. The Okanogan-Wenatchee and Colville National Forests, which administer more than 90 percent of lynx habitat in Washington, continue to manage in accordance with the LCAS. Additionally, the Washington Department of Natural Resources, which manages approximately 4 percent of lynx habitat in Washington, developed a Lynx Habitat Management Plan in 1996, which was updated in 2006 and is also largely based on the LCAS. The Kettle Range to the east of this unit was suspected to have supported a small (likely fewer than 20 individuals) resident population until about 30 years ago when over-trapping compounded by habitat changes may have resulted in its extirpation (Stinson 2001, Koehler et al. 2008). Potential impediments to lynx movement between the Kettle Range and the Cascades and British Columbia may make natural recolonization of the Kettle Range unlikely.

Unit 5 – Greater Yellowstone Area

There are no reliable estimates of current or historical lynx numbers in this unit but, given its naturally-fragmented potential habitat, generally low hare densities, and the paucity of verified records, it appears unlikely this unit ever supported a large resident population, and it is possible that this unit historically supported resident lynx only ephemerally. No lynx have been verified in this unit since 2010, but whether this indicates the extirpation of a small but previously persistent resident population or the temporary loss of an historically ephemeral population is uncertain. Over 97 percent of this unit consists of Federal lands that are currently managed to conserve and restore lynx and hare habitats. Past timber harvest and associated management (thinning, road construction, fire suppression) appear to have had localized impacts but not to have diminished the unit’s ability to support resident lynx. The size and intensity of wildfires have increased over the past several decades, predominantly in the northern half of the unit (including the large fires of 1988 in Yellowstone National Park) and likely in response to climate warming, but impacts to lynx are uncertain. Whether (and if so to what extent) other climate-mediated factors have influenced the current condition of lynx populations or habitats in this unit are also unknown. Snow conditions currently appear to be adequate, with most of this geographic unit modeled to have a 95 percent probability of providing snow cover conditions supportive of lynx presence (Gonzalez et al. 2007). Hare densities were very low in most of Yellowstone National Park but high in parts of the Bridger-Teton National Forest in the southern half of the unit. The role of past and recent immigration in maintaining the demographic and genetic health of lynx populations in this unit is unknown. This unit lacks direct connectivity to other lynx populations, and there is only anecdotal evidence that irruptions of lynx from Canada resulted historically in immigration into this unit. At least 9 lynx released in Colorado dispersed northward into this unit and some temporarily occupied home ranges in areas used previously by native resident lynx, but there is no evidence of long-term occupancy or reproduction by these lynx.

Unit 6 – Western Colorado

The current and historical numbers of resident lynx numbers in this unit are unknown, but Colorado Parks and Wildlife lynx biologists believe it currently could support 100-250 lynx as a result of the 1999-2006 release of 218 lynx from Canada and Alaska. Released lynx had high survival but the proportion of females producing kittens and kitten survival were low. This unit is not directly connected to lynx populations in Canada, and it does not appear to have received immigrant lynx during the historicaly large irruptions of the early 1960s and early 1970s. Since

1996, 2 unprecedentledly large bark beetle epidemics have affected about 16,200 km^2 (6,255 mi^2) of spruce-fir and lodgepole pine forests in Colorado, including much of the lynx habitat in this unit. Additionally, the 2013 West Fork Complex fire impacted more than 400 km^2 (154 mi^2) of lynx habitat in the San Juan Mountains. Beetle outbreaks do not appear to have negatively impacted hares, and hare numbers may increase in affected areas as succession progresses; however, they have negatively impacted red squirrels, an important alternate prey species for lynx in this unit. Areas affected by beetles that contained multi-story stand conditions likely continue to provide habitat to support snowshoe hares and lynx. Areas affected by fire may require 20 years or more, and in some areas considerably longer, to recover to a point where the stands will again support snowshoe hares. Large-scale monitoring efforts in the San Juans documented continued lynx occupancy during 2010-11, 2014-15, and 2015-2016, and it is reasonably likely that lynx continue to occur in all national forests within the State of Colorado. Snowshoe hare habitat is naturally patchily-distributed in this geographic unit, which limits hare abundance. Because the majority (90 percent) of potential lynx habitat in Colorado is under federal land management, actions occurring on other ownerships are unlikely to result in significant impacts to lynx habitat within this unit. The USFS manages over 85 percent of the lynx habitat in this unit, providing conservation through the Southern Rockies Lynx Amendment. However, regulatory mechanisms for the conservation of lynx are lacking on approximately 3,159 km^2 (1,220 mi^2; over 12 percent) of this unit, including lynx habitats on some BLM and some non-Federal lands.

5. Status of Lynx Designated Critical Habitat

The Service published a revised designation of critical habitat for the contiguous United States distinct population segment of the Canada lynx on September 12, 2014, which became effective on October 14, 2014 (79 FR 54782). In total, approximately 38,955 square miles have been designated within five units in the states of Maine, Minnesota, Montana, Wyoming, Idaho, and Washington (see Table IV-3).

Table IV-3. Critical habitat units designated for lynx (79 FR 54782).

Critical Habitat Units	Area Designated (mi^2)	Land Ownership
Unit 1: Maine	10,123	Private, State, Federal
Unit 2: Minnesota	8,069	Federal, State, Private
Unit 3: Northern Rocky Mountains (MT and ID)	9,783	Federal, Private, State
Unit 4: North Cascades	1,834	Federal, Private
Unit 5: Greater Yellowstone Area (MT and WY)	9,146	Federal, State, Private
TOTAL	**38,955**	

The five units contain the physical and biological features essential to the conservation of the lynx as they are comprised of the primary constituent element and its components laid out in the appropriate quantity and spatial arrangement. The units are discussed below with information taken from the final rule revising designated critical habitat for lynx (79 FR 54782) followed by a discussion on the primary constituent element and its components.

Critical Habitat Units

Unit 1 is located in northern Maine in portions of Aroostook, Franklin, Penobscot, Piscataquis, and Somerset Counties. This area was occupied by the lynx at the time of listing and is currently occupied by the species. This area is the one area in the northeastern region of the lynx's range within the contiguous United States that currently supports breeding lynx populations and may serve as a source of lynx, or provide connectivity for more peripheral portions of the lynx's range, in the Northeast.

Unit 2 is located in northeastern Minnesota in portions of Cook, Koochiching, Lake, and St. Louis Counties. This area was occupied by the lynx at the time of listing and is currently occupied by the species. Lynx are currently known to be distributed throughout northeastern Minnesota. This area is essential to the conservation of lynx because it is the only area in the Great Lakes region for which there is evidence of recent lynx reproduction. It likely acts as a source or provides connectivity for more peripheral portions of the lynx's range in the region. National Forest land in Unit 2 is managed under Forest Plans that have incorporated management direction similar to the NRLMD, which reduces or eliminates adverse effects on lynx, by reducing adverse effects on habitat important to lynx.

Table IV-4. Square miles of lynx critical habitat per ownership per state in Lynx Critical Habitat Unit 3: Montana and Idaho (79 FR 54782).

	Federal (mi^2)	State (mi^2)	Private(mi^2)
Montana	8,743	156	839
Idaho	45	.04	0

Unit 3 is located in the Northern Rocky Mountains of northwestern Montana, in portions of Flathead, Glacier, Granite, Lake, Lewis and Clark, Lincoln, Missoula, Pondera, Powell, and Teton Counties and in a small portion of northeastern Idaho in Boundary County. This area is approximately 9,783 square miles, was occupied by the lynx at the time of listing, and is currently occupied by the species. Lynx are known to be widely distributed throughout this unit and breeding has been documented in multiple locations. This area is essential to the conservation of lynx because it appears to support the highest density lynx populations in the Rocky Mountain region of the lynx's range. It likely acts as a source for lynx and provides connectivity to other portions of the lynx's range in the Rocky Mountains, particularly the Yellowstone area. Table IV-4 illustrates the preponderance of federal lands designated as critical habitat, which are primarily National Forest system lands, within Unit 3. Timber harvest and management are dominant land uses, and so special management is required depending upon the silvicultural practices conducted. Timber management practices that provide for a dense understory are beneficial to lynx and snowshoe hares. National Forest lands in Unit 3 are managed under the NRLMD (U.S. Forest Service 2007a). The NRLMD includes a suite of management directives that enhance, maintain, and conserve dense understories within this habitat.

Unit 4 is located in the North Cascade Mountains of north-central Washington in portions of Chelan and Okanogan Counties and includes BLM lands in the Spokane District as well as Loomis State Forest lands. This area was occupied by the lynx at the time of listing and is currently occupied by the species. This unit supports the highest densities of lynx in Washington. This area is essential to the conservation of lynx because it is the only area in the Cascades region of the lynx's range that is known to support breeding lynx populations. National Forest lands in Unit 4 are managed under the 2006 Conservation Agreement (U.S. Forest Service and U.S. Fish and Wildlife Service 2006), which defers any projects that adversely affect lynx until Forest Plans are amended to consider the conservation needs of lynx and lynx habitat.

Unit 5 is located in the Greater Yellowstone Area of southwestern Montana, in portions of Carbon, Gallatin, Park, Stillwater, and Sweetgrass Counties, and in northwestern Wyoming in portions of Fremont, Lincoln, Park, Sublette, and Teton Counties. This area was occupied by the lynx at the time of listing and is currently occupied by the species. The Greater Yellowstone Area is inherently marginal lynx habitat with highly fragmented foraging habitat (snowshoe hare habitat). For this reason, lynx home ranges in this unit are likely to be larger and incorporate large areas of non-foraging matrix habitat. Table IV-5 illustrates the preponderance of federal lands designated as critical habitat, which are primarily National Forest system lands, within Unit 5. National Forest lands in Unit 5 are managed under either the NRLMD (U.S. Forest Service 2007a) or the Southern Rockies Lynx Management Direction (U.S. Forest Service 2008), which provides management direction similar to the NRLMD.

Table IV-5. Square miles of lynx critical habitat per ownership per state in Lynx Critical Habitat Unit 5: Montana and Wyoming (79 FR 54782).

	Federal (mi^2)	State (mi^2)	Private(mi^2)
Montana	2,235	12	140
Wyoming	6,688	10	60

Primary Constituent Element of Critical Habitat

The physical and biological features that are essential to the conservation of lynx were identified within the geographical area occupied by lynx at the time of listing. These physical and biological features are the primary constituent element (PCE) laid out in a specific quantity and spatial arrangement to be essential to the conservation of the species. Based on this and the current knowledge of the life history, biology, and ecology of lynx, the PCE for lynx critical habitat is (79 FR 54811):

1. Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:
2.
    a. Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs

touching the snow surface;

b. Winter conditions that provide and maintain deep, fluffy snow for extended periods of time;

c. Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and

d. Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Activities that May Affect Critical Habitat

The final rule also described activities that may affect critical habitat and therefore should result in consultation. These activities include, but are not limited to: (79 FR 54827):

1. Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx. These activities could significantly reduce the quality of snowshoe hare habitat such that the landscape's ability to produce adequate densities of snowshoe hares to support persistent lynx populations is at least temporarily diminished.

2. Actions that would cause permanent loss or conversion of the boreal forest on a scale proportionate to the large landscape used by lynx. Such activities could eliminate and fragment lynx and snowshoe hare habitat.

3. Actions that would increase traffic volume and speed on roads that divide lynx critical habitat. These activities could reduce connectivity within the boreal landscape for lynx, and could result in increased mortality of lynx within the critical habitat units.

Further, the rule notes that in matrix habitat, activities that change vegetation structure or condition would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range, or if they adversely affect adjacent foraging or denning habitat.

6. Factors Affecting the Status of Lynx Rangewide

The final rule listing lynx as a threatened species (65 FR 16052) concluded that the primary factor threatening the lynx DPS was the inadequacy of existing regulatory mechanisms, specifically, the lack of guidance for conservation of lynx in federal land management plans. The USFS manages the vast majority of lynx habitat in the U.S. The Service concluded that the lack of Forest Plan guidance for conservation of lynx, as evidenced by the fact that, at the time of listing, forest plans allowed or directed actions that cumulatively could adversely affect lynx, was a significant threat to the contiguous United States DPS of lynx. The remanded determination in our clarifications of findings of our final rule (68 FR 40076) affirmed the findings in the final rule.

Based on a review of all past and recent literature, the following are risk factors potentially affecting lynx. These risk factors have varying effects on lynx, depending upon the nature, location, duration and timing of the activity. Some risk factors present more likelihood of risks to lynx, while others are relatively benign in effects. The Service believes vegetation management (including fuels management), wildfire management, habitat loss and fragmentation, and climate change have the greatest potential to influence lynx and snowshoe hares and the population-level. Other risks that may impact lynx but are unlikely to result in population-level effects include incidental trapping, recreation, mineral and energy development, illegal shooting, forest /backcountry roads and trails, and livestock grazing. The discussion of risk factors is largely excerpted from the Revised LCAS prepared by the Interagency Lynx Biological Team (ILBT 2013).

Vegetation Management

Stand structure, composition and arrangement are important elements of habitat for snowshoe hares and lynx. Vegetation management practices can have beneficial, neutral, or adverse effects on lynx and snowshoe hare habitat and populations, and the duration of these effects varies widely. Vegetation management occurs across the range of the lynx and can directly affect important habitats and prey. Management activities uninformed by consideration of negative impacts to the species were identified as being of potential concern to lynx conservation (68 FR 40076).

Throughout the DPS range, hares and lynx are associated with dense regenerating early successional conifer (typically spruce-fir) stand. Historically, the dominant processes that created early successional stages within the range of the lynx were wildlife, forest insect and disease outbreak, and wind/ice events (Kilgore and Heinselman 1990, Heinselman 1996, Veblen et al. 1998, Agee 2000, Seymour et al. 2002, Lorimer and White 2003). In the DPS range, wildlife was the predominant natural disturbance in the West and in the Great Lakes Region, but was less important in the Northeast.

After disturbances, forests generally develop through several stages described by Oliver (1980) as “stand initiation”, “stem exclusion”, “understory reinitiation”, and “old growth”. Stand dynamics, particularly within-stand competition for light, nutrients, and space, determine how forests grow and respond to intentional manipulations and natural disturbances (Oliver and Larson 1996). The frequency and severity of disturbances influence which species will dominate in a stand after the disturbance event. During the stand initiation structural stage (SISS), trees that are established and tall enough to protrude above snow cover may provide winter snowshoe hare and lynx habitat. During the stem exclusion stage, the tree crowns lift and lower branches self-prune, thus growing above the reach of snowshoe hares. As the stand moves into understory reinitiation and old growth structural stages, food and cover may again become available to support snowshoe hares.

Commercial timber management of conifer forests traditionally has been designed to: reduce tree density and promote tree growth (e.g., precommercial thinning), especially in young regenerating forests; improve growth and vigor of mature trees (e.g., commercial thinning, thinning from below); reduce the vulnerability of commercially-valuable trees to insects and disease (e.g., commercial thinning, group selection); and harvest forest products (e.g., regeneration harvest). Timber management practices may mimic natural disturbance processes but management for timber production in not an appropriate ecological substitute. Some practices, such as use of herbicides to suppress hardwood regeneration, do not have a historical analogue. Timber harvest may differ from natural disturbances by:

- Removing most standing biomass from the site, especially larger size classes of trees, and down logs, which alters microsite conditions and nutrient cycling;
- Creating smaller, more dispersed patches and concentrating harvest at lower elevations in mountainous regions and on more nutrient rich soils, resulting in habitat fragmentation:
- Causing soil disturbance and compaction by heavy equipment, which may result in increased water runoff and slower tree growth at the site; or
- Giving a competitive advantage to commercially-valuable tree species and reducing the structural complexity of the forest through the application of harvest, planting, thinning and herbicide treatments.

Where the objective is to provide snowshoe hare habitat by creating additional early successional forest conditions, management considerations include treating areas that are capable of, but not currently providing, dense horizontal cover (e.g., stem exclusion structural stage), designing the appropriate size and shape of treatment units, retaining coarse woody debris, and maintaining high stem densities in regenerated forests (Koehler and Brittell 1990, Homyack et al. 2004, Bull et al. 2005, Fuller and Harrison 2005, Ivan 2011).

Precommercial thinning of young, dense regenerating conifers is generally designed to increase the growth of selected trees by removing competing trees of the same species or shrubs/trees of other species (Homyack et al. 2005, 2007). Reducing the density of sapling-sized conifers in young regenerating forests to increase the growth of certain selected trees promotes more homogeneous patches and reduces the amount and density of horizontal cover, which is needed to sustain snowshoe hares (Griffin and Mills 2004, Ausband and Baty 2005, Griffin and Mills 2007, Ellsworth 2009). Precommercial thinning using traditional methods has been shown to reduce hare numbers by as much as 2 and 3 fold in the first decade after treatment (Griffin and Mills 2007, Homyack et al. 2007) due to reduced densities of sapling and shrub stems and decreased availability of browse. Further, Griffin and Mills (2007) reported that, if their results were representative, the practice of precommercial thinning could significantly reduce snowshoe hares across the range of lynx.

In sub-alpine spruce/fir habitat types precommercially thinned stands are often initially dominated by sun-loving shrub and tree species (e.g., Western larch, lodgepole pine), but are subsequently "filled in" with shade-loving understory trees (e.g., sub-alpine fir). It has been suggested this could be a technique to extend the time that understory trees and low limbs provide the dense horizontal cover that constitutes snowshoe hare habitat. The duration between time of thinning and regrowth to a height providing winter snowshoe hare habitat would likely vary by tree species, each having different regenerative capacities which could be influenced by a variety of local factors (e.g., topographic relief, moisture, and mineral and organic content of the soil; Baumgartner et al. 1984, Koch 1996). Bull et al. (2005) reported that the slash and coarse woody debris remaining after precommercial thinning provided both forage and cover for snowshoe hares up to a year following treatment. Homyack et al. (2007) found that snowshoe hare densities were reduced following precommercial thinning for 1–11 years post-thinning. They further suggested that after precommercial thinning, the stands did not regain the structural complexity in the understory that would be needed to support snowshoe hare densities to the level that were present pre-treatment. Because of documented adverse effects of precommercial thinning to snowshoe hares and lynx, in 2007 and 2008 the USFS amended Forest Plans to incorporate management that would conserve lynx, including direction that prohibited precommercial thinning in most lynx foraging habitat (USFS 2007, 2008). However, precommercial thinning is not regulated on private forest lands throughout the remainder of the DPS.

If removal of large trees opens the canopy to the extent that the patch functions as an opening, this may discourage use by lynx (Koehler 1990a, von Kienast 2003, Squires et al. 2010). Removal of larger trees from mature multi-story forest stands to reduce competition and increase tree growth or resistance to forest insects may reduce the horizontal cover (e.g., boughs on snow), thus degrading the quality of winter habitat for lynx (Robinson 2006, Koehler et al. 2008, Squires et al. 2010). Similarly, removing understory trees from mature multi-story forest stands reduces the dense horizontal cover selected by snowshoe hares, and thus reduces winter habitat for lynx (Koehler et al. 2008, Squires et al. 2010).

Fuels treatments are commonly designed to remove understory biomass and reduce stem density in forests that are outside their historical range of variability, and to clear fuels adjacent to human developments for safety or to protect investments. These types of projects are becoming more common. In the western United States, projects designed to restore forests to a condition more representative of the historical range of variability are generally targeted to drier, lower-elevation forests affected by fire suppression (Hessburg et al. 2005), which are not lynx habitat. Lynx habitats in higher-elevation spruce-fir forests have been less affected by past fire suppression and are mostly within the historical range of variability (Agee 2000).

Fuels treatments may be needed to protect human communities and capital improvements by reducing the intensity and rate of spread of a fire, affording control actions with a higher probability of success and providing safer conditions for fire fighters. By removing or reducing the understory and ladder fuels to meet those objectives, dense horizontal cover important to snowshoe hares is reduced and habitat value is diminished for hares and lynx.

Prescribed burning is a technique used to reduce tree stem density and reduce fuels. In the Great Lakes area, prescribed burning is used in lynx habitat primarily as a tool to reduce fuels (including from blow-down) and mimic a more natural fire regime in pine forest types. In these instances there is a short-term (10–30 years) impact on snowshoe hare habitat. In the western United States, prescribed fire for ecosystem restoration is most applicable in the dry ponderosa pine and Douglas-fir forests that are not lynx habitat. Because spruce-fir forests are generally composed of thinner barked trees that are easily killed even with light fire, this technique is not used frequently in most lynx habitat. Biomass removal for energy production targets the removal of dead trees, logging slash and small diameter trees and shrubs. Biomass removal is similar to fuels treatments in reducing cover and habitat for snowshoe hares.

Wildland Fire Management

Fire and other natural disturbance processes historically played an important role in maintaining a mosaic of forest successional stages that provides habitat for both snowshoe hare and lynx (Koehler and Brittell 1990, Poole et al. 1996, Slough and Mowat 1996). The response of snowshoe hare and lynx in their use of habitat after fires follows a somewhat predictable pattern. For the first few years after a burn, there appears to be a negative correlation between lynx use and the amount of area burned (Fox 1978). This short-term effect is likely a response to a reduction of snowshoe hare populations, reduced cover, and possibly also increased competition from coyotes in the now-open habitat (Stephenson 1984, Koehler and Brittell 1990). The mid-term (10–40 years post-fire) effect on vegetation in a burned area is development of small tree and shrub cover sufficient for hare populations to reoccupy the area. The length of time varies depending on tree species, potential vegetation, fire severity, and the presence of re-sprouting broadleaf species. Where broadleaf species are denser, hare re-occupancy occurs more quickly (within 3–12 years). Hare population density again decreases as the conifer tree canopy develops and shades out the understory. Forest gap processes, such as tree blowdown, insect infestations, and outbreaks of disease, follow a similar pattern (Agee 2000).

Across the range of lynx, vegetation dynamics differ somewhat as a result of the natural fire frequency and intensity. For example, lynx habitat in the northeastern boreal forests had very long fire return intervals of up to 500 years (Agee 2000). The Great Lakes boreal forests tended to have shorter fire return intervals of 50–150 years (Heinselman 1996). In much of the Rocky Mountains, the fire regime was more variable in lynx habitat, with both frequent (35–100 years) stand-replacing or mixed severity fires, and infrequent (200+ years) stand-replacement fires (Morgan et al. 2001). The Cascade Mountains were dominated historically by infrequent (70-150 years) stand-replacing fire regimes (Agee 2000). Disturbance interval and fire severity vary by cover type, with xeric pine types such as lodgepole or jack pine typically experiencing more frequent and more severe fires than mixed conifer types and spruce/fir.

Land management agencies began effective fire suppression with the advent of aircraft support approximately 70 years ago. Over time, continued fire suppression altered vegetation mosaics and species composition. In jack pine forests of the Great Lakes region, fire suppression changed stand composition and successional pathways (Agee 2000). In the western United Stated, a shift to uncharacteristically severe and intense wildfires has occurred recently in lower-elevation forests (Quigley et al. 1996, Morgan et al. 2001). However, fire suppression in areas with a history of infrequent fires, as is typical of cool moist forest types such as spruce-fir forests, has probably not had much impact (Schoennagel et al. 2004).

Current federal wildland fire management policy recognizes fire as a natural ecological process essential to the health and resilience of some forest systems, and it attempts to balance the ecological, social, and legal aspects of wildfire (USDA and USDI 2009). However, the prior history of fire response was largely one of active suppression for most of the last century (Zimmerman and Bunnell 2000, USDA and USDI 2003, 68 FR 40092, Calkin et al. 2015) which, combined with other land-use practices, dramatically altered fire regimes in some places and created conditions prone to larger and more severe fires. Westerling et al. (2006) suggested fuel management and ecological restoration practices will likely not reverse current wildfire trends; large increases in the extent or frequency of wildfires in the western United States since 1970 resulted from increased temperatures and earlier spring snowmelt. Particularly in the western United States, ecosystem restoration is primarily focused in the dry and mesic forest types at lower elevations, rather than in lynx habitat, and includes reestablishing frequent, low intensity fire in those systems. Applying ecosystem restoration across a landscape may reduce the risk of uncharacteristic large, stand-replacing fires occurring in the lower-elevation forest types, and thereby help to prevent their spread into adjacent lynx habitat.

After large dead trees fall to the ground, they provide cover and may enhance lynx foraging habitat in the short term and potential denning habitat in the longer term, depending on post-disturbance stand conditions. Standing snags also may provide sufficient vertical structure and cover to allow lynx to traverse long distances (>1 km) across burned habitat (Maletzke 2004).

Similar to vegetation management, wildland fire management may diminish, enhance, or sustain the density and distribution of snowshoe hare prey resources and lynx habitat, depending on the design and implementation of programs and actions.

Habitat Fragmentation

Human-caused alterations of the natural landscape can reduce the total area of habitat, increase the isolation of habitat patches, and impair the ability of wildlife to effectively move between those patches of habitat. Habitat fragmentation may be permanent by converting forest habitat to residential or agricultural purposes, or temporary by creating an opening but allowing trees and shrubs to regrow. Fragmentation of habitat exacerbates the viability risk inherent in a small population and increases its vulnerability to local extirpation. The combination of human-caused and natural disturbances may exacerbate fragmentation effects.

Lynx habitat in the contiguous United States is inherently patchier than in the northern boreal forest, largely due to less dramatic topography and relatively consistent winter snow conditions (Aubry et al. 2000). The pronounced topographic relief in the mountains of the western United States restricts lynx habitat to a relatively narrow elevational band. A variety of anthropogenic activities can result in increased habitat fragmentation at the home range or broader scale. For example, permanent or temporary removal of forest cover, development of highways and associated infrastructure, and intensive minerals or energy development can fragment lynx habitat.

Within their home ranges, lynx strongly select for habitat patches that enhance their foraging opportunities (Fuller and Harrison 2010, Moen et al. 2008, Vashon et al. 2008, Squires et al. 2010). Analysis of winter movements of lynx in Maine indicated that lynx responded to habitat heterogeneity at a coarse scale within their home ranges, by maximizing their access to snowshoe hare prey (Fuller and Harrison 2010). In Montana, lynx selected homogeneous spruce-fir patches that supported snowshoe hares and avoided recent clear-cuts or other open patches (Squires et al. 2010). Similarly, in Washington, Lewis et al. (2011) reported that landscapes in which hare habitat was more contiguous, or surrounded by a mosaic of similar habitat quality, supported more snowshoe hares than did more fragmented landscapes.

Both lynx and hares are influenced by the spatial arrangement of preferred habitat. In Maine and northern Washington, landscapes where habitat was more contiguous supported more snowshoe hares than landscapes that were more fragmented (Lewis et al. 2011). Several studies (Mowat et al. 2000, von Kienast 2003, Maletzke 2004, Squires and Ruggiero 2007, Squires et al. 2010) have reported that lynx avoid large openings, especially during winter. Mowat et al. (2000) suggested that relatively few snowshoe hares use large openings, and consequently lynx spend little time hunting in these areas. Koehler (1990a) speculated that vegetation management prescriptions that result in distance to cover greater that 100 meters may change lynx movement and use patterns until such time as sufficient reestablishment of forest vegetation occurs.

Fragmentation of the naturally patchy pattern of lynx habitat in the contiguous United States can affect lynx by reducing their prey base and increasing the energetic costs of using habitat within their home ranges. Buskirk et al. (2000) identified direct effects of fragmentation on lynx to include creation of openings that potentially increase access by competing carnivores, increasing the edge between early successional habitat and other habitats, and changes in the structural complexities and amounts of seral forests within the landscape. At some point, landscape-scale fragmentation can make patches of foraging habitat too small and too distant from each other to be effectively accessed by lynx as part of their home range. Maintaining preferred habitat patches for lynx and hares within a mosaic of young to old stands in patterns that are representative of natural ecological processes and disturbance regimes would be conducive to long-term conservation. Vanbianchi et al. (2017) found that in large areas burned by stand-replacing wildfire, retention of unburned patches was important for providing lynx habitat.

Highways typically follow natural features such as rivers, valleys, and mountain passes that may have high value for lynx in providing habitat or connectivity. Various studies have documented lynx crossings of highways. A male lynx in western Wyoming was documented to have successfully crossed several 2-lane highways during exploratory movements (Squires and Oakleaf 2005). In Colorado, lynx successfully and repeatedly crossed major highways, including I-70 (Ivan 2011a, 2011c, 2012). However, in Alberta, Canada, high road densities, human activity, and associated developments appeared to reduce the habitat quality based on decreased occupancy by lynx (Bayne et al. 2008). Apps et al. (2007) found lynx were 13 times less likely to cross the Trans-Canada Highway relative to random expectation, but only 2.2 and 3.1 times less likely to cross Canadian Highway 93 and Highway 1A, respectively, compared to random expectation.

Highways pose a risk of direct mortality to lynx and may inhibit lynx movement between previously connected habitats. If lynx avoid crossing highways, this could lead to a loss of effective habitat within a home range and/or reduced interaction within a local population (Apps et al. 2007). Lynx and other carnivores may avoid using habitat adjacent to highways, or become intimidated by highway traffic when attempting to cross (Gibeau and Heuer 1996, Forman and Alexander 1998). As the standard of road increases from gravel to 2-lane or 4-lane highways, traffic volumes and the degree of impact are expected to increase. Four lane highways, such as the interstate highway system, commonly include fences, "Jersey barriers", and service roads and may run parallel to railroads or power lines that make successful crossing more difficult, or impossible, for wildlife. Alexander et al. (2005) suggested traffic volumes between 3,000 and 5,000 vehicles per day may be the threshold above which successful crossings by carnivores are impeded.

Recreation

The effects of outdoor recreation on lynx and their habitat remain unclear, but effects likely depend on the type of activity and the context within which it occurs. Construction or expansion of developed areas such as large ski areas and 4- season resorts, as well as smaller recreational sites like nordic ski huts or campgrounds, may directly remove forest cover. Such removal in lynx habitat could decrease prey availability, affect lynx movement within home ranges, or result in a more fragmented landscape.

Few studies have examined how lynx react to human presence. Anecdotal information suggests that lynx are quite tolerant of humans, although given differences in individuals and contexts, a variety of behavioral responses to human presence may be expected (Staples 1995, Mowat et al. 2000). Some wildlife species have been found to be more sensitive to disturbance when bearing and rearing young than in other times of the year. Olson et al. (2011) reported they approached 8 dens of females; half of the females moved their dens within 4 days, while the other half did not move dens for at least 20 days following disturbance. The same study noted that lynx dens were located in more remote areas and unlikely to be disturbed by humans.

More than 50 ski areas exist throughout the range of the lynx in the contiguous United States. Most ski areas are located on north-facing slopes, where ample snow conditions provide for extended ski/snowboard seasons. In the western states, many of these landscapes feature spruce-fir forests. While ski resorts occupy a small proportion of the landscape, spruce-fir forests provide important stable habitat for snowshoe hares and lynx at the southern extent of their range. In winter, alpine and Nordic skiing and snowboarding are the primary uses. Most of these resorts offer year-round recreation, with summer activities typically including hiking and mountain biking.

Ski resort development may fragment the forested landscape. One ski run is often separated from the next only by small inter-trail forest islands. Ski runs often are intermixed with other open areas such as open or gladed bowls, rock outcrops or barren tundra ridges. Ski resorts that are built or expanded in lynx habitat may impact lynx by removing forest cover, reducing the snowshoe hare prey base, and creating or increasing human disturbance in or near linkage areas. There is limited information on lynx behavior and habitat use in and around ski areas. Lynx have been known to incorporate smaller ski resorts within their home ranges, but may not utilize the large resorts.

Most backcountry ski hut sites are primitive in nature. Some facilities may have utilities, summer road access, and on-site storage for grooming equipment and fuel. Use by snowmobile clubs and the general public is often focused or concentrated around these sites. Many have developed trail systems that loop around the site or provide access to other remote areas. These facilities are generally located along designated cross-country ski and snowmobile routes. Users compact the snow along the route to/from the huts and in the immediate vicinity. Off-trail travel has the potential to create larger areas of compacted snow. However, this local snow compaction is short term and not likely to change the competitive interactions between lynx and carnivores.

Minerals and Energy Development

Mining and oil and gas exploration and production activities occur primarily within the western units of the DPS although there is increased interest in mining in the Minnesota and Maine units. Lynx habitats may be lost and fragmented as a result of mining, similar to other development: loss of boreal forest; construction of roads, railroads, and transmission lines; and increased human access and disturbance where lynx occur. In the West, for example in the Wyoming Range (Unit 5), extensive oil and coal bed methane development can affect large areas of landscape (e.g., 1 well per 2-4 ha (5-10 ac) and could diminish potential lynx habitat in some areas. Open pit and subsurface mines can affect from tens to thousands of hectares of habitat. To reduce effects of mineral development, land exchanges are sometimes implemented to consolidate private land ownership of the surface above a deposit to be mined. Depending on the lands exchanged, this could retain lynx habitat in public ownership. Surface deposits of minerals and gravel for forest road construction are excavated within some lynx areas and vary from a single truck load to tens of acres. Although mining and oil and gas development can result in loss and fragmentation of lynx habitats, thus far, effects to DPS lynx populations have not been demonstrated.

Forest/Backcountry Roads and Trails

Forest and backcountry roads are typically low-speed (<45 mph), single or double-lane gravel or paved roads. Extensive (>600 km) backtracking studies found that lynx did not avoid gravel forest roads (Squires et al. 2010). Trails are typically narrow routes with a native surface; there is no information to suggest that trails have negative impacts on lynx.

Construction of roads results in a small reduction of lynx habitat by removing forest cover. In some instances, vegetation along less-traveled roads provides good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging (Koehler and Brittell 1990). Similar to McKelvey et al. (2000d), Squires et al. (2010) concluded that forest roads with low vehicular or snowmobile traffic had little effect on lynx seasonal resource-selection patterns in Montana. In Maine, Fuller et al. (2007) documented lynx traveling on roads (unplowed during winter), but determined that roads and their associated edges were selected against within home ranges. Lynx may have exhibited negative selection for road edges because these areas were associated with the lowest density of conifer saplings and hare abundance compared to all other stand types.

Squires et al. (2008) reported that lynx denned farther from all roads compared to random expectation. Lynx occupy dens in early May when many forest roads are still impassable by wheeled vehicles due to persistent snowdrifts and wet, muddy conditions. (ibid.) Snowmobiles no longer used the roads because of intermittent and unpredictable availability of sufficient snow (Squires et al. 2008). They concluded that lynx did not avoid the subset of roads that were open to wheeled vehicle travel (ibid.). Rather, the observed avoidance of roads was more a function of the correlation of roads and landscape pattern; fewer roads were located in denning habitat and higher road density occurred along forest edges and in managed stands, which lynx avoided (Squires et al. 2008).

Climate Change

In 2000, the Service determined there was no evidence that global warming was a threat to lynx (65 FR 16068-16069). In 2003, we concluded that the information available regarding the potential impact of climate change on lynx was speculative and did not demonstrate a threat to lynx (68 FR 40083, 40098). In the 2005 recovery outline, we acknowledged that continued climate warming was likely to negatively affect the boreal forest ecosystem for which lynx are highly adapted, eventually causing it to recede north and/or to higher, colder elevations, potentially resulting in a substantial future reduction or even elimination of lynx habitats from the contiguous United States (USFWS 2005). In the 2009 and 2014 revised critical habitat designations, the Service acknowledged that new science suggested that climate change may pose a significant risk to the future conservation of the lynx DPS (74 FR 8617, 8621; 79 FR 54811).

Continued climate warming is expected to diminish boreal forest habitats and snow conditions at the southern edge of the range (all of the DPS range) that are, in some places, already patchily-distributed and perhaps only marginally capable of supporting resident lynx. Climate models project reductions in the extent of boreal forest habitats and snow conditions thought necessary to support lynx throughout the DPS, with both features predicted to migrate northward in latitude and to higher elevations (Sturm et al. 2001, Carroll 2007, Danby and Hik 2007, Gonzalez et al. 2007, 2010, McKelvey et al. 2011, ILBT 2013, Koen et al. 2015). This would result in fewer, smaller, and more fragmented and isolated areas capable of supporting resident lynx and therefore smaller and more isolated lynx populations that would be more vulnerable to stochastic environmental and demographic events and genetic drift (Carroll 2007, Johnston et al. 2012, 79 FR 54811. Schwartz 2017). Climate change has also been linked to increases in wildfire and forest insect activities in North America (Joyce et al. 2014, Romero-Lankao); two important components of boreal forest disturbance and, therefore, lynx habitat quality, quantity, and distribution. It also may affect other factors that could influence the future health of lynx populations in the DPS, such as hare/lynx cycles in Canada, disease transmission, and parasites.

7. Implementation of Management Direction on Federally Administered Lands

As previously stated, in the Northern Rockies region of the lynx DPS, the NRLMD (USFS 2007) amended 18 National Forest Plans to address the "lack of guidance for conservation of lynx in federal land management Plans." The NRLMD includes standards and guidelines intended to avoid or reduce the potential for projects proposed under Forest Plans to adversely affect lynx. A suite of standards and guidelines in the NRLMD promote and conserve the habitat conditions needed to produce adequate snowshoe hare (lynx primary prey) densities to sustain lynx home ranges, and thus sustain lynx populations. The NRLMD is intended to address the major threats to lynx and the inadequacy of existing regulatory mechanisms in the Northern Rockies region in order to reduce adverse effects and avoid jeopardy through its implementation.

In support of this biological opinion, we reviewed the latest publications and information providing the best available science on the status and factors influencing lynx and snowshoe hare populations in the Northern Rocky Mountains region. Based on our updated review of the literature, we conclude that the provisions of the NRLMD continue to address the major risks to lynx on the FNF. This will be further discussed in Section D *Effects of the Action*.

The primary issues addressed in the NRLMD included winter snowshoe hare habitat in multistoried forests, wildland fire risk, and the nature of management direction applied to grazing, mineral development, roads, and over-the-snow recreation. In addition to the vegetation management direction the NRLMD identifies standards and guidelines specific to four other categories of risk factors including: (1) all management practices and activities; (2) livestock management; (3) human use (i.e. special uses, recreation, road, highways, mineral and energy development); and (4) linkage areas. The objectives, standards, and guideline of the NRLMD are discussed in Sections C.2 and C.3 below, and are presented further Appendix 5.

In 2008, USFS similarly completed the Southern Rockies Lynx Amendment (SRLA), which formally amended forest plans covering about 59,000 km^2 (22,780 mi^2), including over 30,000 km^2 (11,583 mi^2) of mapped (potential) lynx habitat on 7 national forests or national forest complexes in western Colorado and southern Wyoming (USFS 2008). Standards and guidelines developed and implemented in accordance with the NRLMD and the SRLA were designed to limit potentially adverse effects and promote beneficial effects of management activities (vegetation management [e.g., timber harvest, precommercial thinning], wildland fire and fuels management, grazing, recreation, road/access management, energy development, etc.) on important lynx habitats including winter snowshoe hare habitat (high-quality lynx foraging habitat), denning habitat, and linkage/connectivity corridors. In a 2008 biological opinion on the SRLA, the Service concluded that vegetation management standards in the SRLA would prohibit treatments that could adversely affect essential components of lynx habitat on 95.5 percent of the mapped (potential) lynx habitat in the SRLA area (USFWS 2008). We discuss the results of the 2007 NRLMD BO (USFWS 2007) later in this document.

8. Analysis of the Species and Critical Habitat Likely to be Affected

Lynx are a wide-ranging species requiring large, interconnected areas of suitable habitat. Habitat connectivity within geographic areas and with Canada may be important for long-term lynx population viability and maintenance of the contiguous United States DPS. Lynx habitat occurs in a relatively patchy distribution across broad areas of the west. Certain areas include expanses of more contiguous and higher quality lynx habitat that appear more important to supporting viable resident lynx populations (e.g. core areas and critical habitat).

A key factor in sustaining lynx populations in the DPS is USFS management of snowshoe hare (their primary prey) habitat. Lynx on FNF lands may be affected by management activities that reduce or degrade essential habitat elements used by lynx for denning, foraging (snowshoe hare habitat and hunting habitat), and recruitment, or that increase habitat fragmentation and lynx mortality. The biological assessment for the Revised Forest Plan (USFS 2017) determined that the proposed action would likely result in adverse effects to individual lynx over the life of the plan. This biological opinion evaluates the effects implementing the Revised Forest Plan within the action area on the lynx population DPS.

Critical habitat has been designated for Canada lynx within the action area, which lies in the critical habitat Unit 3. The conservation role of lynx critical habitat is to support viable core area populations. A key factor in USFS management is providing boreal forest landscapes supporting a mosaic of differing successional forest for the production of snowshoe hare (the lynx primary prey). The biological assessment for the Revised Forest Plan determined that the proposed action would likely result in project-level adverse effects on designated critical habitat for Canada lynx (USFS 2017). This biological opinion evaluates the effects of the Revised Plan within the action area on the conservation role of lynx critical habitat Unit 3.

C. ENVIRONMENTAL BASELINE

The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The "action area" includes all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action [50 CFR §402.02]. The action area does not necessarily include all areas potentially frequented by far-ranging, or migrant, species (USFWS and NMFS 1998).

As described previously, the action area is the entire FNF (2,392,807 acres). To reiterate, within the 109 LAUs on the FNF, approximately 1,795,000 acres are mapped as lynx habitat (i.e., boreal forest habitat types) and 598,000 acres are mapped as non-lynx habitat (i.e., low elevation lacking deep, fluffy snow, scree slopes, cliff faces, lakes, and dry habitat types). About 2.2 million acres on the FNF are also designated as lynx critical habitat. As discussed earlier in the Section B. *Status of the Species*, resident lynx may make exploratory or breeding movements into new areas, but typically return to their original home range. Males may travel long distances during these episodes. However, lynx habitat supports the densities of snowshoe hares needed to sustain resident lynx and reproduction. Boreal forest is limited in areas outside LAUs, and is much more fragmented in distribution, occurring in smaller patches, than within LAUs. It is unlikely that the amount and distribution of boreal forest patches outside LAUs support the high snowshoe hare densities required by resident lynx.

1. Action Area

The action area is the FNF. This has been discussed previously in Chapter 1 of this biological opinion, as well as in Section A.1 of this chapter.

2. Status of the Species within the Action Area

The lynx recovery outline (USFWS 2005) stratified lynx habitat into three categories: core, secondary, and peripheral. Core areas are places where long-term persistence of lynx and recent evidence of reproduction have been documented. Further, the quality and quantity of habitat in these core areas is available to support both lynx and snowshoe hare life needs. The lynx recovery outline emphasized focusing conservation efforts on core areas to ensure the continued persistence of lynx in the contiguous United States. Six core areas were identified in the recovery outline, one of which is in northwestern Montana/northeastern Idaho. The action area (i.e., FNF) is located entirely within the northwestern Montana/northeastern Idaho core area.

Museum records, trapping data, and other information verify the historical occurrence of lynx in western Montana (McKelvey et al. 2000). Squires and others have conducted extensive studies of Canada lynx in northwest Montana and have stated, "Our study area encompassed the occupied range of lynx within the Northern Rockies as estimated from a compilation of lynx distribution data collected from 1998 to 2007. The study area border followed natural topographic and vegetative boundaries to generally encompass all forested regions with recent evidence of lynx presence, including all telemetry locations we documented for resident lynx from 1998 to 2007 (N = 81,523 locations); this study area represented our best estimate of the current distribution of lynx in western Montana" (Squires et al. 2013). The study area delineated encompasses most of the FNF, with the exception of the area west of Kalispell known as "The Island Unit."

Canada lynx are known to be distributed throughout portions of the FNF included in the study area delineated by Squires et al. (2013). From 2010–2015, 15 individual adult or sub-adult lynx were captured and fitted with radio-telemetry collars on the FNF. This confirmed that the North Fork, Middle Fork, and South Fork of the Flathead River watersheds were occupied by lynx (USFS 2017).

Noninvasive sampling techniques have also been used to detect lynx in on the FNF. In the winter of 2012, members of the Southwestern Crown Collaborative (SWCC) Wildlife Working Group began systematic, landscape-scale carnivore monitoring efforts within the Southwestern Crown of the Continent (SW Crown) landscape. The SW Crown spans the area from north of Condon on the Swan Lake Ranger District, through the Seeley Lake Ranger District on the Lolo National Forest, to just east of Lincoln on the Helena-Lewis and Clark National Forest. Surveys combined multi-species snow track surveys, DNA collection from bait stations, and motion-sensor cameras. In order to standardize the approach across the SW Crown, eighty 5 x 5-mile grids were targeted for sampling. Sampling in the SW Crown identified a total of 26 unique lynx across 41 grid cells, including both males and females. All but five of these individuals were new to the Rocky Mountain Research Station genetic database (SWCC 2015).

The FNF also conducted carnivore monitoring from 2013–2016 using the same 5 x 5-mile grid methodology, but in portions that are outside the SW Crown. In this portion, 64 grid cells were surveyed, resulting in 40 detections by either tracks, camera, or genetic verification (USFS 2017). In addition to areas where lynx had previously been trapped, this effort detected lynx in the Salish Mountain Range (tracks and DNA). A female lynx with two kittens were also photographed on the east side of Hungry Horse Reservoir. In summary, lynx have been detected in all geographic areas of the FNF (Curry et al. 2016, SWCC 2015).

Based upon telemetry locations of lynx to date, best estimate of the current distribution of lynx in western Montana is an area about 8.9 million acres in size that ranges from the Purcell Mountains east to Glacier National Park and then south through the Bob Marshall Wilderness Complex to Highway 200 (USFS 2017). The FNF lies in the heart of this area, highlighting its importance to lynx conservation.

3. Factors Affecting Canada Lynx within the Action Area

The FNF identified past/ongoing actions and key stressors for lynx in its biological assessment (USFS 2017). Additionally, the NRLMD and 2013 LCAS (ILBT 2013) address similar risk factors as those listed in the FNF BA.

As previously stated, the risk factors identified for lynx have varying effects on lynx, depending upon the nature, location, duration, and timing of the activity (USFWS 2007). On NFS lands, some factors present greater likelihood of risks to lynx and others are relatively benign. Many were addressed through implementation of the NRLMD (see Section B.7 above). The status of the risk factors relevant to the action area is summarized below. The combined risk factors are organized and discussed under the following subheadings:

- Vegetation Management
- Wildland Fire Management
- Habitat Fragmentation – including the importance of linkage areas
- Recreation
- Forest/Backcountry Roads and Trails
- Livestock Grazing
- Mineral and Energy Development

Vegetation Management

The primary factors driving lynx populations, behavior, and distribution is the abundance and distribution of their primary prey: snowshoe hare. As discussed in Section B.7 above, stand structure and composition are important elements of habitat for snowshoe hares and lynx. Stem density and snowshoe hare density are directly and positively correlated. Therefore, vegetation management activities that reduce stem densities, overstory vegetative layers, and/or horizontal structure can result in negative effects on both snowshoe hare use of affected stands and therefore lynx.

The vegetation management objectives of the NRLMD (VEG O1, O2, O3 and O4) were designed to improve the quality of lynx habitat by improving conditions for prey:

- VEG O1 - manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx;

- VEG O2 - provide a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hare, and provide winter snowshoe hare habitat in both the SISS and in the mature, multi-story conifer vegetation;

- VEG O3 - conduct fire use activities to restore ecological processes and maintain or improve lynx habitat; and

- VEG O4 - focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.

These objectives are attained through application of the vegetation management standards: VEG S1, S2, S5 and S6. These standards were created in an effort to ensure that sufficient habitat within each LAU would be available to provide lynx with sufficient snowshoe hare prey and lynx foraging (hunting) habitat conditions. Briefly, the standards state:

- VEG S1 - If more than 30 percent of the lynx habitat in an LAU is currently in a SISS that does not yet provide winter snowshoe hare habitat no additional habitat may be regenerated by vegetation management projects;

- VEG S2 - Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS or BLM lands in an LAU in a ten-year period;

- VEG S5 - Pre-commercial thinning projects that reduce snowshoe hare habitat may occur from the SISS until the stands no longer provide winter snowshoe hare habitat only in limited locations or under limited circumstances; and,

- VEG S6 - Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests may occur only in limited locations or under limited circumstances.

Since 2007, the NRLMD vegetative standards have limited or influenced vegetation management on FNF lynx habitat such that a mosaic of vegetative successional stages required by lynx and its primary prey – the snowshoe hare - are maintained and promoted over time. These key standards maintain the quality of lynx habitat by improving conditions for prey. When applied at the project level, adverse effects on lynx are mostly avoided or minimized. In the NRLMD biological opinion, the Service concluded that this direction would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure (USFWS 2007).

The NRLMD also included guidelines for vegetation management. Guidelines were intended to be implemented in most cases, whereas a standard is a required action. The NRLMD guidelines would be adhered to except where compelling reasons, such as the protection of other species at risk or public safety, are an issue (USFWS 2007). The vegetation guidelines include:

- VEG G1 - Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available;

- VEG G4 - Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided;

- VEG G5 - Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU; and
- VEG G11 - Denning habitat should be distributed in each LAU.

These standards and guidelines work together to maintain the quality of lynx habitat by improving conditions for prey. When applied at the project level, adverse effects on lynx are mostly avoided, or minimized. In our 2007 NRLMD biological opinion, we concluded that this direction would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure (USFWS 2007).

Table IV-6 summarizes the current condition of the 109 LAUs on the FNF in regard to VEG S1 and VEG S2. Table IV-6 displays: (a) the percentage of each LAU in a SISS (i.e., snowshoe hare habitat in early successional stages; not to exceed 30 percent); and (b) the percentage of each LAU that has been regenerated by vegetation management in the last 10 years. As shown in Table IV-6, 25 of 109 (23%) LAUs on the FNF have more than 30 percent of lynx habitat modeled as being in an early stand initiation condition. Recent stand-replacing wildfires are the driver in creating substantial acreages on the FNF in a condition where they do not yet provide winter hare and lynx habitat. Although a large percentage of some LAUs coincide with the Wildland Urban Interface (WUI), as shown in Table IV-6, the percentage of lynx habitat affected by regeneration harvest has generally been minor in comparison.

Under NRLMD standard VEG S2, no more than 15 percent of lynx habitat on NFS lands can be regenerated by timber management projects within a LAU in a ten-year period, unless it meets criteria applicable to the WUI. Table IV-6 also displays the condition of LAUs based on forest-wide modeling. On the FNF, only 10 of the 109 LAUs have had more than five percent of the lynx habitat acres regenerated by vegetation management activities over the last ten years. Since the existing Forest Plan was amended to include the NRLMD in 2007, none of the LAUs have had more than 15 percent regenerated by timber harvest.

Table IV-6. Status of lynx habitat and critical habitat on the FNF by LAU, and conditions as they relate to NRLMD standards VEG S1 and VEG S2 (adopted from USFS 2017). Note: LAUs highlighted in grey have had significant regeneration due to recent stand-replacing wildfires.

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
Canyon	96%	23,578	45+3= 48%	0	100	16%
Hay	90%	22,318	0+0=0%	0	100	11%
Lakalaho	100%	21,148	<1+0=<1%	0	100	18%

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
Lower Big	99%	18,543	93+<1=93%	0	100	9%
Lower Coal	53%	13,968	58+0=58%	0	100	17%
Lower Whale	94%	18,341	27+3=30%	<1	100	22%
Moose	82%	11,102	0 +1=1%	<1	100	48%
North Trail	85%	26,722	1+<1=1%	<1	100	25%
Red Meadow	87%	21,956	0=0=0%	0	100	27%
South Trail Tepee	93%	20,236	76+3=79%	<1	100	40%
Teakettle	59%	6,868	1+0=1%	0	100	70%
Upper Big	98%	18,039	24+0=24%	0	100	None
Upper Coal	93%	23,894	7+<1=7%	0	100	None
Upper Trail	100%	15,404	0+0=0%	0	100	None
Upper Whale	100%	21,775	< 1+0=<1%	0	100	None
Bear Creek	96%	21,039	28+<1=28%	<1	100	52%
Challenge Granite	100%	17,419	18+<1=18%	<1	100	None
Clayton Anna	100%	16,183	66+4=70%	0	100	None
Coram Abbot	84%	6,653	0+0=0%	0	100	37%
Dirtyface Spruce	100%	13,023	5+0=5%	0	100	6%
Doris Creek	100%	24,118	24+3=27%	0	100	9%
Emery Creek	100%	12,844	0+1=1%	0	100	2%
Essex Java	99%	14,052	15+<1=15%	<1	100	29%
Felix Logan	100%	17,471	13+0=13%	0	100	None
Graves Forest	100%	21,221	8=0=8%	0	100	< 0.5%
Hungry Horse Creek	100%	11,537	0+0=0%	0	100	None
Lake Five	58%	2,745	0 +0=0%	0	100	99%
Long Cy	100%	21,494	23+0=23%	0	100	none
Moccasin Nyack	92%	13,427	2+<1=2%	<1	100	64%
Murray Canyon	100%	12,625	0+<1=<1%	<1	100	None
Paola Ridge	92%	9,534	<1+2=2%	<1	100	48%
Slippery Bill	100%	12,587	14+<1=14%	<1	100	None

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
South Firefighter	100%	10,726	0+3=3%	3	100	None
Stanton Grant	95%	16,800	0+1=1%	<1	100	51%
Vinegar Moose	100%	21,481	10+0=10%	0	100	4%
West Columbia	87%	7,851	0+0=0%	0	100	86%
Wheeler Creek	100%	15,087	0+0=0%	0	100	14%
Wildcat Mountain	100%	15,831	20+1=21%	0	100	None
Albino Necklace	99%	14,269	13+0=13%	0	100	None
Babcock Creek	100%	11,665	8+0=8%	0	100	None
Bent Whitcomb	100%	21,268	63+1=64%	0	92	4%
Big Prairie Cayuse	100%	11,042	49+0=49%	0	100	None
Big Salmon Lake	97%	22,216	46+0=46%	0	100	None
Black Bear Helen	100%	14,766	79+0=79%	0	100	None
Bunker Creek	100%	23,273	45+<1=45%	<1	100	None
Cox Creek	100%	19,936	4+0=4%	0	100	None
Dolly Varden Creek	100%	24,864	14+0=14%	0	100	None
Dryad Miner	99%	16,882	< 1+0=%	0	100	None
Foolhen Danaher	100%	25,440	10+0=10%	0	100	None
Holbrook Bartlett	100%	29,119	47+0=47%	0	100	None
Hungry Picture	100%	18,561	30+0=30%	0	100	None
Kah Soldier	100%	15,288	9+1+10%	1	100	8%
Little Salmon Creek	100%	27,766	11+0=11%	0	100	None
Lodgepole Creek	100%	21,319	4+0=4%	0	100	None
Lost Jack Mid	100%	13,182	91+0=91%	0	100	None
Lower Gordon Creek	100%	15,795	42+0=42%	0	100	None

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
Lower White River	100%	17,902	38+0=38%	0	100	None
Lower Youngs Creek	100%	18,885	50+0=50%	0	100	None
Mud Lake	100%	10,488	62+0=62%	0	100	None
Pale Clack	100%	13,956	3+0=3%	0	100	None
Peters Crossover	100%	17,925	0+0=0%	0	100	None
Quintonkon Creek	100%	15,888	7<1=7%	0	100	2%
Rapid Basin	100%	29,821	25+0=25%	0	100	None
Shadow Dean	100%	27,399	24+0=24%	0	100	None
Silvertip Creek	100%	12,540	35+0=35%	0	100	None
Spotted Bear Mountain	100%	20,943	53+<1=53%	0	100	1%
Stadium Gorge	100%	25,091	13+0=13%	0	100	None
Stony Jungle	100%	17,700	61+1=62%	<1	100	3%
Strawberry Creek	100%	16,688	27+0=27%	0	100	None
Sullivan Creek	100%	27,743	16+1=17%	0	100	None
Three Sisters Bungalow	100%	27,654	18+0=18%	0	100	None
Trail Bowl	100%	24,727	78+0=78%	0	100	None
Twin Creek	100%	18,890	5+<1=5%	0	96	< 0.5%
Upper Gordon Creek	99%	12,638	5+0=5%	0	100	None
Upper White River	100%	12,521	24+0=24%	0	100	None
Upper Youngs Creek	100%	26,021	59+0=59%	0	100	None
Blacktail	79%	13,680	<1+6=6%	6	0	80%
Haskill Mount	76%	7,885	0+5=5%	2	0	37%
Bond	82%	10,903	0+0=0%	0	100	37%
Buck	68%	9,854	16+0=16%	0	100	61%
Elk	77%	18,879	7+7=14%	1	100	29%
Glacier	92%	21,066	40+6=46%	2	100	20%
Holland	81%	8,294	0+3=3%	3	100	53%

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	VEG S1- % of lynx habitat on NFS lands in stand initiation stage[a] (due to wildfire + harvest = total)	VEG S2 –% of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	% of lynx habitat in critical habitat in the LAU	% of lynx habitat on NFS lands in WUI
Krause	85%	13,308	<1+0=<1%	0	100	50%
Lion	98%	10,950	<1+4=4%	0	100	None
Lost	78%	12,365	12+0=12%	0	100	< 0.5%
Lower Beaver	86%	16,661	<1+7=7%	1	100	39%
Meadow	87%	7,248	41+5=46%	1	100	4%
North Crane	78%	10,258	0+2=2%	0	93	65%
Piper	91%	18,696	<1+7=7%	<1	100	15%
Porcupine	63%	8,087	0+0=0%	0	92	1%
Schmidt	83%	9,677	0+0=0%	0	100	52%
Soup	18%	2,351	0+0=0%	0	100	None
South Cold	93%	17,989	<1+2=2%	<1	100	13%
South Crane	97%	13,938	0+<1=<1%	0	100	36%
South Woodward	94%	13,370	1+3=4%	1	100	8%
Squeezer	51%	10,759	2+1=3%	0	100	None
Upper Beaver	96%	10,684	<1+<1=<1%	<1	100	< 0.5%
Woodward	21%	3,743	0+<1=<1%	0	100	1%
Ashley Herrig	30%	6,660	0+5=5%	5	95	87%
Evers Reid	73%	9,586	<1+10=10%	3	99	82%
Lost Tally	89%	9,590	0+4=4%	3	92	99%
Lower Good	84%	19,746	<1+6=6%	2	100	56%
Lower Griffin	93%	17,622	57+6=63%	1	100	25%
Martin Stillwater	90%	15,804	0+5=5%	0	100	16%
Sheppard	94%	21,352	80+17=97%	12	100	22%
Upper Good	98%	28,384	15+9=24%	5	100	23%
Upper Griffin	81%	15,844	5+5=10%	4	100	1%
Upper Logan	80%	17,893	<1+9=9%	5	100	15%

a. Assumption = acres burned by stand-replacing wildfire or regenerated by timber harvest 1997-2016 are not yet winter snowshoe hare habitat, on average. LAUs may have had regeneration harvest prior to wildfire so harvest acres and burned acres may overlap. Numbers have been added to display a "worst case scenario". These numbers are based upon forest scale data and are verified at the project level.

b. based on USFS FACTS database showing on-the-ground acres of regeneration harvest 2007-2016.

c. Shaded lynx analysis units are estimated to have more than 30 percent of lynx habitat that is not yet winter snowshoe hare habitat and in all LAUS this is due to stand-replacing wildfire. Estimates are verified at the project level.

Exemptions and Exceptions to the Vegetation Management Standards

The NRLMD authorized exemptions from standards VEG S1, S2, S5, and S6 for fuels management within the WUI. The NRLMD also provides exceptions listed in VEG S5 and S6 to allow for precommercial thinning to protect structures, for research, and to promote the conservation of tree species such as whitebark pine and aspen. The exemptions and exceptions would allow actions that may have adverse effects on lynx by reducing the horizontal structure of natural forest succession phases and or affecting the mosaics of the forested landscape in localized areas.

The exemptions for fuels treatments within the WUI was limited to six percent of lynx habitat on each National Forest considered "occupied" as defined in the NRLMD. On the FNF, the total area that could be affected by the exemption is limited to no more than 103,800 acres. Further, the area on the FNF that could be treated using exceptions to VEG S5 and S6 could be no greater than 1,460 acres over a 10 year period. This represents less than 0.1 percent of mapped lynx habitat on the FNF.

Annual monitoring and reporting is also a requirement of the NRLMD biological opinion in order to ensure that the level of incidental take is not exceeded. As of 2017, the FNF has treated (or has a decision to treat) just over 10,000 acres using the WUI exemptions (Table IV-7). This represents less than one percent of the total exemption acres allotted to the FNF under the 2007 NRLMD BO (103,800 acres allotted). It should be noted that the incidental take statement of the NRLMD BO was recently updated (USFWS 2017). During the same period, the Flathead National Forest has treated (or has a decision to treat) 940 acres using the exceptions to VEG S5 and S6 (Table IV-7). The vast majority of thinning completed under the exceptions was for western white pine restoration, in which 80 percent of the winter snowshoe hare habitat was retained as required by the standard.

Table IV-7. Acres of lynx habitat on the Flathead National Forest treated with exceptions and exemptions to the forest plan vegetation standards (decisions from 2007 thru January 2017, updated via consultation)

Habitat	Estimated acres in the 2007 BO	Sum of acres with decisions for treatment as of 2017
Lynx habitat outside the wildland-urban interface with decisions for precommercial thinning using the VEGS5 exceptions (only 1 acre was treated using the VEGS6 exceptions)	1,460 (over 10 years)	940* (2007-2016)
Lynx habitat inside the wildland-urban interface with decisions for treatments using the fuels reduction exemption	103,800 (cumulative)	10,079 (2007-2016)

*The Forest consulted on 940 acres but dropped 675 acres, so only 265 are actually planned for treatment.

Habitat Fragmentation

Fragmentation of the naturally patchy pattern of lynx habitat in the contiguous United States can affect lynx by reducing their prey base and increasing the energetic costs of using habitat within their home ranges. A variety of anthropogenic activities such as highways and major developments and associated infrastructure contribute to fragmentation. Highways also pose a risk of direct mortality and may inhibit lynx movement between previously connected habitats.

The NRLMD recognizes the importance of linkage and addresses it through objectives, standards, and guidelines All O1, All S1, LINK O1, LINK S1, and All G1, which are identified below:

- ALL O1 - Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas;

- ALL S1 - New or expanded permanent development and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area;

- LINK O1 - In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat;

- LINK S1 - When Highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings.

- ALL G1 - Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses, or overpasses.

Linkage areas were initially identified and coarsely mapped at a broad scale by a group of experts. The group anticipated that linkage areas would be further refined as more information became available. Subsequently, Squires et al. (2013) used telemetry data for 64 lynx monitored during 1998–2007 to create a broad-scale resource selection model that predicted probable lynx habitat and "putative movement corridors" across the species' distribution in the Northern Rocky Mountains. This analysis included quantification of the relative likelihood of lynx crossing major highways, one of the major hypothesized anthropogenic threats to lynx connectivity.

Squires et al. (2013) reported that the putative movement corridors they identified for lynx also showed reasonable correspondence with previously published models for wolverine (Schwartz et al. 2009), wolves (Oakleaf et al. 2006), and grizzly bears (Mace et al. 1999). Most of the least-cost paths generated by their model went along the lower slope of the Swan Range to the east of highway 83 (on the Swan Lake Ranger District of the FNF) and crossed the U.S. Highway 2 corridor within a six-mile stretch of highway to the north of Hungry Horse Reservoir near the town of Hungry Horse, Montana. The travel route then moved northwest to the Whitefish Mountain divide and split into two routes, both within the Red Meadow LAU in the North Fork Flathead River watershed as it approached the Canadian border.

Recreation

Understanding of the effects of outdoor recreation on lynx and their habitat is incomplete. Recreational developments may remove forest cover or result in direct habitat loss or fragmentation. Human presence may disturb or displace lynx. NRLMD objectives, standards and guidelines address the most serious consequences of recreational development, requiring new or expanding permanent developments to maintain or where possible, promote habitat connectivity within LAUs and linkage areas (All O1, All S1, LINK O1, LINK S1, and All G1).

Anecdotal information suggests that lynx are quite tolerant of humans, although individuals may behave differently in response to human presence (ILBT 2013). The NRLMD does not address the potential for human disturbance on lynx. The evidence supporting a risk to lynx from compacted snow routes (e.g. snowmobile trails and tracks) is limited. However, the NRLMD includes guidelines HU G11 which states:

- HU G11 - Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.

Ski Resorts

Effects to lynx from Montana's ski resorts were assessed in 2000 and 2001 after listing (USFS-BLM 2000, USFWS 2001). In 2007, when consultation on the NRLMD occurred, the effects of ski areas and other types of winter recreation on lynx were further analyzed. There are two ski resorts on lands administered by the FNF; Whitefish Mountain Resort (formerly known as Big Mountain) and Blacktail Mountain Resort. Both of these resorts were addressed in the biological opinions (USFWS 2001, 2007). In the 2001 biological opinion, the Service stated that habitat loss results from clearing of trees for ski runs, roads, and other developments associated with ski areas. Winter activity associated with ski resorts, including skiing, ski-lift operation, and grooming of ski runs, may also cause disturbance or displacement of individual lynx. In its 2007 biological opinion, the Service determined that although individual lynx may be adversely affected by recreation developments, the management direction in the NRLMD would reduce potential impacts at a landscape scale, avoiding an appreciable reduction in the reproduction, numbers, and distribution of lynx.

Approximately 3,100 acres of the Lakalaho LAU is in the Whitefish Mountain Ski and Summer Resort permit area. Since 2007, the Forest has consulted on the effects of projects within the resort, including consultation for critical habitat (USFS-USFWS 2016; USFWS 2007a, 2011, 2013, 2015).

The Blacktail Mountain Resort is located in the Blacktail LAU. The resort includes cleared or gladed ski runs with heavily treed areas between. Primarily winter operations occur on about 600 acres of NFS lands at this downhill ski area on the summit of Blacktail Mountain. The resort is in mapped lynx habitat and was evaluated as part of the biological assessment and biological opinion for all ski areas in Montana on Forest Service and Bureau of Land Management lands (USFWS 2001). This resort in not located in lynx critical habitat.

Over-Snow Vehicle Use

In November 2006, the FNF issued a decision for a motorized winter recreation plan, also known as amendment 24 (A24) to the Forest Plan. Developed with consideration of the terms of a settlement agreement, the decision clarified where, when, and under what conditions over-snow vehicles are allowable on the FNF. The specific areas and routes that are suitable for motorized over-snow vehicle use are identified on maps that were incorporated into the existing Forest Plan. Under A24, about 32 percent of lynx habitat on the FNF is open to motorized over-snow use, or is in cross-country ski areas where trails are groomed. Across the FNF, there are about 1,098 miles of routes open to motorized over-snow use at various times throughout the year, snow conditions permitting (USFS 2017).

In the A24 biological opinion (USFWS 2006), the Service concurred with the FNF's determination that the proposed federal action was not likely to adversely affect lynx. The Service based their determination on (1) the proposal's compatibility with the Lynx Conservation and Assessment Strategy, (2) snow compaction that would occur in areas and routes remaining open for snowmobiling, (3) a decrease of more than 300,000 acres in the overlap between modeled lynx habitat and areas open to snowmobiling, (4) a decrease of about 220 miles in routes open for snowmobiling through lynx habitat, (5) no new snowmobile areas or routes would be opened under A24, and (6) there could be an indirect benefit of a reduced risk of inadvertent trapping.

Forest/Backcountry Roads and Trails

As described in Section B.6, construction of roads results in a small reduction of lynx habitat by removing forest cover. In some instances, vegetation along less-traveled roads provides good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging. In general, forest roads with low vehicular or snowmobile traffic appear to have little effect on lynx seasonal resource-selection patterns in areas similar to the action area.

Since 2007, effects of roads on FNF lands in lynx habitat have been addressed through implementation of NRLMD guidelines All G1 and HU G6 through G9. These guidelines state:

- ALL G1 - Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses, or overpasses.

- HU G6 - Methods to avoid or reduce effects on lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.

- HU G7 - New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.

- HU G8 - Cutting brush along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.

- HU G9 - On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.

A large portion of the LAUs are also within the NCDE recovery zone for grizzly bears on the FNF (See grizzly bear chapter of this BO for further details). Implementation of Amendment 19 (A19) has resulted in decreased road mileage, decreased road maintenance, and many miles of public road use restrictions over the last decade (USFS 2017). Standards to maintain baseline densities of motorized routes in the grizzly bear primary conservation area and Salish demographic connectivity area would limit potential risks to lynx associated with motorized public access.

Livestock Grazing

Grazing or browsing by domestic livestock on FNF lands is unlikely to reduce the snowshoe hare prey base or have a substantial effect on lynx. However, grazing/browsing could have some localized effects on high elevation willow communities or aspen stands if not managed appropriately. Under the existing FNF Forest Plan grazing allotments in LAUs are managed in accordance with the NRLMD grazing objective GRAZ O1 and through guidelines GRAZ G1 through G4. Specifically, these guidelines state:

- GRAZ O1 - Manage livestock grazing to be compatible with improving or maintaining lynx habitat.

- GRAZ G1 - In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.
- GRAZ G2 - In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.
- GRAZ G3 - In riparian areas and willow carrs, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.
- GRAZ G4 - In shrub-steppe habitats, livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs, to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

Minerals and Energy Development

As described in Section B.6, activities associated with exploration and development of leasable minerals, locatable minerals, and mineral materials could affect lynx habitat by changing or eliminating the native vegetation and contributing to habitat fragmentation. Large-scale mining operations could result in additional habitat loss and fragmentation from site development and distribution facilities.

The effects of mining developments (habitat loss, roads, and human access) are addressed by the NRLMD guidelines HU G4, HU G5, HU G6, HU G9, and HU G12. Briefly, the guidelines state:

- HU G4 - For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.
- HU G5 - For mineral and energy development sites and facilities that are closed, a reclamation plan that restores lynx habitat should be developed.
- HU G6 - Methods to avoid or reduce effects on lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.
- HU G9 - On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.
- HU G12 - Winter access for non-recreation special uses and mineral and energy exploration and development, should be limited to designated routes or designated over-the-snow routes.

At the present time, there is little exploration and no leasable development activity occurring on the FNF. Existing oil and gas leases were suspended and would require further NEPA analysis and consultation before any activity could occur. The Forest has low potential for locatable minerals and low to high potential for leasable minerals (such as oil and gas). Many acres of NFS lands on the FNF are withdrawn from mineral entry (Figure 22). The type of lands withdrawn from mineral entry and leasing in the Flathead National Forest plan area include:

- Administrative sites, such as campgrounds;
- Forest lands within the boundaries of a ski area permit;
- The Bob Marshall, Great Bear, and Mission Mountains Wilderness areas;
- Sections of the North, South and Middle Forks of the Flathead River;
- Portions of the Forest withdrawn from mineral development by the North Fork Watershed Protection Act of 2013.

4. Status of Critical Habitat in the Action Area

This section analyzes the environmental baseline conditions for critical habitat in the action area. Our analysis describes the environmental baseline of critical habitat in the action area, most influential is the Forest Plan direction in lynx habitat, which includes the direction in the NRLMD.

Critical Habitat in the Action Area

For the purposes of this biological opinion, we defined the action area to include lands administered by the FNF. The action area is within Unit 3 of designated lynx critical habitat and contains the physical and biological features essential for the conservation of the species, including the primary constituent element (PCE 1) and its four components (a-d). Our final rule determined that the conservation role of lynx critical habitat is to support viable lynx populations within core areas.

The FNF includes approximately 2.2 million acres of designated critical habitat for lynx in critical habitat Unit 3. This represents 35 percent of the designated critical habitat in Unit 3. About 37 percent of the critical habitat on the Flathead National Forest is in wilderness and special areas. Further, the majority of LAUs (100 of 109) on the FNF have 100 percent of the mapped lynx habitat in designated critical habitat (Table IV-6 above). Of those LAUs with less than 100 percent, seven (Bent Whitcomb, Twin Creek, North Crane, Porcupine, Ashley Herig, Evers Reid, and Lost Tally) have over 90 percent of mapped lynx habitat in critical habitat (see Table IV-6 above for exact percentages). There are only two LAUs (out of 109) on the FNF that do not include some critical habitat: the Haskill Mountain and Blacktail LAUs west of Flathead Lake and Highway 93.

The action area contains physical and biological elements essential for the conservation of the species, including the PCE. Stand initiation habitat, including early stand initiation habitat, potentially provides for PCE 1a; multi-story habitat potentially provides PCE 1a and/or 1c; habitat such as stem exclusion is one of the boreal forest successional stages comprising the PCE, also potentially providing denning habitat PCE 1c; areas of critical habitat not mapped as lynx habitat generally provide matrix habitat (PCE 1d); and the action area in general provides deep, fluffy snow conditions (PCE 1b). Table IV-7 displays the acres of critical habitat by Forest, including mapped lynx habitat and matrix habitat.

Snowshoe hare habitat (PCE 1a) in the action area is generally comprised of young forests in stand initiation and older, multi-story forests. Early stand initiation stands are characterized by dense growth of young trees, providing abundant forage and hiding cover for snowshoe hare during the summer. In the winter, these stands are covered by snow and unavailable to snowshoe hares. Stand initiation phase trees have grown tall enough to protrude above the snow, and provide forage and dense hiding cover for snowshoe hares in the winter and summer. Multi-story forests with dense horizontal cover (a dense understory of young trees and shrubs) provide both lynx and snowshoe hares with abundant forage and hiding cover during summer and winter. Summer habitat is not believed to limit snowshoe hare or lynx populations. However, winter habitat is believed to be a factor limiting snowshoe hare and lynx populations (Squires et al. 2010).

Stands of trees with a relatively closed overstory canopy and limited understory vegetation are characterized as stem exclusion habitat. These phases are forest successional stages that are part of the critical habitat boreal forest landscape described in the PCE. These stages are described as having a closed canopy with limited understory. Little light reaches the forest floor so understory vegetation (including trees) are shaded and grow slowly; shrubs become dormant and new trees are precluded by a lack of sunlight and/or moisture. Thus, these structural stages do not currently provide snowshoe hare habitat due to the lack of horizontal cover described in PCE1a. In some stem exclusion stands, a limited amount of snowshoe hare forage may be available during the summer as a greater variety and quantity of deciduous forage and cover is available to hares due to the lack of snow cover and the growth of seasonal vegetation. This summer habitat is covered by snow during the winter and is unavailable to hares or lynx.

Under the NRLMD, exceptions and exemptions to standards VEG S1, S2, S5 and S6 are allowed to protect the WUI and other specific forest resources. Since 2007, the FNF has treated 11,019 acres of WUI in lynx critical habitat using these exceptions or exemptions. This amounts to less than 1 percent of critical habitat on the FNF treated under the exemptions and exceptions. Further, only 6,456 of the 11,019 acres treated using the exceptions and exemptions were considered to be showshoe hare habitat (PCE 1a) (Table IV-8). These amounts have not likely impaired the conservation role of critical habitat for the species in the LAUs as evidenced by the maintenance of the mosaic of boreal forested stands in differing successional stages across the LAUs.

Table IV-8. Acres of snowshoe hare habitat (PCE 1a) treated in critical habitat on the FNF.

Exception or Exemption category	Acres of critical habitat treated on the FNF that provide PCE 1a
VEGS5 exceptions	940
WUI exemptions	6,456

Winter conditions that provide and maintain deep, fluffy snow conditions for extended periods in boreal forest landscapes (PCE 1b) occur throughout the action area. These conditions likely restrict potential lynx competitors from effectively encroaching on or hunting snowshoe hares in winter lynx habitat. In addition to snow depth, other snow properties, including surface hardness or sinking depth, also influence lynx foraging success.

Lynx den sites (PCE 1c) are generally found in mature spruce-fir forests among downed logs or root wads in areas with abundant coarse woody debris and dense understories with high horizontal cover. Downed trees provide cover for den sites and kittens and are often associated with dense woody stem growth. The structural components of lynx den sites are common features in both managed and unmanaged stands. Because lynx have large home ranges and low den site fidelity, most lynx populations are not limited by a lack of immediate den sites (Squires et al. 2008).

The NRLMD focuses on maintaining and improving snowshoe hare habitat within mapped lynx habitat. Areas that are not mapped as lynx habitat generally do not have inherent potential to produce snowshoe hares at densities that would support lynx residency and reproduction. The Service designated critical habitat on Forest Service lands that in some instances were not mapped as lynx habitat by the Forest Service. This situation occurs where critical habitat, specifically PCE1d, was designated in areas of 'matrix' habitat. The identification and description and use of the term "matrix habitat" did not arise until the designation of critical habitat. Matrix habitat is comprised of patches of habitat types that occur within or adjacent to boreal forest that do not have the capacity to produce high density snowshoe hare habitat. These habitat types typically consist of dry forest, hardwood forest, or non-forested habitat types. Matrix habitat cannot become lynx habitat through forest succession. Lynx use matrix habitat to travel within their home range, but do not depend upon it for foraging or denning sites.

Projects that occur within matrix habitat must still be analyzed for potential effects to matrix habitat. As for all critical habitat, including matrix habitat, the Forest Service may use the guidance in the Service's 2014 critical habitat designation (79 FR 54782) to assess and/or reduce or avoid negative effects on critical habitat. As stated in the final rule, activities that change vegetation structure or condition in matrix habitat are not considered an adverse effect to lynx critical habitat unless those activities create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat or if they adversely affect adjacent foraging and denning habitat.

Other types of management actions that have occurred in lynx critical habitat since 2007 include ski area development and expansion, road construction, oil and gas development, winter recreation management, and grazing management. Appendix K in the NRLMD Biological Assessment (USFS 2007) and Appendix D in the NRLMD Biological Opinion (USFWS 2007) provide lists of management actions that occur within lynx habitat. Such actions may also occur within lynx critical habitat. These appendices are incorporated by reference.

Since the NRLMD was amended to the existing Forest Plan in 2007, few new management actions (other than vegetation management projects described previously) have been implemented. The Big Mountain Ski Resort is within critical habitat; some new ski area improvements have been implemented within permitted ski area boundaries since 2007, including modifications to ski runs and installation of a new chair lift. But, no expansion or improvements outside ski area permit boundaries are known. The NRLMD does not provide for net increases in groomed snow trail routes for skiing or snowmobiles (without a project specific Forest Plan amendment), and no such net increases are known within lynx critical habitat in the action area since 2007. No new oil and gas development projects are known to have occurred. New grazing management plans have been implemented but no changes in grazing management that would affect lynx critical habitat are known. Some new roads have been constructed within lynx critical habitat, but the majority of new road construction since 2007 has been associated with vegetation management projects where new roads are usually temporary roads built to accommodate access to logging units. In addition, many acres of lynx critical habitat within the action area occur in non-developmental allocations such as wilderness.

Fire and other natural disturbance processes currently and historically played an important role in maintaining a mosaic of forest successional stages that provides habitat for both snowshoe hare and lynx (Ruediger et al. 2000, ILBT 2013), including the PCE for lynx critical habitat. In the action area, fire regimes are variable with both frequent (35-100 years) stand-replacing and mixed severity fires and infrequent (200+ years) stand replacement fires. Within the past seventy years, land management agencies began effective fire suppression with the advent of aircraft support; fire exclusion has the potential to alter vegetation mosaics and species composition that may reduce the quality and/or quantity of lynx habitat. In western forests, fire exclusion in areas with a history of infrequent fire return intervals has probably not had much impact. But areas where the fire regime was historically frequent or mixed has generally shifted to more intense fire regimes, resulting in forest compositions and structures that are more homogeneous, composed of more shade-tolerant species with more canopy layers, and are more susceptible to severe fires, insects, and diseases.

As noted in the critical habitat final rule, climate change has already reduced snowpack and the duration of snow cover in the lynx DPS range, and it is projected to further reduce these components of the PCE in the future (FR 79 54810-54811). By the end of this century in Units 3 and 5, climate change is expected to substantially reduce the distribution and duration of the deep, fluffy snow conditions favorable for lynx (FR 79 54825). Climate change is also extending fire prone seasons and can result in larger and higher intensity wildfires than occurred historically; such events are more likely in fire adapted western forests were active fire suppression over the past sixty years has interrupted historic fire regimes (Ruediger et al. 2000). Climate change has also been linked to increases in the extent, frequency, and intensity of outbreaks of native forest insects (e.g., spruce budworms and mountain pine beetles) that can impact lynx habitats. Over the longer-term, climate change is also anticipated to cause northward and upslope contractions in the boreal forest vegetation types with which hares and lynx are both strongly associated. In general, climate change is expected to directly and indirectly affect both snowshoe hare and lynx population dynamics through changes in precipitation patterns, vegetation distributions, and disturbance (i.e., fire, insects) regimes, and has the potential to adversely affect the lynx critical habitat PCE over the long term.

D. EFFECTS OF THE ACTION

Under section 7(a)(2) of the Act, "effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, and that will be added to the environmental baseline. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. [50 CFR §402.02]. Should the federal action result in a jeopardy and/or adverse modification conclusion, the Service may propose reasonable and prudent alternatives that the federal agency can take to avoid violation of section 7(a)(2). The effects discussed below are the result of direct and indirect impacts of implementing the proposed project.

1. Factors to be Considered

This section considers the effects to lynx, and designated critical habitat from implementation of the FNF's Revised Forest Plan direction as guided by the Revised Forest Plan elements (goals, objectives, desired condition, standards, and guidelines). This analysis also addresses how the specific elements for the conservation of lynx and lynx habitat moderate the effects of the Revised Forest Plan.

The FNF's Revised Forest Plan does not prescribe site-specific actions and so, this biological opinion does not provide an analysis of specific projects. Rather, the analysis is a broad-scale examination of the types of activities conducted under the Revised Forest Plan that could potentially result in effects on Canada lynx, lynx habitat, and designated critical habitat. Because of the broad-scale analysis, the FNF will retain the responsibility for section 7 consultation on all future projects (conducted under the Revised Forest Plan) that may affect the Canada lynx or its habitat or designated critical habitat even if those projects are consistent with the Revised Forest Plan.

Our analysis will be used to determine the potential for the Revised Forest Plan direction to jeopardize the affected population of lynx, or destroy or adversely modify lynx critical habitat. In our analysis, we will discuss the effects of the Revised Forest Plan and implementation of the MAs relative to LAUs, which are the units of analysis commonly used to describe effects on lynx (see Section A.1).

Notably, the Revised Forest Plan incorporates existing direction from the NRLMD, with some FNF-specific deviations. The analysis contained in our biological opinion on the effects of NRLMD on lynx (USFWS 2007) was considered in this analysis and updated where appropriate. Relevant sections of the NRLMD are cited by page number in our analysis below; our analysis is updated with recent science where appropriate. In this biological opinion we analyze the effects of the Revised Forest Plan, as it implements appropriate direction from the NRLMD as well as additional FNF-specific plan elements. As previously discussed (Section A.2), we determined that implementation of the NRLMD was not likely to jeopardize the continued existence of the Canada lynx (USFWS 2007). This analysis also considers the effects of the Revised Forest Plan, including the NRLMD, on designated critical habitat. Recently, the Service determined that implementation of the NRLMD is not likely to result in the destruction or adverse modification of lynx critical habitat (USFWS 2017a).

2. Analysis for Effects of the Action on Lynx

The following sections analyze the direct and indirect effects of implementing the elements of the FNF Revised Forest Plan on lynx. The effects will be discussed by factors as described in Section C.2:

1. Vegetation Management
2. Habitat Fragmentation
3. Recreation
4. Forest/Backcountry Roads and Trails

5. Livestock Grazing

6. Mineral and Energy Development

For each category of effect, we begin with a general summary of the potential impacts on lynx, followed by an analysis of the specific effects of the proposed action on lynx.

Effects of Vegetation Management on Lynx

General Effects

Timber harvest and associated forest management can be benign, beneficial, or detrimental to lynx depending on harvest methods, spatial and temporal specifications, and the inherent vegetation potential of the site (65 FR 16052). Regeneration harvest, for example, removes or alters stand structure, and temporarily eliminates snowshoe hare forage/cover and lynx cover until the site is regenerated to forest cover. In addition, this type of treatment reduces potential denning habitat by removing large trees and down logs from the site and reduces alternate prey habitat (i.e. red squirrel) with the removal of large trees. However, even-aged management, or regeneration harvest, can be a tool for creating high quality snowshoe hare habitat in the future, especially where natural regeneration would be expected to respond and provide dense young vegetation.

Uneven-aged management, such as single tree selection or group selection, results in varying effects to snowshoe hare and lynx, depending on the number of stems removed, canopy cover, harvest system and post-sale treatments. Removal of dense horizontal structure through timber harvest is typically detrimental to snowshoe hare habitat. However, where dense understory is lacking, removal of trees (overstory) allows light to penetrate the forest floor and so can stimulate pockets of dense regeneration and the development of horizontal cover preferred by hares.

Silvicultural thinning can reduce an area's carrying capacity for snowshoe hares by reducing dense horizontal structure within forest stand understories (Homyack et al. 2007). In northwestern Montana, Ausband and Baty (2005) found that within individual forest stands, hares had a significant affinity for dense, unthinned sapling patches. Research conducted in northwestern Montana found that precommercial thinning decreased snowshoe hare abundance, compared to both control and thinned stands where 80 percent of the entire stand was thinned but 20 percent of the total stand was retained with saplings uncut (Griffin and Mills 2007). Declines were prominent in the second winter after treatment. Additionally, estimated survival rates of snowshoe hares decreased as individuals spent proportionately more time in open young and open mature forest stand structure types (Griffin and Mills 2007).

Vegetation treatments focused on fuel reduction have the potential to reduce the quality of lynx habitat by simplifying stand structure and/or reducing stem densities below levels that provide suitable forage and cover conditions for snowshoe hares. These activities have the potential to reduce the affected area's carrying capacity for snowshoe hares. Fuel reduction projects or salvage of dead and dying trees can result in the removal of coarse woody material and may reduce the areas potential use as denning habitat for lynx.

As discussed in depth above, the abundance of snowshoe hare is the primary factor driving lynx populations, behavior, and distribution. Older forested stands provide high quality winter habitat when they provide multi-story structure that provides forage and horizontal cover, for both lynx and snowshoe hare (Murray et al. 1994, Squires et al. 2010). Regenerating forests providing dense sapling stands that protrude above the snow also provide important snowshoe hare habitat in Montana. Winter is the most constraining season for lynx in terms of resource use (Squires et al. 2010).

In summer, lynx broaden their habitat use to include younger forest stands with an abundance of shrub cover that support snowshoe hares (Squires et al. 2010). Dense, young sapling stands (more than 2,000 trees per acre) can also provide habitat for concentrations of hares in western Montana (Griffin 2004, pp.84-88). Lynx also require cover when searching for food (Brand et al. 1976). Lynx have been observed (via snow tracking) to avoid large openings during daily movements within the home range (Koehler 1990, Staples 1995). As a result, mature stands, along with stands in an early successional stage and intervening successional stages (i.e., stand initiation stage), provide the landscape mosaic of habitat conditions needed for snowshoe hare production and lynx foraging (hunting) habitat, and thus for recovery and survival of lynx.

The primary negative effects of vegetation management on lynx and lynx habitat include reduction in amount or quality of snowshoe hare habitat, indirectly impacting lynx foraging. However, vegetation management may also affect availability of denning habitat by reducing recruitment of downed woody debris. The common component of denning habitat appears to be large amounts of coarse woody debris (Koehler 1990; Staples 1995). This structure is most valuable when distributed throughout the home range, in or near foraging habitat. Coarse woody debris is needed at den sites for cover and shelter for kittens at den sites. Vegetation management activities such as salvage harvesting and prescribed fire may remove existing coarse woody debris and/or affect its recruitment by removing existing coarse woody material, which can affect the quality and quantity of available lynx denning habitat.

Effects of the Action

Under the Revised Forest Plan, approximately 528,010 acres of potential lynx habitat is located within the general forest management areas that are suitable for timber production (i.e., 6b and 6c) (Table IV-9). This makes up 29 percent of the potential lynx habitat on the FNF. Potential lynx habitat located within the general forest management areas provide a mosaic of successional stages in a roaded environment due to past road construction and timber harvest. In these areas, active management activities, including prescribed fire, timber harvest, fuels reduction, precommercial thinning, commercial thinning, and planting, are most likely to create a mosaic of forest conditions. Within management area 6, riparian management zones (RMZs) are not suitable for timber production, providing an interconnected network that contributes to habitat connectivity for lynx. In the North Fork, Hungry Horse, and Swan Valley geographic areas, some 6a and 6b management areas are located in areas along putative travel corridors identified by Squires and others (2013).

Of the general forest management areas, management area 6a is anticipated to have the lowest intensity of timber harvest, followed by management area 6b, which also contributes to habitat connectivity in key areas for lynx. Much of management areas 6c area is in the wildland-urban interface (WUI), where timber harvest intensity is anticipated to be higher. This area is where exemptions to the vegetation standards for lynx are most likely to result in adverse effects to lynx.

Vegetation management may be allowable under certain conditions in management areas other than 1a and 1b. This represents an additional 17 percent of potential lynx habitat on the FNF (Table IV-9). While these management areas are not suitable for timber production, vegetation management may occur in these areas for purposes such as maintaining desired ecological conditions, or meeting research needs. Therefore, under the Revised Plan, vegetation management activities in these management areas could occur in lynx habitat.

As analyzed in the 2007 biological opinion on the NRLMD (USFWS 2007), the Service concluded that the ongoing implementation of the NRLMD under the existing FNF Forest Plan would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure. These components ensure habitat that maintains its inherent capability to support both snowshoe hare prey base and adequate lynx foraging habitat (and denning habitat, discussed later) during all seasons.

Table IV-9. Canada lynx habitat in each Forest management area (MA) under the FNF's Revised Forest Plan.

Management Area (MA)	Approximate Lynx Habitat Acres	Percentage of Potential Lynx Habitat
1a Designated wilderness	771,082	43
1b Recommended wilderness	155,820	9
2a Designated wild and scenic rivers	4,294	< 1
2b Eligible wild and scenic rivers	13,364	1
3b Special areas	1,001	< 1
4a Research natural areas	4,673	< 1
4b Experimental and demonstration forests	8,782	< 1
5a Backcountry nonmotorized year-round	122,511	7
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	45,047	3
5c Backcountry: motorized over-snow vehicle use	95,822	5
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	8,583	< 1
6a General forest low	106,027	6
6b General forest medium	255,311	14
6c General forest high	166,672	9
7 Focused recreation areas	36,578	2
Total	**1,795,567**	

The Revised Forest Plan applies the NRLMD objectives, standards, and guidelines that avoid or reduce adverse effects on lynx habitat and snowshoe hare habitat as a result of vegetation management. Specifically, timber harvest, thinning, and salvage harvest in lynx habitat would be subject to the standards of the NRLMD: VEG S1, VEG S2, VEG S5, and VEG S6, and guidelines: VEG G1, VEG G4, VEG G5, and VEG G11. These standards and guidelines were crafted to avoid or limit adverse effects to lynx by ensuring that habitat within each LAU would provide lynx with sufficient snowshoe hare prey (i.e. snow shoe hare habitat) and lynx foraging (i.e. hunting) habitat conditions. Briefly, the standards require:

- If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat no additional habitat may be regenerated by vegetation management projects (VEG S1).
- Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS or BLM lands in an LAU in a ten-year period (VEG S2).
- Pre-commercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only in limited locations or under limited circumstances (VEG S5).
- Vegetation management projects, including prescribed fire, that reduce snowshoe hare habitat in multi-story mature or late successional forests may occur only in limited locations or under limited circumstances (VEG S6).
- Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available (VEG G1).
- Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided (VEG G4).
- Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU (VEG G5).
- Denning habitat should be distributed in each LAU (VEG G11),

These standards and guidelines work together to maintain the quality of lynx habitat by improving conditions for prey. If applied at the project level, adverse effects on lynx are mostly avoided, or minimized. In the NRLMD biological opinion, the Service concluded that this direction would conserve the most important components of lynx habitat: a mosaic of early, mature and late successional staged forests, with high levels of horizontal cover and structure (USFWS 2007).

Exemptions to Vegetation Standards

The NRLMD includes exemptions from standards VEG S1, S2, S5, and S6 to allow for fuels management within the WUI. These exemptions allow actions that may have adverse effects on lynx by reducing the horizontal structure of natural forest succession phases, and/or affecting the mosaics of the forested landscape in localized areas. These exemptions are brought forward into the FNFs Revised Forest Plan.

Specifically, the NRLMD biological opinion constrains WUI exemption treatments to no more than 6 percent (cumulatively) of lynx habitat on an individual national forest. The Revised Forest Plan will carry forward the 6 percent exemption for vegetation treatments within the WUI. On the FNF this equates to 103,800 acres for the life of the Revised Forest Plan, which is anticipated to be 15 years.

During the period 2007-2016, the FNF used the exemption to treat fuels on 10,079 acres of lynx habitat within the WUI (see Table IV-7 above), or about 9 percent of the limit allowed under the NRLMD. Therefore, under the remaining allowance for exemptions in the Revised Forest Plan, up to 93,723 acres of lynx habitat could be treated fuels management in the WUI. Fuels treatments in the WUI are expected to have some adverse effects on lynx and snowshoe habitat because the intent would be to maintain lower tree density in these areas, resulting in less area of dense horizontal cover.

As analyzed in the NRLMD biological opinion (USFWS 2007), the exemptions from VEG S1 for fuels management would affect the forest mosaic by allowing more than 30 percent of lynx habitat within an LAU to be in a stand initiation stage. The exemption from VEG S2 would allow more than 15 percent of an LAU to be regenerated within a decade. Where the exemptions from VEG S1 or S2 are used within the WUI, there may be adverse effects to lynx by reducing the quality and productivity of lynx and snowshoe hare habitat for at least 10 to 15 years, depending up on the location, until treated stands regenerate to provide winter snowshoe hare habitat. Notably, these stands may be treated again to retain them as fuel breaks, and not allowed to regenerate extending the length of time they remain in early seral conditions. However, standard VEG S1 will limit effects by stating that fuel treatment projects may not result in more than three adjacent LAUs exceeding the standard.

The exemption from VEG S5 for fuels management may reduce natural levels of horizontal structure in early successional phases by allowing precommercial thinning prior to when the stand no longer provides winter snowshoe hare habitat. Thinning dense stands of young trees could adversely affect lynx by reducing the carrying capacity of these stands to produce snowshoe hares. Similarly, the exemption for fuels management from VEG S6 would likewise allow management actions that reduce the horizontal cover and thus the quality of snowshoe hare habitat in older, multi-layered stands.

Exceptions to Vegetation Standards

In addition to the exemptions described above, the NRLMD also includes exceptions from standards VEG S5 and S6 and would allow some precommercial thinning to protect structures, for research, and to promote the conservation of tree species such as whitebark pine and aspen. These exceptions allow actions that may have adverse effects on lynx by reducing the horizontal structure of natural forest succession phases, and/or affecting the mosaics of the forested landscape in localized areas.

The NRLMD exceptions to VEG S5 and S6 are brought forward into the FNFs Revised Forest Plan with one additional exception to VEG S6. Under the NRLMD direction carried forward into the Revised Plan, standard VEG S5 has an exception that allows precommercial thinning to restore whitebark pine. However, VEG S6 does not provide a comparable exception to accommodate vegetation treatments to protect whitebark pine in multistory mature stands.

Whitebark pine was historically widespread on the FNF and resilient to losses due to wildfire, drought, insects, or pathogens. However, white pine blister rust, has caused severe decline of whitebark pine across its distribution on the FNF. Some whitebark pine trees on the FNF are surrounded by dense forests dominated by larger subalpine fir, making whitebark pine very susceptible to wildfires. The FNF has already lost some of its remaining live whitebark pine trees of all sizes to high-severity wildfire, but it continues to serve as an important source of whitebark pine seeds that are used for restoration of the species throughout the region.

Under the Revised Forest Plan, standard VEG S6 would have an additional exception that would allow non-commercial felling of trees of any size that are growing within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. The text of this new exception can be found in Standard VEG S6 section of Appendix 4 (new exception category is indicated by bold text). Removal of these trees would be aimed at reducing the risk of mortality of whitebark pine trees due to wildfire, within-stand competition, and other stressors and making the trees more resilient and adaptable to changing future environments.

Under the FNFs new VEG S6 exception, along with the existing exception to VEG S5 for whitebark pine, it is estimated that a total of 2,500 acres over the next 15 years would be treated with precommercial thinning and about 4,400 acres would be treated with non-commercial thinning to protect and restore whitebark pine. The acreage estimated is for the entirety of existing whitebark pine stands, although not all of the acres within a stand would be affected by the new exception since only trees located within 200 feet of the selected, mature whitebark pine trees would be felled.

Preliminary analysis, subject to further site-specific analysis, indicates that 18 out of the 109 LAUs distributed in all but the Salish Mountains geographic area may have treatments using this new exception. No more than 6 percent of the lynx habitat in any one LAU that is identified for possible treatment (for estimated exception acres in LAUs on the FNF see Figures 28 and 29) will be treated.

Removal of the trees that surround selected mature, rust-resistant whitebark pine trees in mature multistory stands has the potential to decrease the habitat quality of lynx and snowshoe hare habitat. At this time, it is not known whether the stands that would be targeted for treatment actually provide the dense horizontal cover needed by snowshoe hares, and therefore the effects on lynx are uncertain, but site-specific consultation would be conducted when treatments are proposed. Since the felled trees would not be removed from the site, the downed logs would provide additional horizontal cover that may partially offset the adverse effects for a short period of time. Because whitebark pine grows at high elevations and no treatment areas were identified in the portions of the Salish geographic area west of Highway 93, treatments would not be adjacent to areas currently treated with WUI exemptions.

In total, the FNF is proposing that a maximum total of 15,460 acres will be treated using exceptions to standards VEG S5 and VEG S6. This estimate is an increase over what was originally allowed under the 2007 NRLMD biological opinion (1,460) and includes treatment acres for the newly proposed VEG S6 exception. In detail, these totals are anticipated to be distributed as follows:

- about 500 acres for defensible space (VEG S5/S6 exception 1);
- about 1,510 acres for research studies and genetic tree tests (VEG S5/S6 exception 2);
- about 1,800 acres for conifer removal or daylight thinning of aspen (VEG S5 exception 4);
- about 4,750 acres for daylight thinning of planted, rust-resistant western white pine (VEG S5 exception 5);
- about 2,500 acres to restore whitebark pine in wildfire areas and forests with sapling-size trees (VEG S5 existing exception 6);
- about 4,400 acres to restore whitebark pine in forests with trees larger than sapling-size (VEG S6 **new** Forest-specific exception).

Overall, although there could be adverse effects on individual lynx due to the limited number of acres of lynx habitat that would be treated, it is not likely that there would be a detectable impact on the lynx population as a result of the exceptions. Exceptions #2-6 to VEG S5 will only be utilized in LAUs where standard VEG S1 is met. Exceptions 2, 3, and 4 to VEG S6 will only be utilized in LAUs where VEG S1 is met. These limitations would continue to limit the concentration of impacts to Canada lynx in the future.

In summary, the FNFs Revised Forest Plan may result in adverse effects on snowshoe hare/lynx foraging habitat: 93,723 acres for future fuels treatments in the WUI (exemptions), and 15,460 acres for other future resource needs (exceptions). Under the Revised Forest Plan, about 25-30 percent of lynx habitat occurs in management areas where timber harvest is anticipated to occur. However, within these areas, riparian management zones are not suitable for timber production, so harvest is not likely to occur on all acres. Opportunistic timber harvest and harvest for resource benefit could occur on an additional 17 percent of lynx habitat. However, the Revised Forest Plan would apply desired conditions for vegetation and wildlife and the NRLMD objectives, standards, and guidelines to projects in lynx habitat in these areas.

Effects of Habitat Fragmentation on Lynx

General Effects

Maintaining linkage with lynx populations in Canada and between mountain ranges is important for lynx in the Northern Rocky Mountains Geographic Area and for populations farther south in the Rocky Mountains (Ruediger et al. 2000). Potential impediments to lynx dispersal include highways and areas of human settlement (Apps 2000, Ruediger et al. 2000). Lynx use a variety of habitats for dispersal and are known to travel great distances to use suitable habitat patches

(Ruggiero et al. 2000). When dispersing, lynx have been documented to cross large, early-successional stage stands or very large openings, which would otherwise be avoided if located within breeding territories (Ruggiero et al. 2000). Although empirical data are limited, tracking of radio-collared lynx indicate they have crossed divided interstate and secondary highways. However, it is not yet understood how major highways and high levels of associated development may impact population connectivity. Private land development, especially along road corridors in mountain valleys, may fragment habitat and impede movement of lynx (Ruediger et al. 2000). Private land development on non-NFS lands is addressed in Cumulative Effects below.

Effects of the Action

Objectives, standards, and guidelines carried forward from the 2007 NRLMD in the Revised Forest Plan are aligned with the conservation measures to minimize habitat fragmentation in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (ILBT 2013) at a forestwide scale. Additional management direction for the FNF allows for activities to occur to meet social, economic, and multiple use objectives of the Forest while promoting recovery of the Canada lynx population, as discussed below:

- Emphasize land uses that promote or retain conservation of contiguous blocks of lynx habitat. (Desired condition FW-DC-LSU-01).

- Maintain a mosaic of vegetation and features such as riparian areas, forest stringers, unburned inclusions, or forested ridges to provide habitat connectivity within and between LAUs. (Standard FW-STD-RMZ-01, Guideline FW-GDL-RMZ-09, FW-GDL-TIMB-01, FW-DC-TE&V-19).

- Identify linkage areas where needed to maintain connectivity of lynx populations and habitat. Factors such as topographic and vegetation features and local knowledge of lynx movement patterns should be considered. Retain lynx habitat and linkage areas in public ownership and acquire land to secure linkage areas where needed and possible. On private lands in proximity to federal lands, agencies should strive to work with landowners to develop conservation easements, explore potential for land exchanges or acquisitions, or identify other opportunities to maintain or facilitate lynx movement. (Desired condition FW-DC-P&C-01).

- Minimize large-scale developments that would substantially increase habitat fragmentation, reduce snowshoe hare populations, or introduce new sources of mortality. (No large-scale developments are anticipated on NFS lands over the life of the plan).

- Give special attention to the design of highway improvements such as new road alignments, adding traffic lanes, installing Jersey or Texas barriers, or other modifications that increase highway capacity or speed. Upgrading unpaved roads should be avoided in lynx habitat if the result would be increased traffic speeds and volumes or a substantial increase in associated human activity or development. Crossing structures or other techniques could be used to minimize or offset impacts (Guideline FW-GDL-IFS-12).

In summary, the Revised Forest Plan will contain multiple objectives, standards, and guidelines that apply in lynx habitat. Standard ALL S1 specifies that new or expanded permanent developments and vegetation management projects must maintain habitat connectivity in a lynx analysis unit and/or linkage area. Guideline ALL G1 says that methods that avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Objective LINK O1 encourages working with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions in mixed ownership areas to reduce the potential of adverse impacts on lynx and lynx habitat. In linkage areas, potential highway crossings will be identified (LINK S1), and Forest Service lands should be retained in public ownership (LINK G1). Guideline HU G6 says that methods to avoid or reduce the effects on lynx in lynx habitat should be used when upgrading unpaved roads to maintenance levels 4 or 5 if the result would be increased traffic speeds and volumes or a foreseeable contribution to increases in human activity or development in lynx habitat. Guideline HU G7 states that new permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.

Many actions that fragment habitat, such as highway expansions and residential developments, are not under the authority of the Forest Service and are discussed in the section on cumulative effects. However, the forest plan components listed above are beneficial in maintaining or improving habitat connectivity on National Forest System lands, and would help to reduce or minimize adverse effects. In addition, alternative B modified includes site-specific plan components to help provide connectivity for Canada lynx. In addition, other Forest-specific plan components promote connectivity between areas of Canada lynx habitat, including:

- Guideline FW-GDL-IFS-12 specifies: Within areas specifically identified as being important for wildlife connectivity across highways (see Table IV-10) the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety.

Table IV-10. Key highway crossing areas for wildlife

Area	Route	Mile Marker
east of Essex[1]	U.S. 2	181-184
east of Essex[1]	U.S. 2	189-190
east of Columbia Falls[1]	U.S. 2	141-143
north of Columbia Falls[1]	Rt 486	7-9

Area	Route	Mile Marker
between Whitefish and Eureka[1]	U.S. 93	148
between Whitefish and Eureka[1]	U.S. 93	157-160
Swan Valley[2,3,4]	U.S. 83	31-36
Swan Valley[2,3,4]	U.S. 83	45-58

[1]Based on Ament and others (2014)
[2, 3, 4] Based on Huijser et al. (2006), Sandstrom (1996), and Weaver (2014)

- Desired condition FW-DC-TE&V-19 specifies that forest patterns contribute to connectivity of habitat for wildlife (e.g., Canada lynx, marten), movement within and between home ranges, and dispersal between populations.

- Desired condition FW-DC-LSU-01 specifies that land ownership adjustments, through purchase, donation, exchange, or other authority, improve national forest management by consolidating ownership, reducing wildlife-human conflicts, providing for wildlife habitat connectivity, improving public access to public lands, and retaining or acquiring key lands for wildlife and fish and within Wild and Scenic River corridors.

- Desired condition FW-DC-P&C-01 specifies that the Forest work towards an all-lands approach to management, cooperating with other land managers; this includes efforts to mitigate threats or stressors, provide for wildlife and fish habitat connectivity, and provide social, economic and ecological conditions that contribute to mutual objectives.

- GA-HH-DC-03 specifies that the Coram connectivity area provides habitat connectivity for a north-south movement corridor for wide-ranging species (e.g., grizzly bear, Canada lynx, wolverine) moving between the southern and northern watersheds on the Forest. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-MF-DC-04 specifies that the Nyack, Essex, and Pinnacle connectivity areas (see Figure B-29) provide habitat connectivity for wide-ranging species (e.g., grizzly bear, Canada lynx, wolverine) moving north-south between Glacier National Park and the Bob Marshall Wilderness Complex and east-west in the Middle Fork watershed. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-NF-DC-06 specifies that the Haskill Basin connectivity area (see Figure B-29) provides habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, wolverine) moving north-south between the Swan Range and the Whitefish Range. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-NF-DC-07 specifies that the North Fork and North Whitefish Range connectivity areas (see Figure B-29) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, wolverine) moving between Glacier National Park and the Whitefish Range. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-SM-DC-03 specifies that in areas between the [grizzly bear] primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. NFS lands in the Swift Creek-Stillwater connectivity area (see Figure B-10) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

- GA-SV-DC-07 specifies that the portion of the Seeley Clearwater connectivity area from Condon south to the boundary of the Swan Valley geographic area and the area near the town of Swan Lake (see Figure B-10) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, and wolverine) moving between the Swan and Mission Mountain Ranges. This incorporates the highest value putative travel corridor identified in Squires et al. (2013).

In addition, forestwide guidelines for riparian management zones would promote connectivity. Two of these guidelines state, “to protect water quality and maintain live trees that contribute to forest structural diversity for provide habitat for aquatic- and riparian-dependent species, clearcuts should not occur in an RMZ” and “If new openings are created in RMZs through even-aged regeneration harvest or fuel reduction vegetation management activities, the created opening’s distance to cover should not exceed 350 feet to provide wildlife habitat structural diversity, connectivity and cover”. These guidelines would benefit lynx and are consistent with findings by Squires and others (2013) regarding lynx avoidance of areas more than 364 feet to cover. We do not anticipate adverse effects on linkages and movement areas for lynx under the Revised Plan.

Effects of Recreation on Lynx

<u>General Effects</u>

The potential effects of recreation on lynx reproduction, behavior, habitat use and populations have not thoroughly been investigated. Anecdotal evidence suggests that lynx are tolerant of human presence; however, this has not been rigorously tested (Staples 1995, Mowat et al. 2000). The growing popularity of outdoor recreation combined with improved technology has expanded recreation to previously undisturbed federal and state lands. Further, advances in snowmobile technology, expansion of trail grooming and an increase in off-trail recreation have led to easier and more frequent access to remote and rugged areas. Additionally, the use of helicopters and tracked vehicles for backcountry skiing is also increasing in popularity (Heinemeyer and Squires 2012).

Effects of the Action

The Revised Forest Plan retains the NRLMD objectives, standards, and guidelines that address the most serious consequence of development, requiring new or expanding permanent developments to maintain or where possible, promote habitat connectivity within LAUs and linkage areas (All O1, All S1, LINK O1, LINK S1, and All G1). If ski areas are expanded or proposed, they would be required to incorporate the NRLMD guidelines that reduce impacts within the proposed development itself, including: HU G1, HU G2, and HU G3.

The likelihood of construction of new or expanded recreation sites affecting a lynx den is extremely low. Lynx are rare, den sites are rare and are typically not re-used year to year, multiple den sites are used each year, and denning habitat is not limited in the action area (Squires et al. 2008, 2010). If human activities or presence near den sites disturbed lynx, it is unlikely that a lynx would select a site near a construction site or a new or existing developed area. We expect the likelihood of developed recreation disturbing a lynx den site to be so unlikely as to be discountable.

Developed Ski Areas

Under the FNF Revised Forest Plan, objective HU O3 encourages concentrating activities in existing developed areas; and HU O4 says to provide for lynx habitat needs and connectivity when developing or expanding existing developed recreation sites or ski areas (see text of individual plan components in Appendix 4). No standards were adopted because recreational activities were not considered to be a threat to the population of lynx. Two guidelines were included that address ski area development or expansion: HU G1 indicates that provisions should be made for inter-trail islands that maintain winter snowshoe hare habitat and HU G2 encourages providing foraging habitat consistent with the ski area's operational needs. Further, guideline HU G3 says that recreation development and operations should be planned to provide for lynx movement and maintain the effectiveness of lynx habitat.

As discussed in Section C.2, there are two ski resorts, Whitefish Mountain Resort (formerly known as Big Mountain Resort) and Blacktail Mountain Resort on the FNF that contain lynx habitat. The 2007 NRLMD biological opinion reconfirmed the conclusion that individual lynx may be adversely affected through habitat avoidance, alteration, or loss but that the total area affected is limited and the objectives, standards, and guidelines would reduce the potential impacts (USFWS 2007). Under the Revised Forest Plan the two ski resorts will continue to operate within their existing permit area boundaries, and the adverse effects to lynx as a result of these two resorts have been exempted under previous consultation with the Service (USFWS 2001, 2011, 2013, 2015). We do not expect additional adverse effects to lynx beyond what is discussed in these previous biological opinions.

Motorized Over-Snow Use

In the past, researchers speculated that packed trails could indirectly affect lynx by serving as travel routes that might enable competing predators (e.g., coyotes) to access snowshoe hare prey in lynx habitat (Murray et al. 1994,). However, in 2003 the Service found no evidence of competition between lynx and other predators such as coyotes or, if competition exists, there is no evidence that it exerts a population-level impact on lynx, and therefore the Service did not consider this to be a threat to lynx (68 FR 40076). Additionally, Kolbe et al. (2007) completed a study of the effect of snowmobile trails on coyote movements in lynx habitat in northwestern Montana. They reported that coyotes in their study area were primarily scavengers in winter (snowshoe hare kills composed only 3 percent of coyote feed sites). Furthermore, coyotes did not forage closer to compacted snowmobile trails than random expectation, and the overall influence of snowmobile trails on coyote movements and foraging success appeared to be minimal. Subsequently, Squires et al. (2010) reported on the effects of snowmobiling on lynx in their Seeley Lake study area, south of the FNF. They were unable to quantify the number of snowmobiles using forest roads in lynx home ranges, but one primary groomed trail was used by approximately 130 snowmobiles per day. They reported that they found no evidence that lynx selected areas away from forest roads or groomed snowmobile trails during winter.

Existing NRLMD guideline HU G11 addresses designated over-the-snow routes or designated play areas and areas of consistent snow compaction, which are defined as areas that get enough human use that individual tracks are indistinguishable. Areas such as over-snow motorized vehicle use routes, groomed cross-country ski routes, parking lots, and adjacent openings with consistently high levels of use would meet this definition.

Unlike some other National Forests within the Northern Rockies, the FNF designated specific motorized over-snow routes and areas under A24 (see discussion in Section C.2), as well as seasons, for motorized over-snow vehicle use in accordance with §212.81 of the Travel Management Rule (USFS 2017). As a result, approximately 68 percent of the lynx habitat on the FNF is closed to motorized over-snow vehicle use (see Figures 33 and 36).

The FNF's Revised Forest Plan would change the wording of HU G11 to include a FNF-specific guideline to better mesh with the Forest's desired conditions for social and economic sustainability of motorized winter recreation while addressing ecological sustainability for lynx. The proposed change to HU G11 is presented below in Table IV-11:

Table IV-11. NRLMD guideline HU G11

Northern Rockies Lynx Management Direction, guideline HU G11	Flathead National Forest-specific modification of HU G11 under Revised Forest Plan
Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This is calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.	To provide ecological conditions to support Canada lynx on NFS lands at a forestwide scale, there should be no net increase in miles of designated motorized over-snow vehicle routes, groomed routes or areas where motorized over-snow vehicle use would be suitable. The "no net increase" is in comparison to suitability displayed in figure B-11. This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by guideline HU G12.

The effects of this change to HU G11 would be that additional areas would be suitable for motorized over-snow use in seven LAUs. In the North Fork Flathead River geographic area, there would be an increase in acres suitable for over-snow use of about 217 acres in the Lower Big LAU, and 7,660 acres in the Canyon LAU. There would be an increase of about 485 acres in the middle of an existing route in the Upper Big LAU and an increase of about 260 acres in the Upper Coal LAU. In the Red Meadow LAU there would be an increase of about 235 acres adjacent to an existing area. In the Middle Fork geographic area there would be an increase of about 1,548 acres adjacent to an existing open area in the Bear Creek LAU, and about 602 acres in the Challenge-Granite LAU. Additional snow compaction would occur on some, but not all of this acreage, because there are portions where tree cover is too dense for snowmobiles to navigate. In total, about 11,007 acres will become suitable for motorized over-snow use.

In the LAUs with an increase in acres suitable for motorized over-snow vehicle use, an increase in over-snow use would be expected to occur. This increase could affect some individual lynx, but there are adjacent areas that are not suitable for motorized over-snow use where snow compaction would not occur. In vicinities that are already heavily used by motorized over-snow vehicles, such as Canyon Creek, there is a potential for the additional suitable areas to result in an increase in the area of consistent snow compaction, as defined by the NRLMD. The effects of this increase on Canada lynx are anticipated to be minor. In addition, not all of the acreage in added suitable areas would be expected to have an increase in the area of consistent snow compaction. This is due to terrain and vegetation that influence where over-snow vehicles can physically go.

At a forest-wide scale, the above increases would be offset by changing some areas in five different LAUs to make them unsuitable for motorized over-snow vehicle use. These changes would total 48 acres in the Bunker Creek LAU, 2,646 acres in the Kah Soldier LAU, 94 acres in the Stony Jungle LAU, 8,812 acres in Sullivan LAU, and 344 acres in the Slippery Bill LAU. In addition, there would be some very minor adjustments in suitable and non-suitable areas (generally less than 15 acres) scattered across 30 LAUs in order to clean up boundaries previously mapped in a raster format or to assist in enforcement of closed areas. In total, 11,934 acres previously suitable for over-snow use will become unsuitable. Thus, for the FNF as a whole there would be no net increase in the percentage of lynx habitat designated as suitable for over-snow vehicle use. In fact, the proposed change will result in a net decrease of 927 acres of lynx habitat that is suitable for motorized over-snow use.

This proposed change to guideline HU G11 provides a strategy for management of over-snow motorized recreation that is more adaptive in the future, as compared to the current guideline for addressing designated routes/play areas and areas of consistent snow compaction. Overall, there would be no net increase in routes, groomed routes, or areas that are suitable for over-snow vehicle use across the FNF as a whole under the Revised Forest Plan. By limiting where snow compaction and disturbance could occur in the future, a small benefit to lynx and snowshoe hares might result. Changes to over-snow motorized use would go through site-specific consultation at the project level.

In summary, with the application of NRLMD objectives standards and guidelines (listed above), and lynx tolerance of human activities, we do not anticipate adverse effects of developed recreation sites on lynx. Further, the we do not anticipate the changes proposed to HU G11 to have additional adverse effects on the lynx since there will be a net decrease in lynx habitat open to over-snow vehicle use.

Effects of Roads and Trails on Lynx

General Effects

In general, construction and reconstruction of forest roads are not considered a primary threat to resident lynx populations in and of themselves (USFWS 2007). Construction of forest roads typically results in a small reduction of lynx habitat by removing forest cover. In some instances, vegetation along less-traveled roads provides good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging (Koehler and Brittell 1990). McKelvey et al. (2000c) demonstrated that lynx show no preference or avoidance of unpaved forest roads and the existing road density did not appear to affect lynx habitat selection. Hence, forest roads and trails likely do not represent an impediment to lynx movements. Information suggests that lynx do not avoid roads (Ruggiero et al. 2000), except at high traffic volumes (Apps 2000).

Vehicle speeds on forest roads in the mountainous west are relatively slow in comparison to highways or other public roads due to topography, substrate and road conditions. Thus, the potential for lynx mortality or injury due to collisions with vehicles is low on forest roads in the west. Further research directed at investigating the effects of road density on lynx is needed. Roads and trails can also fragment habitat; these effects are addressed under Effects on Linkage Habitat (above).

Effects of the Action

Construction of roads and trails results in a small reduction of lynx habitat by removing forest cover. In some instances, vegetation along less-traveled roads provides good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging. In general, forest roads with low vehicular or snowmobile traffic appear to have little effect on lynx seasonal resource-selection patterns in areas similar to the action area.

Under the Revised Forest Plan effects of roads and trials on FNF lands in lynx habitat will continue to be addressed through implementation of NRLMD guidelines ALL G1 and HU G6 through G9 (see Section C.2 for text of guidelines). Guideline ALL G1 directs the FNF to use underpasses and overpasses where possible when constructing highways, and HU G7 directs the FNF to avoid building permanent roads in areas identified as important for lynx connectivity. These guidelines will reduce the potential for the Revised Forest Plan to result in habitat fragmentation. Guidelines HU G6, G8 and G9 also reduce to potential for the Revised Forest Plan to impact lynx by directing the FNF to use methods that avoid or reduce effects to lynx with upgrading unpaved roads, building new project roads, and cutting brush along low-volume unpaved roads. These guidelines will reduce the effects to lynx by minimizing both human disturbance and habitat loss that may result from road construction or maintenance. In summary, with the application of the NRLMD guidelines and revised plan standards, roads and trails under the Revised Plan are not expected to result in adverse effects to lynx.

Further, a large portion of the LAUs are also within the NCDE recovery zone for grizzly bears on the FNF (See grizzly bear chapter of this BO for further details). Standards to maintain baseline densities of motorized routes in the grizzly bear primary conservation area and Salish demographic connectivity area also would limit potential risks to lynx associated with motorized public access.

Effects of Livestock Grazing on Lynx

General Effects

Snowshoe hare densities and overwinter survival appear to be positively correlated with understory density (Litvaitis et al. 1985). Livestock may compete with snowshoe hares for forage resources (Ruediger et al. 2000). Browsing or grazing also could impact plant communities that connect patches of lynx habitat within a home range. Throughout the Rocky Mountains and other regions of the west, grazing and browsing by domestic livestock and wild ungulates has been identified as a factor in the decline or loss of aspen as a seral species in subalpine forests (Barnett and Stohlgren 2001). The habitats used by snowshoe hare that are most likely to be affected by livestock grazing are riparian willow and aspen communities. Heavy grazing by domestic livestock that inhibited aspen regeneration and survival thus could impact snowshoe hare habitat, indirectly affecting lynx.

There is no existing research that provides evidence of lynx being adversely affected by grazing within the Northern Rockies/Cascade Mountains Region or elsewhere, or of lynx movements within home ranges being impeded by grazing practices (USFWS 2007). Overall, grazing or browsing by domestic livestock on federal lands is unlikely to reduce the snowshoe hare prey base or have a substantial effect on lynx (ILBT 2013).

Effects of the Action

Grazing or browsing by domestic livestock on FNF lands is unlikely to reduce the snowshoe hare prey base or have a substantial effect on lynx. However, grazing/browsing could have some localized effects on high elevation willow communities or aspen stands if not managed appropriately. Section C.2 describes existing Forest Plan and NRLMD direction that reduces the impacts of livestock grazing on lynx. The Revised Forest Plan will carry forward this direction.

Under the Revised Forest Plan, objective GRAZ 01 will provide direction that livestock operations should be compatible with maintaining lynx habitat on the FNF. Further, guidelines GRAZ G1 under the Revised Forest Plan will also maintain lynx habitat by guiding livestock operations in a manner that allows for shrub and tree regeneration following fire, long-term health of aspen stands, and maintenance of multiple vegetation stages in riparian and shrub-steppe habitats. These plan components will reduce the potential for livestock grazing to result in the loss of lynx habitat. In summary, with the application of the NRLMD guidelines and revised plan standards, livestock grazing under the Revised Plan is not expected to result in adverse effects to lynx.

Effects of Minerals and Energy Development on Lynx

General Effects

Generally, the impacts of mining and energy development on lynx result from the habitat loss and fragmentation. See Sections B.6 and C.2 for further discussion.

Effects of the Action

The effects of mining developments (habitat loss, roads, and human access) are addressed by the NRLMD guidelines HU G4, HU G5, HU G6, HU G9, and HU G12 (see Section C.2 for text of guidelines). The Revised Forest Plan will carry forward these components. Guidelines HU G5, G6 and G9 will reduce the potential for mineral and energy development activities to result in loss of lynx habitat by directing the FNF to develop reclamation plans that restore lynx habitat, and reclaim or decommission roads following project completion. The Revised Forest Plan will also reduce the potential for mineral and energy development to increase snow compaction through implementation of guidelines HU G4 and G12. These guidelines state that mineral and energy facilities should be encouraged to reduce snow compaction, and winter access to these sites should be through designated routes only.

In addition, the Revised Forest Plan will contain a "no surface occupancy" stipulation for any new leases within the Primary Conservation Area of Northern Continental Divide grizzly bear ecosystem (see grizzly bear chapter of this biological opinion for further details). This stipulation will further limit the potential for future mining and/or energy development to effect lynx, or lynx habitat.

Activities associated with exploration and development of leasable minerals, locatable minerals, and mineral materials could affect lynx by altering vegetation, contributing to habitat fragmentation, and compacting deep fluffy snow. However, with the application of the NRLMD guidelines and revised plan standards, we do not expect mineral and energy development under the Revised Forest Plan to result in adverse effects to lynx.

3. Analysis for Effects of the Action on Lynx Critical Habitat

Lynx critical habitat on the FNF lies within Critical Habitat Unit 3. Critical habitat on the FNF is a subset of the total mapped lynx habitat and so is mostly addressed under the NRLMD direction carried forward in the Revised Forest Plan. The Revised Forest Plan includes standards and guidelines intended to avoid or reduce the potential for projects to adversely affect lynx. The primary focus of the standards and guidelines is to conserve and promote the *habitat* conditions needed to produce adequate snowshoe hare (lynx primary prey) at densities adequate to sustain lynx home ranges, and thus sustain lynx populations. Thus, the NRLMD direction being carried forward in the Revised Forest Plan addresses the habitat types, habitat components, and habitat conditions detailed and described in the lynx critical habitat PCE 1 (outlined in Section B.5).

Effects of Vegetation Management on Critical Habitat

General Effects

Vegetation management includes activities that change the composition and structure of vegetation to meet specific objectives, using such means as prescribed fire or timber harvest. For the purposes of this discussion, vegetation management does not include removing vegetation for permanent developments like mineral operations, ski runs, roads, and the like, and does not apply to fire suppression or wildland fire use.

The primary factors driving lynx populations, behavior, and distribution is the abundance and distribution of snowshoe hares. Vegetation management or natural fire can set back vegetation succession to an early stand initiation structural stage, which may be used by snowshoe hares during the summer but is snow-covered and thus unavailable to hares during the winter. Eventually these stands regenerate into a stand initiation structural stage, providing high stem densities and horizontal structure extending above the snowpack during winter, and become high quality snowshoe hare habitat, particularly in the summer (Squires et al. 2010, Kosterman 2014). Older forested stands also provide high quality habitat when they provide multi-story mature or late successional forests that provide high horizontal cover for both lynx and snowshoe hare (Murray et al. 1994, Squires 2010, Kosterman 2014). In Montana, these stands were used consistently by both lynx and snowshoe hare during the winter (Squires et al. 2010). These stands, along with stands in a stand initiation structural stage (including early stand initiation), provide the landscape mosaic of habitat conditions needed for snowshoe hare production and lynx foraging (hunting) habitat (Kosterman 2014), and thus provide for PCE 1a.

Effects of the Action

The Revised Forest Plan will carry forward four NRLMD objectives related to vegetation management that would improve the quality of lynx critical habitat by improving conditions for prey: (1) manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx (Objective VEG O1); (2) provide a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hare, and provide winter snowshoe hare habitat in both the stand initiation structural stage and in the mature, multi-story conifer vegetation (Objective VEG O2); (3) conduct fire use activities to restore ecological processes and maintain or improve lynx habitat (Objective VEG O3); and (4) focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover (Objective VEG O4).

Vegetation management activities can result in a conversion of vegetation types. For example, if silvicultural prescriptions are designed to change species composition to western larch, which has a high economic value, and eliminate lodgepole pine, which has low economic value but provides better lynx habitat, that would negatively affect lynx critical habitat. However, prescriptions designed to maintain a diverse mix of species (e.g., sub-alpine fir, spruce) may be beneficial to lynx critical habitat. The Objectives VEG O1, O2, O3, and O4 reduce the potential for adverse effects to lynx from such conversions of habitat. Attainment of the vegetation management objectives through projects designed using vegetation management standards and guidelines would support lynx survival and recovery. With the application of these measures, we do not anticipate that the proposed action would adversely affect lynx critical habitat via habitat conversions within the action area.

Under the Revised Forest Plan, standards VEG S1, VEG S2, VEG S5, and VEG S6 would lead to attainment of the vegetation objectives described above by limiting the disturbance to snowshoe hare habitat and ensuring that enough habitat within each LAU would be available to provide lynx with sufficient snowshoe hare prey and lynx foraging habitat conditions (PCE 1a). Under standard VEG S1, if more than 30 percent of lynx habitat in an LAU is in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects. Additionally, standard VEG S2 requires that timber management projects shall not regenerate (i.e., change to stand initiation structural stage) more than 15 percent of lynx habitat within an LAU in a 10-year period. It is important to note that early stand initiation structural stages are not considered adverse if they occur in less than 30 percent of an LAU. Indeed, these young stands typically contain high stem densities and horizontal cover, which provides summer habitat and eventually grows into essential winter foraging habitat for snowshoe hares. Vegetation standards VEG S1 and VEG S2 promote a balance, a mosaic, of young and older stands within each LAU.

Thinning stand initiation structural stages can reduce horizontal cover that is critical to maintain the snowshoe hare prey base. High horizontal cover is important to hares and lynx. Reducing dense horizontal structure through silvicultural thinning would likely reduce an area’s carrying capacity for snowshoe hares (Ruggiero et al. 2000). By deferring precommercial thinning that reduces snowshoe hare habitat until the stand no longer provides winter snowshoe hare habitat, standard VEG S5 ensures that stand initiation snowshoe hare and lynx habitat (PCE 1a) is not degraded. This standard protects and maintains the high stem densities that provide high quality snowshoe hare forage during summer and/or winter seasons and maintains the inherent capacity of the habitat to produce snowshoe hares and provide for PCE 1a.

Lynx preferentially forage in spruce-fir forests with high horizontal cover, abundant hares, deep snow, and large-diameter trees during the winter (Squires et al. 2010). The high horizontal cover found in multi-story conifer stands is a major factor affecting winter hare densities (Ibid.). During winter, snowshoe hares were consistently found in multi-story forest stands. These older, multi-story stands provide forage, hiding cover, and likely thermal cover for both snowshoe hares and lynx. Standard VEG S6 precludes vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests. This standard protects mature, multi-story habitat that provides a dense understory and high quality snowshoe hare habitat and also maintains the inherent capacity of the habitat to produce snowshoe hares and provide for PCE 1a.

Guideline VEG G1 directs that vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey. In other words, emphasis should be on those stands that do not currently provide snowshoe hare habitat, which in turn may improve snowshoe hare habitat (PCE 1a) over the long-term. Adverse effects to lynx critical habitat are not anticipated as a result of treatments in a stem exclusion or similar stage. Such stands are characterized as having a closed canopy with limited understory, lacking dense cover preferred by hares and are generally not progressing towards year-round snowshoe hare habitat. Treatment of stem exclusion stands would open up the stands and encourage an increase in horizontal cover (understory regeneration). Thus, treatments in these stands do not reduce existing snowshoe hare habitat (PCE 1a) and have the potential to improve the habitat for snowshoe hares by either creating openings to allow understory growth or stimulating the regeneration of dense stands of young trees used by hares.

Vegetation management typically does not influence the overall winter conditions that provide and maintain deep fluffy snow for extended periods of time (PCE 1b), as such conditions are a function of topography and climate. However, actions may result in some level of localized snow compaction, which can promote an increase in use by competing predators or lynx. As explained further in the recreation section, we have no evidence that snow compaction facilitates competition to a level that negatively affects lynx. Further minimizing the potential for snow compaction related to vegetation management, guideline VEG G4 directs that prescribed fire activities should not create permanent travel routes that facilitate snow compaction and that constructing permanent firebreaks on ridges or saddles should be avoided. Thus, while vegetation management may affect PCE 1b to some degree via localized snow compaction, we expect any effects would be insignificant.

Guideline VEG G5 is focused on habitat for alternate prey species, primarily red squirrel and directs that such habitat should be provided in each LAU. Red squirrel habitat typically contains snags and downed wood, generally associated with mature or older forests, which may be used by lynx for denning (PCE 1c) if the required components are provided and it is in close proximity to snowshoe hare habitat. Guideline VEG G11 directs that denning habitat (PCE 1c) should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future. Denning habitat elements are generally found distributed across the Forests. Vegetation management projects may result in localized effects to PCE 1c by removing existing coarse woody material and/or affecting its recruitment. This can affect the quality and quantity of available lynx denning habitat (PCE 1c). In most cases, denning habitat is not known to be limited within lynx habitat in the action area, and the vegetation management objectives, standards, and guidelines either directly or indirectly promote the development and retention of adequate amounts of denning habitat. In the cases where PCE 1c may be affected by vegetation management, guidelines VEG G5 and VEG G11 would apply and would minimize the potential for effects by requiring that such habitat be provided and well distributed. Therefore, vegetation management is unlikely to result in adverse effects to PCE 1c.

While vegetation management direction in the Revised Forest Plan does not include standards and guidelines specific to matrix habitat (PCE 1d), we do not expect vegetation management activities that are implemented under the Revised Plan to have adverse impacts on PCE 1d. As described in the 2014 lynx critical habitat final rule, activities in matrix habitat that change vegetation structure or conditions would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range, or if they would adversely affect adjacent foraging habitat or denning habitat (FR 79 54827). While vegetation management activities may affect vegetation within PCE 1d, we do not expect that such activities would affect the ability of a lynx to travel through such habitat because vegetation management is not likely to create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential lynx home range. As such, the effects from vegetation management that occur within PCE 1d would be insignificant.

In addition to the vegetation management standards, standard ALL S1 also applies to vegetation management projects in that vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area. Having this standard apply to each LAU (which represents a lynx home range) would maintain connectivity among LAUs and throughout the larger landscape, thus minimizing the potential impacts to habitat connectivity and linkage areas from vegetation management. We do not expect habitat connectivity or linkage to be adversely affected from vegetation management projects.

Based on the best available information, the Service concludes that the Revised Forest Plan would conserve the most important components of lynx critical habitat: a mosaic of early and mature multi-story forests with high levels of horizontal cover and structure. These components ensure habitat that maintains its inherent capability to support both snowshoe hare prey base and adequate lynx foraging habitat (PCE 1a) and denning habitat (PCE 1c). These standards and guidelines are applicable to all vegetation management actions on at least 94 percent of mapped lynx habitat within the action area. As analyzed below, areas within the WUI (totaling approximately six percent of mapped lynx habitat) are exempt from the standards; however guideline VEG G10 would apply and requires consideration of the standards in designing fuel treatment projects. Where these standards and guidelines are applied to vegetation management projects, we anticipate few projects, if any, would have adverse effects on lynx critical habitat. Collectively, application of the vegetation management standards and guidelines is expected to avoid most adverse effects to lynx critical habitat and the PCE would continue to serve its intended conservation role for lynx. The physical and biological features would not be altered to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Exemptions to Vegetation Standards

The Revised Forest Plan would protect existing lynx habitat that provides PCE 1a except for allowed exemptions to the vegetation standards within the wildland-urban interface, and allowed exceptions for other resource purposes listed under VEG S5 and VEG S6. Exemptions to standards VEGS1 and VEGS2 are allowed for fuel treatment projects within the WUI, subject to a cumulative limit of no more than 6 percent of lynx habitat on the FNF (USFWS 2007). The WUI is defined in the NRLMD as the area adjacent to an at-risk community that is identified in a community wildfire protection plan. If there is no community wildfire protection plan in place, the WUI is the area 0.5 mile from the boundary of an at-risk community or within 1.5 miles of the boundary of an at-risk community under special conditions (USFS 2007). Additionally, fuels treatment projects may not result in more than three adjacent LAUs exceeding the standards. This requirement helps to ensure actions that would remove understory vegetation and reduce the quantity or quality of hare habitat within boreal forest stands do not occur disproportionately in one portion of lynx critical habitat. Figure 34 displays critical habitat in relation to the current WUI within the geographic areas of the FNF.

The maximum exemption area for treatment in the WUI is 103,800 acres for the FNF. Lynx critical habitat totals about 2.2 million acres of NFS lands on the FNF, so cumulative WUI exemptions could be used on approximately five percent of critical habitat across the FNF. As of 2017, about 0.4 percent of critical habitat had been affected by WUI exemptions (USFS 2017). Fuels treatments under the WUI exemption may result in adverse effects to lynx critical habitat by reducing the density of the understory that provides PCE1a. The maximum amount of remaining lynx critical habitat providing PCE1a the FNF can treatment in the WUI is 94,250 acres. This means that implementation of the Revised Forest Plan may adversely affect PCE 1a on an additional 4.3 percent of critical habitat across the FNF over the life of the plan, which is anticipated to be 15 years.

Exceptions to Vegetation Standards

Under the Revised Forest Plan, the acreage that could be treated under the existing exceptions to VEG S5 and VEG S6 (based upon incidental take determined during NRLMD consultation; USFWS 2007) may be increased relative to estimates provided in 2007. In total, the FNF is proposing that a maximum total of 15,460 acres will be treated using exceptions to standards VEG S5 and VEG S6. This estimate is an increase over what was originally allowed under the 2007 NRLMD biological opinion (1,460 acres) and includes treatment acres for the newly proposed VEG S6 exception. In detail, these totals will be distributed as follows:

- 500 acres for defensible space (VEG S5/S6 existing exception 1)
- 1,510 acres for research studies and genetic tree tests (VEG S5/S6 existing exception 2)
- 1,800 acres for conifer removal or daylight thinning of aspen (VEG S5 existing exception 4)

- 4,750 acres for daylight thinning of planted, rust-resistant western white pine (VEG S5 existing exception 5)
- 2,500 acres to restore whitebark pine in wildfire areas and forests with sapling-size trees (VEG S5 existing exception 6)
- 4,400 acres for non-commercial felling within 200 feet of existing whitebark pine trees (VEG S6 ***new*** exception: see detail below)

In the Revised Forest Plan, the vegetation exception categories under the existing Forest Plan would remain in place with one forest-specific change. An additional exception to VEG S6 would allow non-commercial felling of trees within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. Since this is non-commercial felling, trees will be left on-site and will continue to provide some degree of horizontal cover and denning material. This new exception to VEG S6 would be anticipated to remove understory vegetation and reduce the quality of snowshoe hare habitat within about 4,400 acres of boreal forest stands, affecting about 0.2 percent of Canada lynx critical habitat, a minor amount. Further, the estimate of 4,400 acre makes up the entire stand of whitebark pine, but clearing will only occur within 200 feet of desireable trees. As a result, the acres of habitat treated will actually be much less than the 4,400 acres.

As previously analyzed during the consultation for the NRLMD, the Forest anticipates that the overall acres will be constrained but that there will be flexibility as to which exception categories are used in order to respond to changing conditions and needs. Use of exceptions to standards VEG S5 and VEG S6 may result in an adverse effect to PCE 1a. As mentioned above, the Revised Forest Plan will allow these exceptions to be used on a maximum of 15,460 acres of lynx critical habitat over the life of the plan (15 years). This represents less than one percent (0.7 percent) of critical habitat on the FNF.

Summary of Effects of Exemptions and Exceptions on Critical Habitat

The conservation role of lynx critical habitat is to support viable core area lynx populations. The activities that treat PCE 1a may have adverse effects on lynx critical habitat by reducing snowshoe hare forage and numbers. Snowshoe hare forage would be diminished primarily through the removal of the dense horizontal structure of natural forest succession phases and/or altering the mosaics of the forested landscape in localized areas.

Although the exemptions from and exceptions to vegetation management standards may result in some adverse effects to lynx critical habitat, vegetation objectives, standards, and guidelines overall would contribute to creating and maintaining landscape patterns that sustain snowshoe hare and lynx populations. No permanent loss (such as paving or building construction) of habitat or conversion of the boreal forest would occur as a result of vegetation management under the NRLMD direction carried forward in the Revised Forest Plan. The habitat would retain its inherent capacity to regenerate. Some vegetative treatments may degrade the function of the PCE by delaying the development of high density snowshoe hare habitat through succession; however, they do not remove the PCE from the site. Such actions may change the successional stage of a stand, but do not affect that stand's potential to produce snowshoe hare habitat in the future. Although vegetation management under the Revised Forest Plan may adversely affect areas of critical habitat, specifically PCE 1a, lynx critical habitat is expected to remain capable of producing adequate densities of snowshoe hares to support continual lynx presence and would continue to serve the intended conservation role for lynx. The physical and biological features would not be altered to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Effects of Habitat Fragmentation on Critical Habitat

The Revised Forest Plan will promote maintenance and improvements in connectivity to the extent that the FNF has authority to influence or control actions that affect connectivity. Connected forest habitats allow lynx to move long distances to find food, cover, and mates.

In addition to objectives, standards, and guidelines related to site-specific actions, the following objective, standard, and guidelines apply within linkage areas in occupied habitat, subject to valid existing rights. Such management direction is incorporated to improve connectivity. Objective Link O1 directs the FNF to work with landowners in areas of intermingled land ownership to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. Standard LINK S1 requires the FNF to identify potential highway crossings when highway or forest highway construction or reconstruction is proposed in linkage areas. In addition, guideline LINK G1 guides the FNF to retain Forest land in public ownership and guideline LINK G2 guides management of livestock grazing in shrub steppe habitats to contribute to maintaining or achieving a preponderance of mid- to late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

In addition, standard ALL S1 addresses the impacts to lynx critical habitat from loss of connectivity within occupied habitat in the action area. Standard ALL S1 requires that new or expanded permanent developments and vegetation management projects in a LAU or linkage area maintain habitat connectivity. Thus, under this standard, FNF actions will not be permitted to degrade connectivity in lynx habitat or in linkage areas.

The objective, standards, and guidelines described above would reduce or minimize the potential for effects to lynx in most cases, and therefore the Revised Forest Plan would ultimately conserve adequate connectivity with occupied lynx critical habitat. The specific effects of projects that may impact connectivity would be analyzed during project-specific consultation. Squires et al. (2013) concluded that while changes to habitat structure can affect lynx movement, there is no evidence that genetic isolation is an issue. We do not anticipate that implementation of the Revised Forest Plan would result in adverse impacts to lynx connectivity. Such actions are not likely to create a barrier or impede lynx movements. Thus, linkage and connectivity within lynx critical habitat would continue to serve their intended conservation role for lynx. The physical and biological features would not be altered to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Effects of Recreation on Critical Habitat

General Effects

Dispersed winter recreational uses and activities, such as snowmobiling, cross-country skiing, and snowshoeing also occur within lynx critical habitat. The range of lynx is restricted to forested areas with deep snow conditions (PCE 1b) during the winter. Lynx evolved in and are highly adapted to a boreal forest environment. Morphologically, lynx are well-adapted to hunting snowshoe hares in deep snow (Murray and Boutin 1991) in densely forested environments. Lynx have very large feet in relation to body mass, which prevents them from sinking deep into snow. This provides lynx with an inherent competitive advantage over many other mammalian carnivores in deep snow conditions. Their primary prey, snowshoe hare are also adapted to living in dense boreal forests in areas with abundant snow. Within the last century, coyotes have expanded their range from western and central prairie regions in North America to forests of the east and far north. Morphologically, coyotes are at a disadvantage hunting in high snow areas, as their feet are fairly small in relation to body mass and they therefore sink into soft snow (Murray and Boutin 1991).

To date, research has confirmed that lynx and coyote populations coexist, despite dietary overlap and competition for snowshoe hare and alternate prey species. In some regions and studies, coyotes were found to use supportive snow conditions more than expected, but none confirm a resulting adverse impact on lynx populations in the area. The best scientific information from within the action area, an area populated by both lynx and coyotes, concludes that coyotes did not require compacted snow routes to access winter snowshoe hare habitat (ILBT 2013). In the final rule (March 24, 2000; 65 FR 16052), snow compaction created by human activities was not found to be a threat to the lynx DPS. Currently there is no evidence that packed snow trails facilitated competition to a level that negatively affects lynx or lynx populations.

Winter dispersed recreation such as snowmobiling is unlikely to affect PCE 1a, 1c, or 1d. Insignificant effects to PCE 1b may indirectly occur via snow compaction. However, while snow compaction may occur, the areas of compaction are localized and snow compaction does not impact the overall ability for winter condition to provide and maintain deep fluffy snow for extended periods of time. Thus, adverse effects from winter dispersed recreation are not anticipated.

Developed recreation can result in the direct loss of lynx critical habitat, and depending on the structural stage, could affect PCE 1a, 1c, and/or 1d. Large developed sites, such as four-season resorts, alters lynx habitat, results in direct loss of lynx habitat on the footprint of the development itself, and may fragment habitat depending upon size and location. Developments such as ski areas result in permanent loss of lynx habitat through the development of permanently groomed runs and resort infrastructure, such as lift termini, buildings and roads. Some loss of lynx habitat is unavoidable with development, but at larger scales (e.g., Forest-wide), relatively small areas are affected. The most serious impact of ski or four-season resort development is the associated private land development at the base, with resulting increases in highway traffic, speeds, and surrounding development. Such development can impact connectivity between areas of lynx habitat, typically valley bottoms between mountain ridges.

Effects of the Action

The proposed action includes objective HU O1 to maintain the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat. In addition, recreation activities should be managed to maintain lynx habitat and connectivity (Objective HU O2) and rather than developing new areas in lynx habitat, activities should be concentrated in existing developed areas (Objective HU O3). The NRLMD Guideline HU G11 will be modified in the Revised Forest Plan (see Table IV-11). Further, guideline HU G12 limits winter access for non-recreation special uses and mineral and energy exploration and development to designated routes or designated over-the-snow routes.

The Revised Forest Plan will carry forward NRLMD objectives, standards, and guidelines that address the most serious consequence of development, requiring new or expanding permanent developments to maintain or where possible, promote habitat connectivity within LAUs and linkage areas (Objective All O1, Standard All S1, Guideline All G1, Objective LINK O1, and Standard LINK S1). Recreational activities should be managed to maintain lynx habitat and connectivity (Objective HU O1), with activities concentrated in existing developed areas, rather than developing new areas in lynx habitat (Objective HU O3). Objective HU O4 provides for lynx habitat needs and connectivity when developing new or expanding existing developed recreation sites or ski areas.

The Revised Forest Plan will also carry forward several guidelines from the NRLMD that will reduce impacts within the development itself, including: adequately sized inter-trail islands that support winter snowshoe hare habitat (Guideline HU G1), providing foraging habitat for lynx that is consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes (Guideline HU G2), provide for lynx movement and maintain the effectiveness of lynx habitat (Guideline HU G3), and consider the location of access roads and lift termini to maintain and provide lynx security habitat if identified as a need (Guideline HU G10).

Although effects to winter snow conditions (PCE 1b) (via compaction) and denning habitat (PCE 1c) may occur from new developments, we do not anticipate the effects to be adverse because overall winter conditions are not influenced and denning habitat is not limited. We also do not anticipate adverse effects to matrix habitat (PCE 1d) because the scale of disturbance is not expected to create a barrier or impede lynx movement within an LAU.

The main effect of non-winter recreation is disturbance to lynx rather than effects to habitat. Due to the low susceptibility of lynx to displacement by humans, this activity presents low risk of effects to how lynx use critical habitat. Effects to the PCE from non-winter dispersed recreation, including effects to 1a, 1b, 1c, and/or 1d, are not likely to adversely impact lynx critical habitat.

In summary, although areas of lynx critical habitat may be adversely affected by recreation management such as ski areas, the Revised Forest Plan has objectives, standards, and guidelines to reduce the potential impacts and lynx critical habitat would continue to serve the intended conservation role for lynx. The physical and biological features would not be altered as a result of recreation management to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Effects of Roads and Trails on Critical Habitat

General Effects

Non-highway roads on NFS lands rarely receive motorized use at levels that create barriers or impediments to lynx movements. Lynx have been documented using less-traveled roadbeds for travel and foraging (Koehler and Brittell 1990). In Montana, Squires et al. (2010) concluded that roads with use levels that are low had little effects on how lynx used seasonal resources. Lynx show no preference or avoidance of unpaved forest roads, and the existing road density does not appear to affect lynx habitat selection (McKelvey et al. 2000). The best information suggests that the types of roads managed by the Forest Service do not likely adversely affect lynx. Lynx mortality from vehicle strikes are unlikely, and to date have not been documented on Forest lands in the action area given the relatively slow speeds at which vehicles on these roads travel (due to topography and road conditions) and generally low traffic volumes. Any new permanent road construction may affect lynx critical habitat. The relatively small amount of snowshoe hare habitat (PCE 1a) affected within the route prism would be minor and likely insignificant. Temporary routes constructed in snowshoe hare habitat may also have minor impacts on the PCE. However, temporary routes are restored and/or decommissioned such that effects are temporary and not permanent and vegetation grows back. Furthermore, the amount of vegetation and area impacted for the linear structures tends to be limited. Thus, impacts to the PCE and its components would likely be insignificant as a result of new road construction.

Effects of the Action

To reduce highway effects on lynx, objective HU O6 directs the FNF to work cooperatively with other agencies to provide for lynx movement and habitat connectivity and to reduce the potential of lynx mortality. While this objective relates to highways, which typically do not occur on NFS land, it encourages cooperation with other agencies in order to reduce the potential for effects. The Revised Forest Plan will carry forward several NRLMD guidelines relate to potential impacts of roads, including upgrading (Guideline HU G6), new permanent roads (Guideline HU G7), cutting brush (Guideline HU G8), and new roads built for project use (Guideline HU G9). These guidelines generally discourage improving road access for people and minimize impacts of road construction (permanent and/or temporary) and maintenance on lynx critical habitat.

As described in the critical habitat final rule (79 FR 54823) human-made structures including paved and gravel roadbeds, parking lots, and other structures that lack the PCE for the lynx, are not intended to be designated as critical habitat and have been excluded by text. While the roadbed itself may not be designated as lynx critical habitat, it can affect the way lynx use the adjacent habitat. However, based on the information above, we do not anticipate any effects to lynx critical habitat related to roads to be significant or adverse. Lynx critical habitat would continue to serve the intended conservation role for lynx. Forest roads would not alter the physical and biological features to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function

Effects of Livestock Grazing on Critical Habitat

General Effects

Livestock may compete with snowshoe hares for forage resources (Ruediger et al. 2000). Browsing or grazing also could impact plant communities that connect patches of lynx habitat within a home range. Snowshoe hare habitat such as riparian willow and aspen communities are most likely to be affected by grazing (ILBT 2013). Conversely, appropriate grazing management can rejuvenate and increase forage and browse in some habitats. At the time of the lynx listing, the Service found no evidence that grazing was a factor threatening lynx, therefore, grazing was not addressed in the final lynx listing rule (March 24, 2000; 65 FR 16052). Overall, grazing is not likely to reduce the snowshoe hare prey base or have substantial effects on lynx (ILBT 2013). As such, there is no existing research that provides evidence of lynx critical habitat being adversely affected by grazing, or of lynx movements within home ranges being impeded by grazing practices.

Effects of the Action

The FNF's Revised Forest Plan will contain one objective and four guidelines related to livestock management. As with other plan components, these are being carried forward from the NRLMD. Objective GRAZ O1 directs the FNF to manage livestock grazing to be compatible with improving or maintaining lynx habitat. The Revised Plan would reduce the potential for grazing to affect lynx critical habitat through the guidelines for livestock management practices that provide for: regeneration of trees and shrubs (guideline GRAZ G1), aspen stands (guideline GRAZ G2), riparian areas and willow cars (guideline GRAZ G3), and shrub-steppe habitats (guideline GRAZ G4). These guidelines should adequately minimize the potential for effects of grazing to lynx critical habitat and may improve the habitat over baseline conditions. The quality and quantity of snowshoe hare habitat (PCE 1a) would not be significantly diminished as a result of grazing livestock. Livestock management is not likely to affect snow conditions (PCE 1b). Effects to lynx denning habitat (PCE 1c) would likely be none to very negligible. Impacts to matrix habitat (PCE 1d) would not create a barrier or impede lynx movement within a potential home range.

With implementation of the plan components outlined above, the effects of grazing across the action area would be minimal and livestock management under the Revised Forest Plan is expected to either have no effects to lynx critical habitat or have insignificant and/or discountable effects to lynx critical habitat depending on site-specific information. Thus, the PCE and its components (PCE 1a, 1b, 1c, and 1d), would not be significantly affected. Lynx critical habitat would continue to serve their intended conservation role for lynx. Grazing would not alter the physical and biological features to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

Effects of Minerals and Energy Development

General Effects

Mining, oil and gas exploration, and production can result is habitat loss and fragmented. These effects of these activities are similar to other development: loss of boreal forest; construction of roads, railroads, and transmission lines; and increased human access and disturbance where lynx occur.

Effects of the Action

Mining and energy development on the FNF may directly impact lynx critical habitat. New development could result in small, localized effects to lynx critical habitat, including PCE 1a, 1c, and or 1d. The Revised Plan will contain objective HU O5 which directs the FNF to manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat. The Revised Plan also contains the following three guidelines that would minimize the potential impacts of mineral and energy development on lynx critical habitat by remote monitoring to reduce snow compaction (HU G4), reclamation plans that restore lynx habitat (HU G5), and limitations on winter access to designated routes or designated over-the snow routes (HU G12).

With the application of these measures, the mineral and energy development would likely result in either no effects or only minor, insignificant effects to lynx critical habitat depending upon the scale of development. Lynx critical habitat would continue to serve its intended conservation role for lynx. Mineral and energy development would not alter the physical and biological features to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

4. Summary of Response to the Proposed Action

Lynx Response to the Proposed Action

The final rule listing lynx as a threatened species (March 24, 2000; 65 FR 16052) concluded that the primary factor threatening the lynx DPS is the inadequacy of existing regulatory mechanisms, specifically, the lack of guidance for conservation of lynx in federal land management plans. The NRLMD biological opinion (USFWS 2007) concluded that the programmatic and project-level objectives, standards, and guidelines in the amended Forest Plans provide comprehensive conservation direction adequate to reduce adverse effects to lynx from Forest management and to preclude jeopardy to the lynx DPS. The Revised Plan incorporates the continued implementation of the NRLMD on the FNF. In addition, the Revised Plan would implement two FNF-specific modifications that affect lynx, and upon review of the Revised Plan in its entirety, our conclusions remain the same as in 2007 (USFWS 2007): most actions in lynx habitat that are in compliance with the NRLMD would avoid or substantially reduce adverse effects on lynx in the action area.

Conservation of snowshoe hares and their habitat is of prime importance to sustaining lynx populations. Forest management under the Revised Plan has the potential to reduce the quality and quantity of snowshoe hare habitat. The Revised Plan incorporates the continued implementation of the vegetation management direction contained in the NRLMD on the FNF, with one additional resource exception (i.e., whitebark pine).

The NRLMD vegetation objectives, standards, and guidelines conserve snowshoe hare habitat, and avoid or minimize the effects on lynx and on most lynx habitat in the action area. The Revised Plan includes exemptions and exceptions to the standards that allow adverse effects on snowshoe hare and lynx habitat. However, the Revised Plan limits the total acres that may be treated under the exemptions and exceptions in the future to no more than 93,723 acres and 15,460 acres of lynx habitat for the anticipated life of the plan (15 years), respectively. Combined, no more than six percent of lynx habitat on the FNF could be treated in ways that adversely affect lynx, or snowshoe hare, or lynx habitat. In addition to implementing the NRLMD, the Revised Forest Plan would maintain or improve vegetative desired conditions for lynx and their prey in the long-term by providing for more resilient and resistant vegetative conditions and allowing natural disturbance processes to function nearer to historical conditions (USFS 2017). This means that adverse effects would be avoided on about 94 percent of lynx habitat on the FNF, which would maintain the landscape mosaic of habitat conditions needed for snowshoe hare production. Thus, we expect that lynx and within the action area will respond favorably to the management under the Revised Plan and that implementation of the Revised Plan will provide for the recovery of lynx in the action area.

As discussed above, this biological opinion considers the effects of implementation of the the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

Critical Habitat Response to the Proposed Action

Conservation of snowshoe hares and their habitat is of prime importance to sustaining lynx populations. Forest management actions have the potential to alter boreal forest landscapes that support a mosaic of differing successional forest stages (PCE 1); and may adversely affect the quality and quantity of PCE 1a (snowshoe hare habitat). Forest management actions may also affect PCE 1d (snow conditions), PCE 1c (denning habitat) and PCE 1d (matrix habitat), but adverse effects to these PCE components are not expected. Overall, the Revised Plan avoids or minimizes most adverse effects on lynx critical habitat and supports the PCE.

The majority of adverse effects to lynx critical habitat from implementation of the Revised Forest Plan would come from the exemptions from (fuel treatment projects in the WUI) and exceptions to (activities for other resource benefit) the vegetation standards. Other than vegetation management, many activities authorized by Forests will have relatively minor or less substantial impacts on lynx critical habitat. A limited number of actions where third parties are involved, such as ski area expansions and development, may also have adverse effects on lynx critical habitat. The likelihood of this occurring is low, but if such activities were to occur, the effects specific to such activities would be analyzed in site-specific analysis.

We anticipate adverse effects to lynx critical habitat only from the actions proposed under the Revised Forest Plan that occur within lynx foraging habitat, PCE 1a (snowshoe hare habitat). A maximum of 94,250 acres of lynx critical habitat that provides PCE1a could be treated using WUI exemptions to the vegetation standards, and a maximum of 15,460 acres that provide for lynx critical habitat PCE 1a could be treated using other resources exceptions to the vegetation standards. This represents less than five percent of critical habitat on the FNF. Potential treatments could occur for the life of the Revised Forest Plan, which is anticipated to be 15 years.

We do not anticipate adverse effects to critical habitat as a result of the treatments in stem exclusion stands that do not provide snowshoe hare habitat, winter snow conditions (PCE 1b), areas that provide PCE1c (denning habitat), or areas that provide PCE1d (matrix habitat). Although the exemptions from and exceptions to the vegetation management standards may result in some adverse effects to lynx critical habitat, vegetation objectives, standards, and guidelines overall would contribute to creating and maintaining landscape patterns that sustain snowshoe hare and lynx populations. The habitat would retain its inherent capacity to regenerate. Vegetation management under the Revised Forest Plan may adversely affect areas of critical habitat, specifically PCE 1a. However, critical habitat on the FNF is expected to remain capable of producing adequate densities of snowshoe hares to support continual lynx presence and would continue to serve their intended conservation role for lynx. Thus, the physical and biological features would not be altered to an extent that would appreciably reduce the conservation value of critical habitat for lynx and the PCE would continue to function.

As discussed about, this biological opinion considers the effects of implementation of the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

F. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Past and present impacts of non-Federal actions are part of the environmental baseline, as are the impacts of Federal activities that have undergone section 7 consultation. This analysis addresses the potential cumulative effects on lynx, lynx habitat, and critical habitat in the action area.

While activities such as recreation, minerals and energy management, forest/backcountry roads and trails, and grazing by domestic livestock may affect individual lynx, they are not expected to have adverse effects. Substantial effects on the overall lynx population are unlikely.

The Montana Department of Natural Resources and Conservation (DNRC) manages the Stillwater State Forest, the Coal Creek State Forest, and the Swan State Forest, as well as sections acquired from Plum Creek Timber Company in the Swan Valley. In a record of decision on the proposed issuance of a permit to DNRC authorizing incidental take of endangered and threatened species on forested trust lands in western Montana, the Service concluded that removal of winter foraging habitat from scattered DNRC parcels in occupied habitat would not result in adverse effects on lynx for the following reasons: (1) scattered parcels in occupied lynx habitat support about 13 percent (11,600 acres) of the total winter foraging habitat in the project area, (2) the anticipated 230 acres of annual harvest of winter foraging habitat would be spread across more than 11,600 acres of winter foraging habitat on scattered parcels in occupied habitat, (3) the amount of occupied habitat treated would likely represent a small proportion of a lynx home range and would not be enough to measurably reduce snowshoe hare productivity in the home range, and (4) viable lynx habitat would be retained through implementation of DNRC commitments under their habitat conservation plan, combined with the availability of habitat on adjacent LAUs where standards on federal lands regulate treatments of winter foraging habitat in multistoried stands (USFWS 2011a). Where practicable, DNRC will consider harvest unit designs at the project level to maintain a connected network of suitable lynx habitat along riparian areas, ridge tops, and saddles that connect third-order drainages. Measures for grizzly bears that will limit the size of forest openings that can be created through timber harvesting, as well as measures for secure cover, will also provide habitat connectivity for Canada lynx.

Private lands represent a small fraction of lynx habitat, and the final rule listing the lynx as a threatened species did not find that present conditions on private lands threaten the lynx. Most private lands within the FNF geographic areas are at elevations too low to support lynx foraging, but lynx do cross through these areas. There is a potential for future management to have negative effects on lynx, although the Service concluded that some of the negative effects would be moderated by federal land management within the large landscapes inhabited by an individual lynx (USFWS 2007). Fuels treatments and fire suppression that occurs in lower montane forests where many private lands occur can help to control wildfires that have the potential to spread up in elevation into lynx habitat.

There are some private parcels along the Middle Fork and North Fork of the Flathead River, in the Swan Valley, and Stillwater Valley near Olney. These areas are at elevations suitable for lynx. Some of these landowners are clearing vegetation to reduce the risk of wildfire, which may reduce the potential for lynx foraging, although whether lynx would forage in close proximity to human dwellings, dogs, etc. is unknown. Former Plum Creek Timber Company lands in the Stillwater River watershed are now managed by Weyerhauser. In this watershed, vegetation management, including timber harvest and precommercial thinning, is likely to continue. These activities may decrease habitat quality for lynx, depending upon the specific location, rate, and type of treatment. In addition to private lands, lynx and lynx habitat also occur on the Flathead Reservation south of Kalispell, Montana. The Confederated Salish and Kootenai Tribe incorporated the Lynx Conservation Assessment and Strategy (ILBT 2013) into their management plans, which helps to minimize adverse effects on those lands.

On state and private lands with lynx critical habitat, vegetation projects, fuel treatment projects, mineral extraction, oil and gas exploration, urban and rural development, recreation site construction and use, road construction, and utility corridors all have the potential to affect the PCE and its components. Some snowshoe hare habitat (PCE 1a) may be temporarily reduced in quantity and/or quality or may be permanently lost to development. The cumulative effects to PCE 1a may range from insignificant to adverse depending on site-specific conditions and actions. Some non-federal actions may slightly impact localized snow conditions (PCE 1b) via snow compaction. However, we do not expect such actions to significantly affect the overall winter conditions that provide and maintain deep fluffy snow for extended period of time. Some non-federal actions may reduce the availability of den sites (PCE 1c) through removal of coarse woody debris. Because denning habitat is not limiting throughout the action area, any cumulative effects to PCE 1c would be insignificant. Vegetation management and/or development of private lands to support increased human populations will likely continue and may reduce habitat connectivity in matrix habitat (PCE 1d). Since new developments would likely occur at lower elevations and because the amount of private land within the action area is very small, we do not expect such actions would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within in a potential lynx home range. Thus, cumulative impacts to PCE 1d would likely be insignificant.

Not all lands would be developed or used in ways that have negative impacts on lynx critical habitat. Combined, private lands developed or used in ways that would have negative impacts on lynx critical habitat would constitute a fairly small proportion of lynx critical habitat within the action area. At elevations suitable for lynx, non-federal lands are scattered throughout the action area and comprise a fairly small portion of the action area relative to the large LAU landscape required by an individual lynx to support its home range. Many non-federal lands are and would be adjacent to or interspersed with Forest Service land, and therefore some of the potential negative effects on the private parcels would be moderated by federal land management. Therefore, we anticipate that the lynx critical habitat within the action area would retain its current ability for the PCE to function and critical habitat would continue to serve its intended conservation role for the species.

The state of Montana prohibits trapping of lynx; however, legal trapping of other species occurs in Montana and lynx could be unintentionally injured or killed, incidentally. Poaching may also occur. More restrictive trapping regulations were implemented in 2008, and we believe that the potential magnitude of this effect has decreased. Some lynx home ranges overlap the international border, making those lynx susceptible to harvest because Canada has a legal trapping season for lynx.

This biological opinion considers the effects of implementation of the proposed framework of the Revised Forest Plan. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on Canada lynx and critical habitat, which will include a project-specific cumulative effects analysis.

G. CONCLUSION

1. Conclusion for Lynx

After reviewing the current status of the Canada lynx, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the effects of the proposed FNF Revised Forest Plan are not likely to jeopardize the continued existence of the Canada lynx.

Regulations implementing section 7 of the Act define "jeopardize the continued existence of" as: "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." (50 CFR 402.02). The best information suggests that implementation of the Revised Forest Plan would not appreciably reduce the likelihood of survival and recovery of Canada lynx. Our conclusion is based on the literature and information referenced in this document, meetings and discussions with FNF, discussions with Canada lynx experts, the information in the biological assessment (USFS 2017), and information in our files.

We find that although adverse effects are likely to some individual lynx, the proposed action is expected to support and sustain lynx populations within the action area, the FNF, and so is not reasonably expected to reduce appreciably the likelihood of both the survival and recovery of lynx populations in the wild. The Revised Plan elements include measures to maintain the habitat mosaic, structure, and components required to support lynx and their primary prey, the snowshoe hare. Further, in this biological opinion, we determined that the FNF's Revised Forest Plan is compatible with our understanding of recovery needs for lynx.

The following are key findings, which are discussed in detail in the preceding sections of this biological opinion:

- Timber production and vegetation management in lynx habitat would be subject to standards VEG S1, S2 (described above), S5 and S6, which prohibit pre-commercial thinning that reduces snowshoe hare habitat unless certain conditions are met; and prohibit reduction of snowshoe hare habitat in multi-story mature or late successional forests, with certain exemptions or exceptions. The guidelines would further limit effects on lynx from vegetation management projects by requiring projects be planned to: recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available (VEG G1); provide habitat for alternate prey species, primarily red squirrel, in each LAU (VEG G5); and provide denning habitat distributed in each LAU (VEG G11).

- Prescribed fire in lynx habitat may be conducted under standard VEG S6. This standard prohibits vegetation management projects (including prescribed fire) that reduce snowshoe hare habitat in multi-story mature or late successional forests with certain exemptions or exceptions such as treatment around administrative sites, for research studies, or for incidental removal during salvage. This standard would greatly limit the number of prescribed fires that could reduce the amount of this high quality snowshoe hare habitat type. Further at the project level, guideline VEG G4 would limit prescribed fire activities such that permanent travel routes that facilitate snow compaction are not created and constructing permanent firebreaks on ridges or saddles are avoided (VEG G4).

- Most adverse effects on lynx will be associated with vegetation management projects such as precommercial thinning or timber harvest that use exemptions to and/or exceptions from the vegetation standards in the Revised Forest Plan.

- The Revised Forest Plan may result in adverse effects to lynx, primarily from the following actions on up to 6 percent of the Forest:

    - Future fuels management projects that are exempted from vegetative management standards inside WUI on up to 93,723 acres of mapped lynx habitat on the FNF; and

    - Future exceptions to vegetative standards for other resource benefits (e.g., whitebark pine restoration) on up to 15,460 acres.

- Snowshoe hare and lynx habitat will be conserved on at least 94 percent of mapped lynx habitat within the action area. The Revised Forest Plan would promote forested landscape patterns and connectivity designed to maintain or restore lynx habitat.

- Since 2007, all projects on the FNF have complied with the direction in the NRLMD. Under the NRLMD, the Forest has conducted vegetation management on thousands of acres in lynx habitat; however, adverse effects were limited to:

    - 10,079 acres of lynx habitat within the WUI, and

    - 940 acres of lynx habitat of precommercial thinning in lynx habitat.

- To date, under these exemptions and exceptions, the FNF has treated substantially fewer acres than anticipated (and authorized) in 2007 under the NRLMD. We expect that trend to continue under the revised Forest Plan. The relatively low total acres of lynx habitat treated within the WUIs and the current condition of lynx habitat related to landscape standards VEG S1 and VEG S2, indicate that the overall baseline condition of lynx habitat in regard to vegetation is in good condition on the FNF. While acres burned by wildlife have increased and effected some LAUs, modeling indicates that is has remained within the natural range of variation.

- The total amounts above are based on what the maximum extent allowed under the Revised Forest Plan. While we use the maximum extent allowable in our analysis, many actions that are allowed and projected may not actually occur. Many activities that are allowed by the Forest Plan direction are never fully carried out for a variety of reasons, such as funding limitations and environmental or policy considerations.

- While the Revised Forest Plan would allow vegetation activities that may adversely affect lynx by altering snowshoe hare habitat, the nature of these activities is typically temporary and reversible (i.e. forests regrow or can be restored). Such actions may change the successional stage of a stand, but do not affect that stand's potential to produce snowshoe hare habitat in the future. The adverse effects on lynx from vegetation management carried out under the Revised Forest Plan are temporary and no permanent loss of the inherent capacity of treated stands to provide snowshoe hare habitat is expected.

- Acres treated are expected to be distributed throughout the Forests and are not likely to be excessively concentrated within any one LAU or group of adjacent LAUs because exemptions and exceptions are limited by standards VEG S1 and S2 and cannot occur in more than three adjacent LAUs. Thus, adverse effects, while possible, are likely to affect only portions of any individual lynx home range.

- Based on research done by Squires et al. (2008), denning habitat is found in a variety of forest conditions, and suitable den site attributes occur in small pockets scattered across the landscape at relatively high densities. As a result den site availability is not limiting for lynx. Further, when denning habitat is lacking, guideline VEG G11 requires that denning habitat be distributed in an LAU. Effects to denning habitat would be insignificant.

- Since 2007, most National Forests have managed lynx habitat under the NRLMD or similar strategies. This management provides comprehensive conservation direction adequate to reduce adverse effects to lynx from Forest management and to preclude jeopardy to the lynx DPS. Such management strategy is expected to continue under the Revised Forest Plan.

Other activities on the Forest are expected to result in no or limited effects on lynx:

- Management of roads or trails under the Revised Plan would not result in adverse effects on lynx. Most lynx habitat is in wilderness MAs and backcountry MAs where all motorized vehicle access is prohibited. The Revised Plan incorporates the guidelines ALL G1 and HU G6 through G9 that would reduce the potential effects of forest roads on lynx and lynx habitat.

- Effects on lynx from developed recreation site are expected to remain low under the Revised Plan. Implementation of plan components addresses effects of developed recreation on connectivity and linkage as well as measures to reduce site specific impacts. The Revised Plan desired conditions for wildlife further reduce the likelihood of adverse effects.

- The Guideline HU G11 will result in a minor net decrease in the acres of lynx habitat open to over-snow motorized use.

- The likelihood that dispersed recreation on or off trails would occur in proximity of a den site and/or that the dispersed recreation activities occurring would actually disturb a lynx den site or in other ways adversely affect lynx is so low as to be discountable.

- There is no indication that compacted snow routes from winter recreational activities increase competition from other species to levels that adversely impact lynx populations, and under the proposed action, the amount of areas affected by snow compaction by snowmobiles within the action area would decrease.

- Guidelines for grazing management (Graz G1, G2, G3, G4) provide for the regeneration of trees, shrubs and aspen clones in lynx habitat and should avoid the potential for adverse effects of grazing to lynx, potentially improving the habitat over baseline conditions.

We find that the Revised Forest Plan would allow some actions that may result in adverse effects to some individual lynx. The proposed action overall promotes the conservation and recovery of lynx and their habitat through the desired conditions and guidelines of the Revised Forest Plan. These conditions would maintain the habitat mosaic, structure, and components required to support lynx and their primary prey, the snowshoe hare. We have examined the impacts of the proposed action on individuals and on the lynx within the action area. We conclude that the proposed action would not appreciably reduce the numbers or distribution of lynx on the FNF or the Northern Rocky Mountains Region of the DPS. Thus, the proposed action is not likely to appreciably reduce the likelihood of survival and recovery of lynx in the wild, and is not likely to jeopardize the continued existing of the contiguous United States Canada lynx DPS.

As discussed above, this biological opinion considers the effects of implementation of the the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

2. Conclusion for Lynx Critical Habitat

After reviewing the current status of designated lynx critical habitat, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is the Service's biological opinion that the effects of the proposed FNF Revised Forest Plan are not likely to result in the destruction or adverse modification of designated Canada lynx critical habitat. Implementing regulations for section 7 define "destruction or adverse modification" as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (50 C.F.R. § 402.02). The Lynx Critical Habitat Final Rule (79 FR 54826) explains that "the key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species. Activities that may destroy or adversely modify critical habitat are those that alter the physical and biological features to an extent that appreciably reduces the conservation value of critical habitat for the lynx DPS." The role of critical habitat is to support life-history needs of the species and provide for conservation of the species.

The Revised Forest Plan will not preclude continued adequate amounts of snowshoe hare habitat needed to sustain lynx in the LAUs within the action area and thus, critical habitat in the LAUs would remain functional. When added to the status of the critical habitat units, the effects of the Revised Forest Plan are such that the conservation role of lynx Critical Habitat Unit 3 will continue to serve its intended conservation role for lynx and the physical or biological features, including the PCE components essential to the conservation of lynx, will not be altered to a point that precludes or significantly delays development of these features. Thus, the Service concludes that while the FNF Revised Forest Plan may result in some level of adverse effects to lynx critical habitat, the level of adverse effects are not reasonably expected to alter the physical and biological features to an extent that appreciably reduces the conservation value of critical habitat for the lynx DPS.

Our conclusion is based primarily on the information presented in the biological assessment on the effects of the Revised Forest Plan on lynx critical habitat (USFS 2017), information in our files, and informal discussions between the Service, the Forest, and other personnel. Our rationale for the no destruction or adverse modification conclusion is based on, but not limited to the following factors summarized below, as detailed earlier in this biological opinion.

- Implementation of the Revised Forest Plan will allow land management actions that may adversely affect key lynx habitat components. While negative effects on lynx critical habitat may not be totally eliminated, the Service considers the retention of high quality snowshoe hare habitat (PCE 1a) within in lynx critical habitat as most essential to lynx conservation. The vegetation standards contained in the Revised Forest Plan directly address the major impacts identified from vegetation management (impacting stand initiation and multi-story stands that provide PCE 1a). Managing and moderating these impacts will minimize affects to snowshoe hare habitat and production, thus benefiting lynx critical habitat.

- As described in our biological opinion, we anticipate adverse effects to lynx critical habitat from those actions that occur within snowshoe hare habitat and impact PCE1a within the action area. The majority of these adverse effects would be a result of actions using the exemptions from and/or exceptions to the vegetation management standards.

- In areas that provide lynx critical habitat but not snowshoe hare habitat, we do not anticipate adverse effects to the remaining PCE and components, including PCE 1b (deep fluffy snow), PCE 1c (denning habitat), PCE 1d (matrix habitat), and stem exclusion habitat (part of the PCE boreal forest).

- Future actions conducted during the anticipated life-span of the Revised Forest Plan (15 years) that may adversely affect PCE 1a using exemptions from and exceptions to the vegetation management standards will occur on no more than 93,723 and 15,460 acres, respectively. This is less than five percent of lynx critical habitat on the FNF.

- A total of approximately five percent of PCE 1a on the FNF may be treated using the exemptions from and exceptions to the Revised Forest Plan vegetation standards.

- The adverse effects of vegetation management on lynx critical habitat would occur on a very small portion of Critical Habitat Units 3. When considering all critical habitat in Unit 3, 109,710 acres of critical habitat in Unit 3 may be adversely affected by implementation of the Revised Forest Plan. This is approximately 1.7 percent of all critical habitat in Unit 3 (Unit 3 is 9,783 square miles or 6,261,095 acres).

- It is important to note that mapped lynx habitat consists of a mosaic of various forest structural stages and not all mapped lynx habitat is providing PCE 1a at the same time. However, at a programmatic scale such as this, it is not possible to accurately map PCE 1a at every point in time for the life of the Revised Forest Plan (anticipated to be 15 years). Forest structural stages change over time and what is providing PCE 1a today may not be at some point in the future and what is not providing PCE 1a today may provide such in the future. As a result, we are analyzing the maximum amount that could be treated to be sure we do not overlook any potential effect. While the percentages provided above display the maximum percentage of mapped lynx habitat that may provide PCE 1a that could be treated, it is not expected that this maximum would be reached all at the same time. Future site-specific consultations on projects will provide both the amount of PCE 1a within the action area LAU(s) and the amount of PCE 1a affected by the action, thus, analyzing the specific amount of PCE 1a that will be affected.

- The Revised Forest Plan direction provide would require monitoring and recording of actions to ensure that the number of acres treated through exemptions and exceptions do not exceed the amounts described here.

- The total amounts above are based on what the maximum extent allowed under the Revised Forest Plan. While we use the maximum extent allowable in ourt analysis, many actions that are allowed and projected may not actually occur. Many activities that are allowed by the Forest Plan direction are never fully carried out for a variety of reasons, such as funding limitations and environmental or policy considerations.

- While the Revised Forest Plan would allow activities that may adversely affect lynx critical habitat, the nature of most vegetation management alteration is temporary and reversible (i.e. forests regrow or can be restored). Some vegetative treatments may degrade the function of the PCE by delaying the development of high density snowshoe hare habitat through succession; however, they do not remove the PCE from the site. Such actions may change the successional stage of a stand, but do not affect that stand's potential to produce snowshoe hare habitat in the future. The adverse effects on lynx critical habitat from vegetation management carried out under the Revised Forest Plan are temporary and no permanent loss of the inherent capacity of treated stands to provide lynx habitat is expected.

- Acres treated will be constrained by standards VEG S1 and S2and are not likely to be excessively concentrated within any one LAU or group of adjacent LAUs. Thus, adverse effects, while possible, are likely to affect only portions of any individual lynx home range.

- Other projects types that may adversely affect lynx critical habitat, such as recreation development are constrained by other standards such as mandating maintenance of connectivity and would likely only affect a relatively small proportion of lynx critical habitat within the action area. Such actions would undergo site-specific consultation to determine such effects.

- A large proportion of lynx critical habitat in the action area occurs in lands with non-developmental status (e.g., designated and proposed wilderness) where management focuses on the maintenance of natural ecological processes, or conservation of rare ecological settings or components.

- Under the Revised Forest Plan, LAUs are expected to continue to provide conditions that would be conducive to supporting lynx. Although some actions may adversely affect areas of critical habitat, they are expected to have small to insignificant effects on Critical Habitat Unit 3 as a whole. The critical habitat is expected to remain capable of producing adequate densities of snowshoe hares to support continual lynx.

- While vegetation management projects that use the exemptions from and/or exceptions to the vegetation standards may adversely affect PCE 1a, the limited amount of PCE 1a that could be treated is not likely to result in adverse impacts to the survival and recovery of lynx. The Revised Forest Plan would allow for the action area as a whole to serve its role in the conservation of lynx, by maintaining its inherent capacity to provide a prey base and foraging habitat for a breeding population of lynx and connectivity for lynx movement within home ranges, and dispersal. The vegetation objectives, standards, and guidelines would contribute to sustaining and growing snowshoe hare and lynx populations within lynx critical habitat in the action area, and the Revised Forest Plan would not appreciably diminish the value of lynx critical habitat for the conservation of lynx.

We conclude that the adverse effects of the Revised Forest Plan on PCE 1a are limited in severity and in scale to the extent that critical habitat would continue to produce adequate densities of snowshoe hares and adequate levels of cover to support persistent lynx populations across Critical Habitat Unit 3. We conclude that the proposed action will not alter the physical and biological features of critical habitat to an extent that appreciably diminishes the value of critical habitat for the conservation of lynx. The alterations will not preclude or significantly delay development of such features. The critical habitat units would retain their current ability for the primary constituent element to be functionally established. Therefore, the proposed action is not likely to result in the destruction or adverse modification of designated Canada lynx critical habitat.

H. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of an incidental take statement.

In general, an incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize the impacts of the take and sets forth terms and conditions which must be complied with in order to implement the reasonable and prudent measures.

1. Amount or Extent or Incidental Take

This biological opinion considered the effects to lynx from implementation of the Revised Forest Plan as guided by the proposed plan elements (goals, objectives, desired condition, standards, and guidelines). It includes specific elements for the conservation of lynx and lynx habitat, but does not authorize specific actions. The Revised Forest Plan (as proposed) contains sufficient specificity through its suite of elements to permit an adequate analysis of the effects of projects and activities on lynx. As a result, the Service was able to make a determination that the extent of adverse effects on lynx as a result of the Revised Plan does not rise to levels that are likely to jeopardize lynx. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

We anticipate that take associated with implementation of the proposed action would occur through vegetation management when projects are conducted in lynx habitat under the exemptions and exceptions to the Revised Forest Plan vegetation standards VEG S1, S2, S5 and S6, as described and analyzed in this biological opinion. We anticipate this take in the form of harm, as the exemptions and exceptions allow modification of lynx habitat that could result in decreased production and density of snowshoe hares, their primary prey. As a result, we anticipate that some, but not all, adult female lynx within home ranges affected by such projects could fail to complete a pregnancy or could be less successful in finding adequate food resources needed to ensure maximum survival potential for kittens. Thus, significant reproductive impairment and kitten survival may be affected.

The Service anticipates that incidental take of lynx will be difficult to quantify and detect for the following reasons:

- Lynx are wide-ranging and not easily detected in the wild.

- Although we have a general understanding of where lynx population centers are within the action area, the distribution of individual lynx across the FNF or at smaller scales within the action area is not known.

- Information required to accurately quantify snowshoe hare and alternate prey needed for the survival of adult lynx or kittens is not available.

- Snowshoe hare populations exhibit population cycles in Canada and although not well understood, populations likely fluctuate in the United States as well. This variation could cloud our ability to demonstrate a direct cause and effect relationship. It may be difficult in many cases to determine whether mortality or injury of lynx is attributable to incidental take of lynx as a result of the proposed action, or whether it was natural mortality or injury of lynx due to natural declines in snowshoe hares.

- We lack information to predict with precision the densities of hares in various habitat and forest stands, before and after specific treatments, especially in relationship to the host of naturally occurring environmental variables that may affect hare densities.

- Thus, we lack information to predict with precision the densities of hares in various habitat and forest stands within the home range of individual females, before and after specific treatments.

- Discovery or detection of lynx injury or mortality attributed to habitat alteration is very unlikely.

In addition to the difficulties outlined above, monitoring lynx is difficult and very expensive. For example, because individual lynx are sparsely distributed over tens of square miles often in snowy terrain, specialized equipment is necessary to safely access their habitat for capturing and collaring. Also, in order to capture and collar enough lynx for an adequate sample size for scientifically valid trends, hundreds of square miles of this habitat must be surveyed and monitored over multiple years. These circumstances would drive the yearly cost of monitoring into hundreds of thousands of dollars and require a commitment of several biologists to the monitoring for several years. For these reasons, direct monitoring is not practical or reasonable.

In cases such as these, Service policy, as stated in the Endangered Species Consultation Handbook (USFWS and NMFS 1998) (Handbook), is to provide some detectable measure of effect, such as the relative occurrence of the species or a surrogate species in the local community, or amount of habitat used by the species, to serve as a measure for take. Take also may be expressed as a change in habitat characteristics affecting the species. Because of the difficulty of estimating the precise number of lynx that would experience take in the manner described above, we have developed a surrogate measure to estimate the amount of anticipated take. Here we will use the number of acres of snowshoe hare habitat treated through the exceptions and exemptions of vegetation management standards as a surrogate measure of the anticipated incidental take of lynx.

The FNF has provided explicit estimates on the number of acres of snowshoe hare habitat that may be impacted by vegetation management under the Revised Forest Plan. As a result, we are able to accurately assess take from these activities. In the biological assessment, the FNF provided estimates of the number of acres that could treated through (a) fuels treatment projects within the WUI conducted under the exemptions from vegetation standards VEG S1, S2, S5 and S6, and (b) precommercial thinning and non-commercial felling projects for "resource benefit" (detailed earlier in this biological opinion) allowed under exceptions to VEG S5 and S6. Projects conducted under the exceptions and exemptions may reduce the quality of habitat that produces snowshoe hares. We have determined that many, but likely not all, of the projects conducted under the exemptions or exceptions could significantly reduce the capacity of affected snowshoe hare habitat to produce hares, and so could result in take in the form of harm. Therefore, we are using the number of acres treated under these exemptions and exceptions under the proposed action as a detectable surrogate for the number of lynx taken in the form of harm, through significant degradation or modification of habitat. This approach is consistent with Service policy (USFWS and NMFS 1998), which endorses the use of acres of species' habitat destroyed or disturbed as a reasonable surrogate measure for the number of a species harmed.

The FNF has proposed to carry forward existing direction of the NRLMD, using the 2007 projections for acres of WUI to be treated for fuel reduction under exemptions. Further, the FNF is proposing additional acres for pre-commercial thinning and non-commercial felling for other resource benefits under exceptions. In 2007, the NRLMD decision projected the number of acres on the FNF that may need to be treated using (a) exemptions to the vegetation standards for fuels treatment to protect life and property in the WUI: 103,800 acres; and (b) exceptions to the vegetation standards for other resource benefits: 1,460 acres, over a period of 10 years (USFWS 2007). Since 2007, the FNF consulted on treatment of 10,077 acres under WUI exemptions, and 940 acres under exceptions for other resource benefits. Including the acres already treated since 2007, the FNF anticipates treating no more than the total numbers of acres identified in 2007 under WUI exemptions (103,800) over the life of the Revised Plan. The FNF anticipates treating no more than 15,460 acres under exceptions for other recourse benefits for the life of the Revised Plan (anticipated to be 15 years).

In this biological opinion, we analyzed the effects of treating the total number of acres projected for the proposed action under the exceptions and exemptions to vegetation standards. This was the uppermost estimate as being necessary for fuels reduction in the WUI to protect human safety and property, or for other resource benefits. Thus, we are using the total number of acres that could potentially be treated under these exemptions and exceptions as our anticipated amount of incidental take. The acres treated under exemptions and exceptions on the FNF since 2007 are well below those anticipated in our 2007 biological opinion. Further, of the 10,077 acres treated through fuel reduction projects, not all treatments resulted in adverse effects to lynx; however, we do not expect, but cannot rule out that: (1) the total number of acres identified above would be treated over the life of the plan, or that (2) all treatments in the WUI or for other resource benefit may result in adverse effects on lynx. Therefore, this biological opinion analyzed the greatest level of adverse effects on lynx allowed under the proposed action.

This biological opinion anticipates the following amounts of take in the form of harm (modification of habitat that will significantly reduce the snowshoe hare prey base for lynx, resulting in significant impairment of lynx breeding (i.e. reproduction) and feeding): treatment of up to 93,723 acres of lynx habitat over the life of the Revised Forest Plan due to fuels management in the WUI, and up to 15,460 acres of lynx habitat due to pre-commercial thinning and non-commercial felling for vegetation management for other resource benefits. Because the exemptions and exceptions are limited to a total of no more than about six percent of lynx habitat on the FNF, the decrease in prey base would translate to a low amount of impairment of reproduction and feeding during some years. Specifically, we anticipate that some adult female lynx within home ranges affected by such projects may fail to complete a pregnancy or could be less successful in finding adequate food resources needed to ensure maximum survival potential for kittens. Thus, reproductive impairment and/or kitten survival may be affected.

At any time during the course of the action (i.e. beginning on the date of the signed ROD for this proposed action to 15 years later, or during the life of the Revised Forest Plan, whichever comes first) the level of take anticipated in this incidental take statement would be exceeded if:

- more than 93,723 acres of lynx habitat in the WUI is treated under the exemptions from VEG S1, S2, S5 or S6 for fuel treatment projects; or

- more than 15,460 acres on the FNF is treated under the exceptions to VEG S5 and S6 for other resource benefits.

2. Effect of Take

In this biological opinion we determined that the level of anticipated take is not likely to result in jeopardy to the species. To provide perspective on what these impacts on habitat mean to lynx, the average lynx territory in the action area is 53,375 acres for males and 21,745 acres for females (Squires et al. 2004). The proposed action limits adverse effects on lynx (through reductions in snowshoe hare habitat) to projects conducted in the WUI and for resource benefits, which would affect no more than six percent (109,183 acres) of lynx habitat on the FNF over the anticipated life of the Revised Forest Plan (15 years).

Therefore, the number of individual lynx home ranges that would be affected would be low, or if the acres treated were widely distributed, the acres treated within any one home range would be low. In areas treated through exemptions and exceptions, the level of reduction in snowshoe hare prey base and its specific impact on female lynx will vary. This variation is caused by differences in the scale of the project, site specific snowshoe hare habitat conditions within the project area, and the existing prey base, as well as the habits of the individual lynx. Without the details on the actual project site and the variations mentioned, the Service has made assumptions regarding the condition and distribution of the habitat that leads to an overestimate of the amount and quality habitat impacted. Our assumptions therefore lead to an overestimate of the effect and the associated level of take, because not all treated acres would intersect with snowshoe hare and lynx habitat in a way that represents harm to the lynx.

As discussed above, this biological opinion considers the effects of implementation of the the Revised Forest Plan as well as the effects of proposed measures to be implemented at the project level. However, this biological opinion does not provide a detailed analysis for effects of specific projects. Future projects undertaken by the USFS will undergo detailed, site-specific analysis for effects on listed species. This consultation represents the first tier of a tiered consultation framework, with each subsequent project that may affect lynx or lynx critical habitat as implemented under the Revised Forest Plan being the second tier of consultation. These second tier consultations would reference back to this biological opinion to ensure that the effects of specific projects under consultation are commensurate with the effects anticipated in this biological opinion. With each subsequent second tier consultation, the cumulative total of acres treated under the exemptions and/or exceptions to the vegetation standards would be tracked.

3. Reasonable and Prudent Measures

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take of lynx:

- **RPM #1:** The Forest shall minimize harm of lynx from fuels management by ensuring that the acres impacted are not concentrated in several adjacent LAUs.

- **RPM #2:** The Forest shall minimize harm of lynx from pre-commercial thinning and other vegetation management projects by ensuring that female lynx home ranges, as represented by LAUs, either retain sufficient foraging habitat (when sufficient foraging habitat already exists in an LAU) or does not substantially reduce foraging habitat (when sufficient foraging habitat does not already exist in an LAU).

- **RPM #3:** The Forest shall monitor and report the progress of the action and the impact on the species.

These reasonable and prudent measures, with their implementing terms and conditions (detailed below), are designed to minimize the impact of incidental take that might otherwise result from the proposed action, and to ensure that the level of take exempted in this incidental take statement is not exceeded.

4. Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the Forest must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

The following terms and conditions implement reasonable and prudent measure #1:

The Forest Service shall ensure that new or future projects conducted under the exemptions from standards VEG S1, S2, S5 and S6 on the FNF:

1. Do not occur in greater than 93,723 acres in the WUI.

2. Do not result in more than 3 adjacent LAUs that do not meet the standard VEG S1 of no more than 30 percent of an LAU that is not yet snowshoe hare habitat.

3. Projects allowed per the exemptions or exceptions to VEG S5 and S6, shall not occur in any LAU exceeding VEG S1, except for protection of structures.

The following term and conditions implement reasonable and prudent measure #2:

The Forest Service shall ensure that vegetation management projects conducted under exceptions to VEG S5 and S6 on the FNF adhere to the following:

4. Timber management projects (*as defined in Appendix 5*) shall not regenerate more than 15 percent of lynx habitat on FNF lands within a LAU in a ten-year period.

5. Do not occur in greater than 15,460 acres.

The following term and conditions implement reasonable and prudent measure #3:

5. In support of the monitoring and reporting requirements of the NRLMD, the FNF shall provide to the Service and the Forest Service Northern Region (Region 1) Office in Missoula, summaries of the reporting requirements listed below. The summaries shall be submitted to the Service's Montana Ecological Services Office in Helena, Montana by April 1 of each year, or other date through mutual agreement. The summaries shall document the following information related to fuel treatment and vegetation management projects occurring in lynx habitat:

   a. Individual fuels treatment and vegetation management projects conducted in lynx habitat under the exemptions and exceptions to the vegetation standards VEG S1, S2, S5 and S6 may reduce the quality or quantity of snowshoe hare habitat. Some projects are likely to result in detectable and measurable effects to lynx (and our biological opinion's analysis found may rise to the level of take) while other projects will not result in a detectable, measurable effect to lynx (i.e. may affect, but not likely to adversely affect). The acreages of all projects will be tracked and aggregated to ensure that over the life of the Revised Forest Plan, the number of acres impacted does not exceed the acres projected to be treated and the effects analyzed in our biological opinion. This approach to tracking and monitoring ensures that the proposed action is implemented as proposed and is consistent with our analysis. In addition, given the long timespan of the proposed action, this process provides information that can help determine whether consultation reinitiation ever becomes necessary.

      Thus report as follows:

      The BA prepared for each site-specific project shall include a report of the acres to be treated under the exemptions and/or exceptions from the vegetation management standards VEG S1, S2, S5, and S6. The report shall also include the total acres treated to date on the FNF as a whole, a map indicating the spatial distribution of past treatments, and acres treated by LAU. This total shall include the acres in the proposed project, other projects that have signed decisions (including those that have been completed since implementation of NRLMD in 2007), and those projects that have completed section 7 consultation.

b. In addition, each BA shall report whether or not the site-specific project meets all applicable Revised Forest Plan guidelines for lynx. If guidelines were not met, provide rationale as to why they could not be met.

c. To ensure that term and condition # 2 is met, each project level biological assessment shall report any three adjacent LAUs within the action area that have more than 30 percent of lynx habitat in a stand initiation structural state that does not yet provide winter snowshoe hare habitat, either because of natural events, vegetation management or fuel treatment projects, or any combination of these or other causes.

d. To ensure that term and condition # 4 is met, report by LAU the amount of lynx habitat treated through vegetation management projects as allowed by exceptions to VEG S5 and S6; record the type of exception, acres, location (LAU) and whether or not standard VEG S1 was adhered to.

e. The FNF shall report this project level monitoring information at the time a site-specific decision is signed to the designated Forest Service office with responsibility for maintaining an accurate accounting of reports. These data will be provided in a biennial report to the Service's Montana Ecological Services Office by April 1st.

I. CONSERVATION RECOMMENDATIONS

Sections 7(a)(1) of the Act directs federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans or to develop information. The recommendations provided here relate only to the proposed action and do not necessarily represent complete fulfillment of the agency's section 7(a)(1) responsibilities.

This biological opinion identifies the following conservation recommendations that, in addition to the proposed action and other ongoing conservation actions, will support recovery of listed species. As discussed above, these conservation recommendations are discretionary agency activities meant to minimize or avoid adverse effects to listed species. The conservations recommendations are:

1. In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat.

2. When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings.

3. Participate in inter-agency efforts to understand the effects of climate change, wildlife, and post-fire treatments in lynx habitat.

4. The Service commends the Forest Service for initiating and implementing important efforts to increase our understanding of lynx and lynx habitat with completion of the Science Report, lynx habitat mapping, and linkage zone identification, and assuming leadership roles on both the Lynx Biology Team and Lynx Steering Committee. We recommend that you continue to be a leader in these arenas, in coordination/cooperation with other Federal, State, or private entities.

In addition to management direction that will contribute to the recovery of Canada lynx, direction relative other listed species (i.e., bull trout, grizzly bear, water howelia) is also contained in the FNF's Revised Forest Plan. These elements are documented in the biological assessment (USFS 2017) or species-specific chapters of this biological opinion. Upon review the Service concludes that the FNF's Revised Forest Plan demonstrated a commitment to conservation of threatened and endangered species, and will continue to contribute to the recovery of these species.

Upon review of Forest Plan components that will be carried forward, and components that are being proposed, we conclude that the features of the amended Forest Plans can be considered elements of a program for the conservation of endangered species and threatened species, as described in section 7(a)(1) of the Act. Further, we conclude that this proposed action demonstrates the USFS's commitment to conservation of threatened and endangered species on NFS lands in the action area.

J. REINITIATION NOTICE

This concludes formal consultation on the FNF's Revised Forest Plan and its effects on Canada lynx and its critical habitat. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded (not applicable to critical habitat); (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

As detailed in the incidental take statement in this biological opinion, at any time during the course of the action (i.e. beginning on the date of the signed ROD for this proposed action to exactly 15 years later, or during the life of the Revised Plan, whichever comes first) the level of take anticipated in this incidental take statement would be exceeded if:

- more than 93,723 acres of lynx habitat in the WUI on the FNF is treated under the exemptions from VEG S1, S2, S5 or S6 for fuel treatment projects; or

- more than 15,460 acres of lynx habitat on the FNF is treated under the exceptions to VEG S5 and S6 for other resource benefits.

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Appendix 1: Maps and Figures

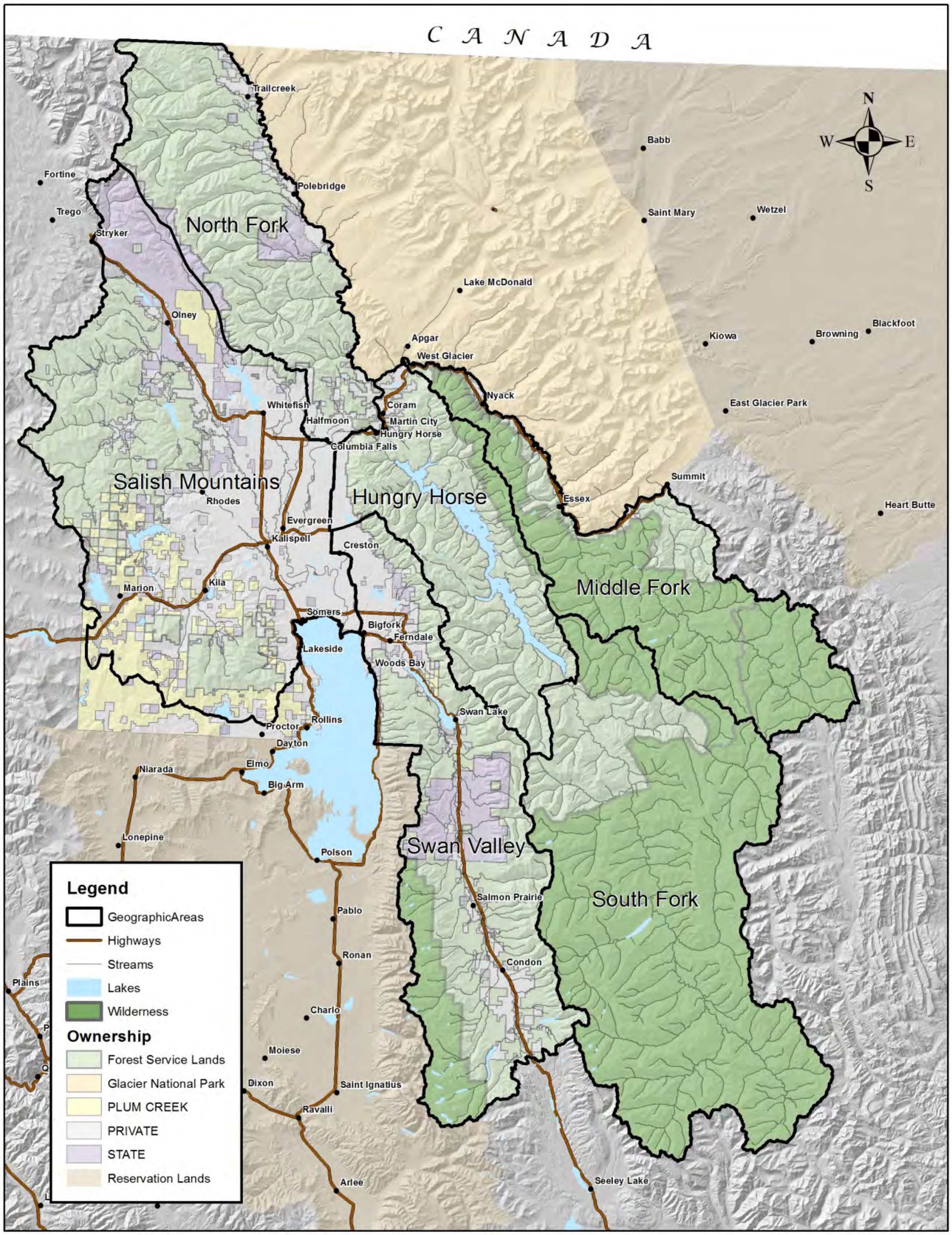


Figure 1. Flathead National Forest geographic area (GA) boundaries and land ownership (Note: lands shown as Plum Creek on the legend are now owned by Weyerhauser).

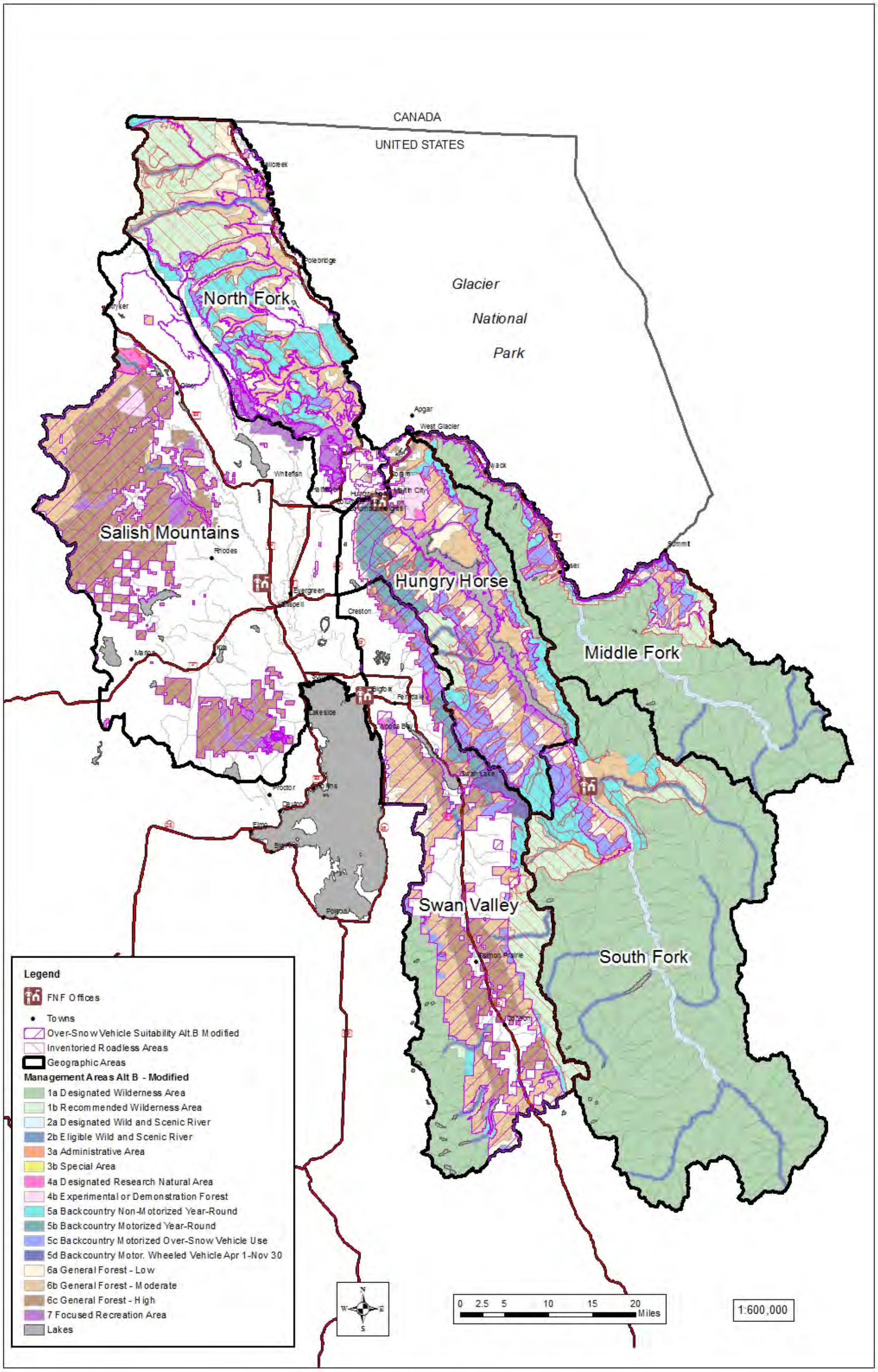


Figure 2. Management area designations under the Flathead National Forest Revised Forest Plan.

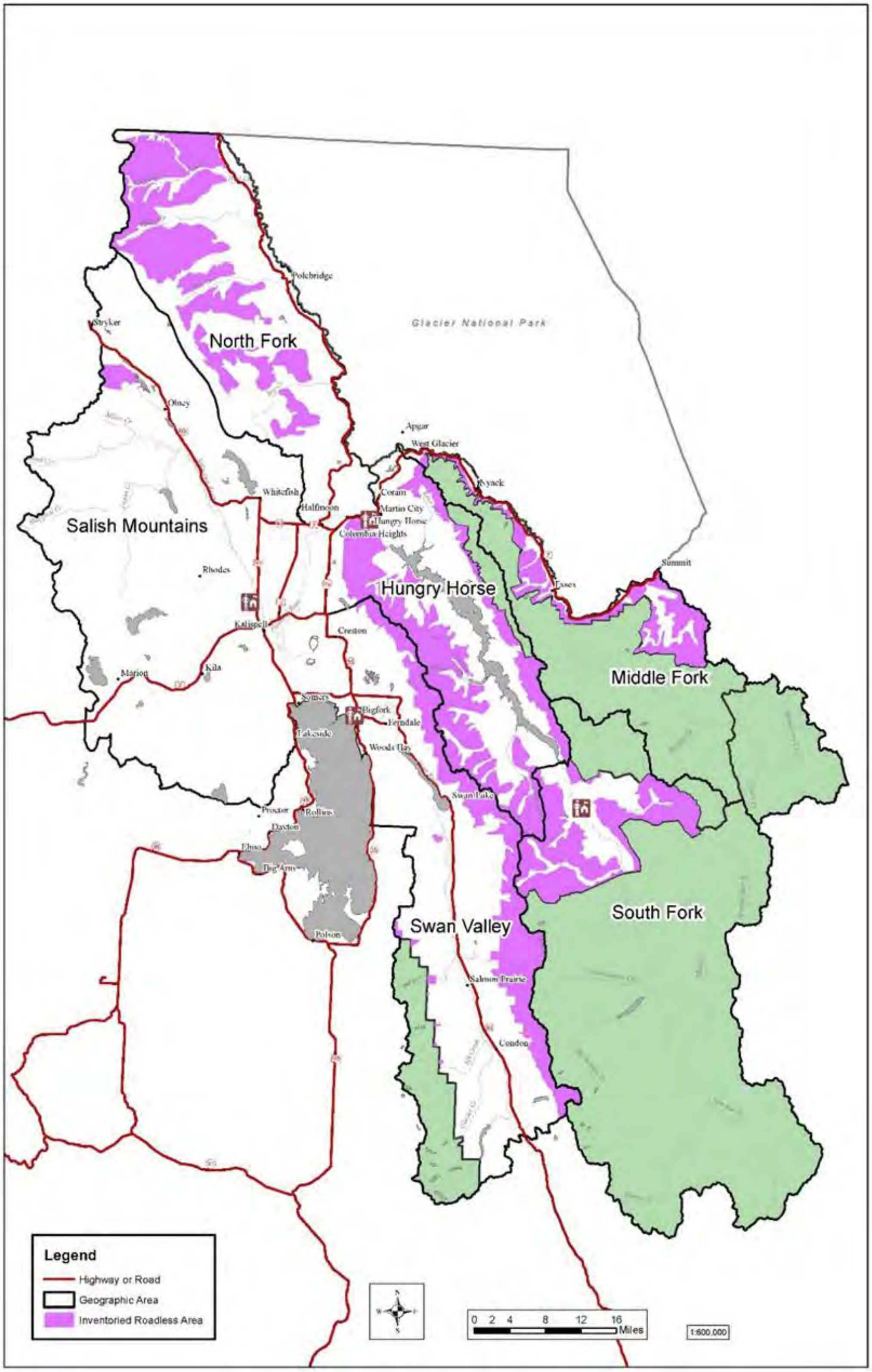


Figure 3. Inventoried roadless areas (IRAs) on the Flathead National Forest.

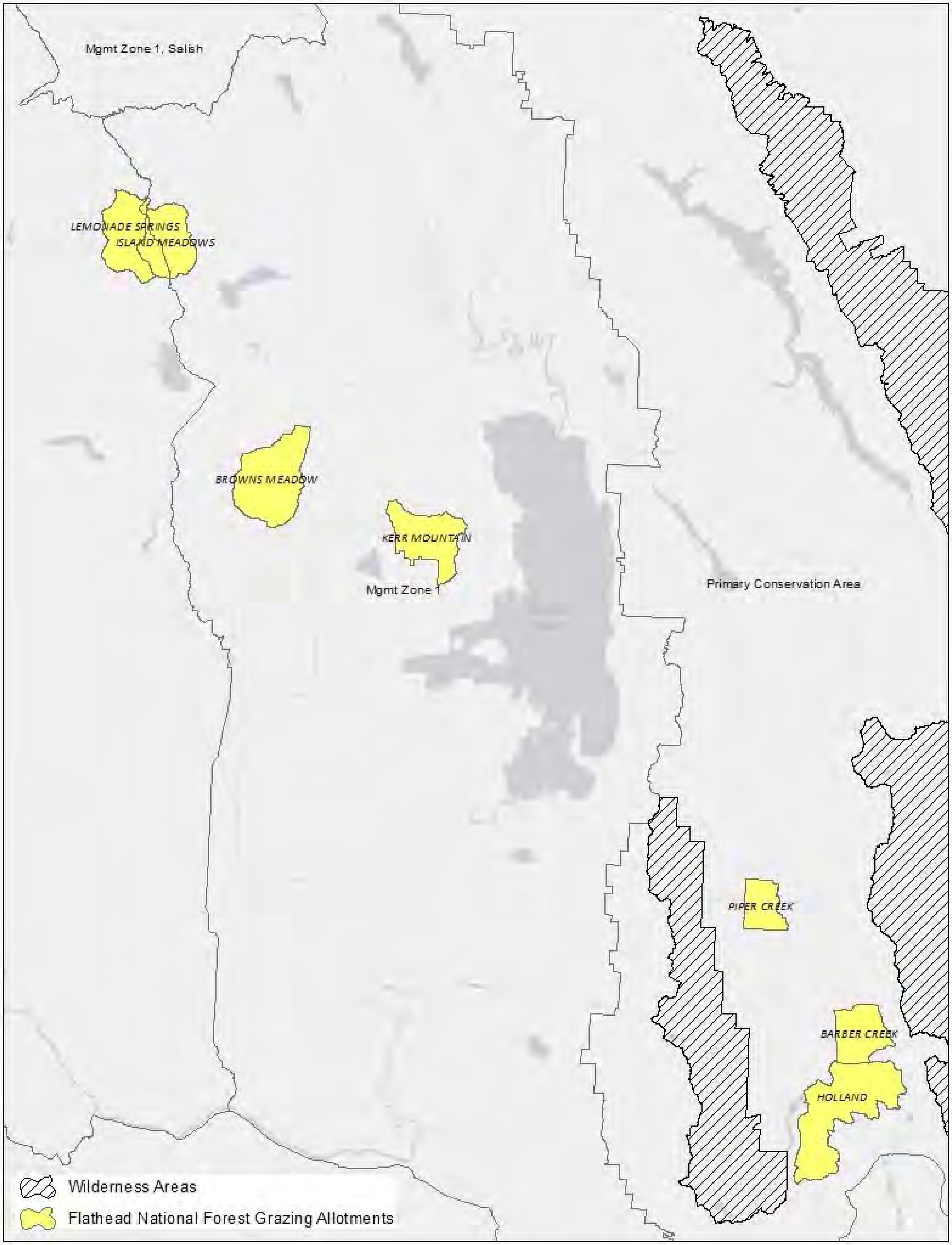


Figure 4. Grazing allotments on the Flathead National Forest.

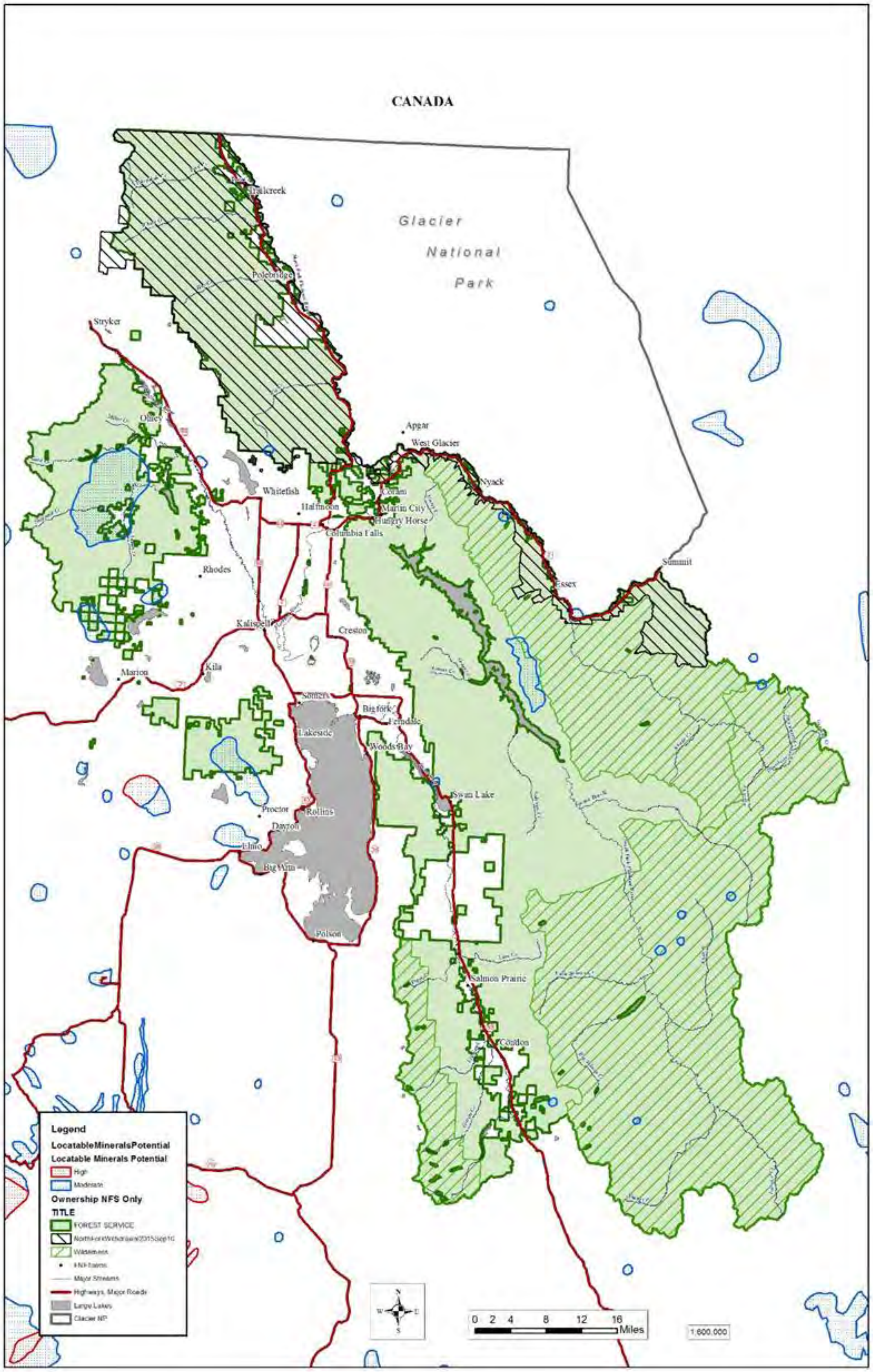


Figure 5. Potential locatable minerals on the Flathead National Forest.

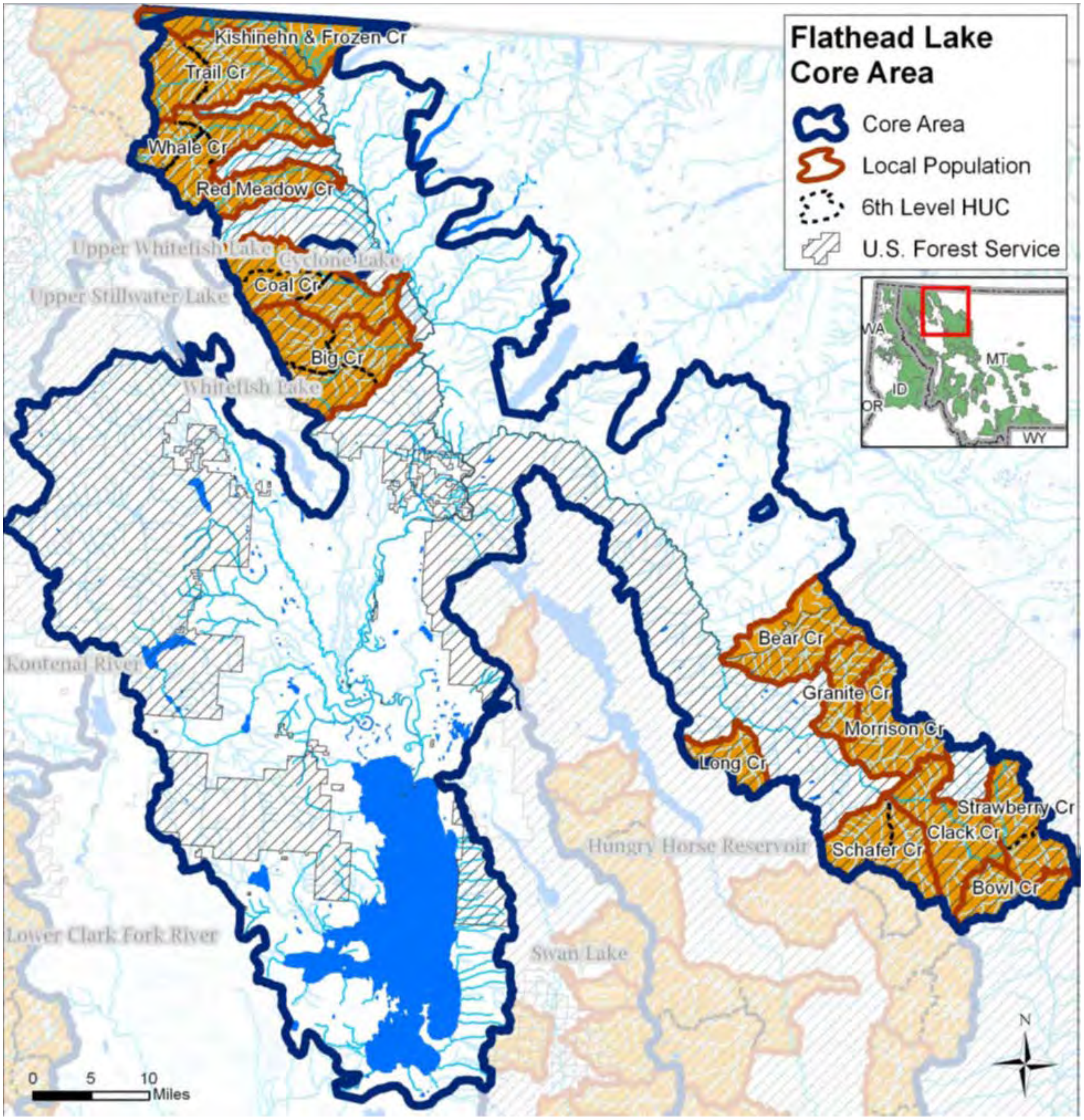


Figure 6. Flathead Lake Bull Trout Core Area.

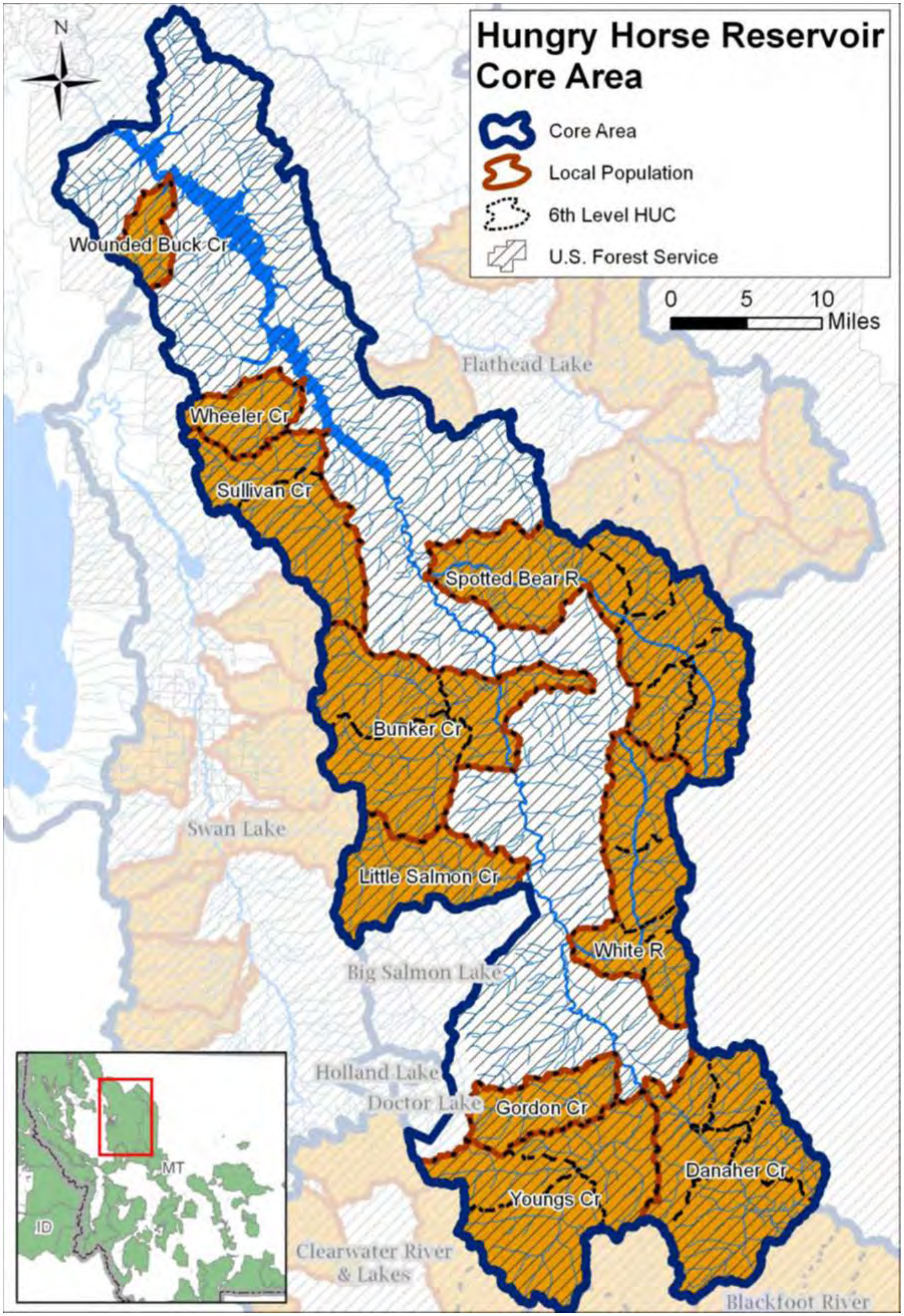


Figure 7. Hungry Horse Reservoir Bull Trout Core Area.

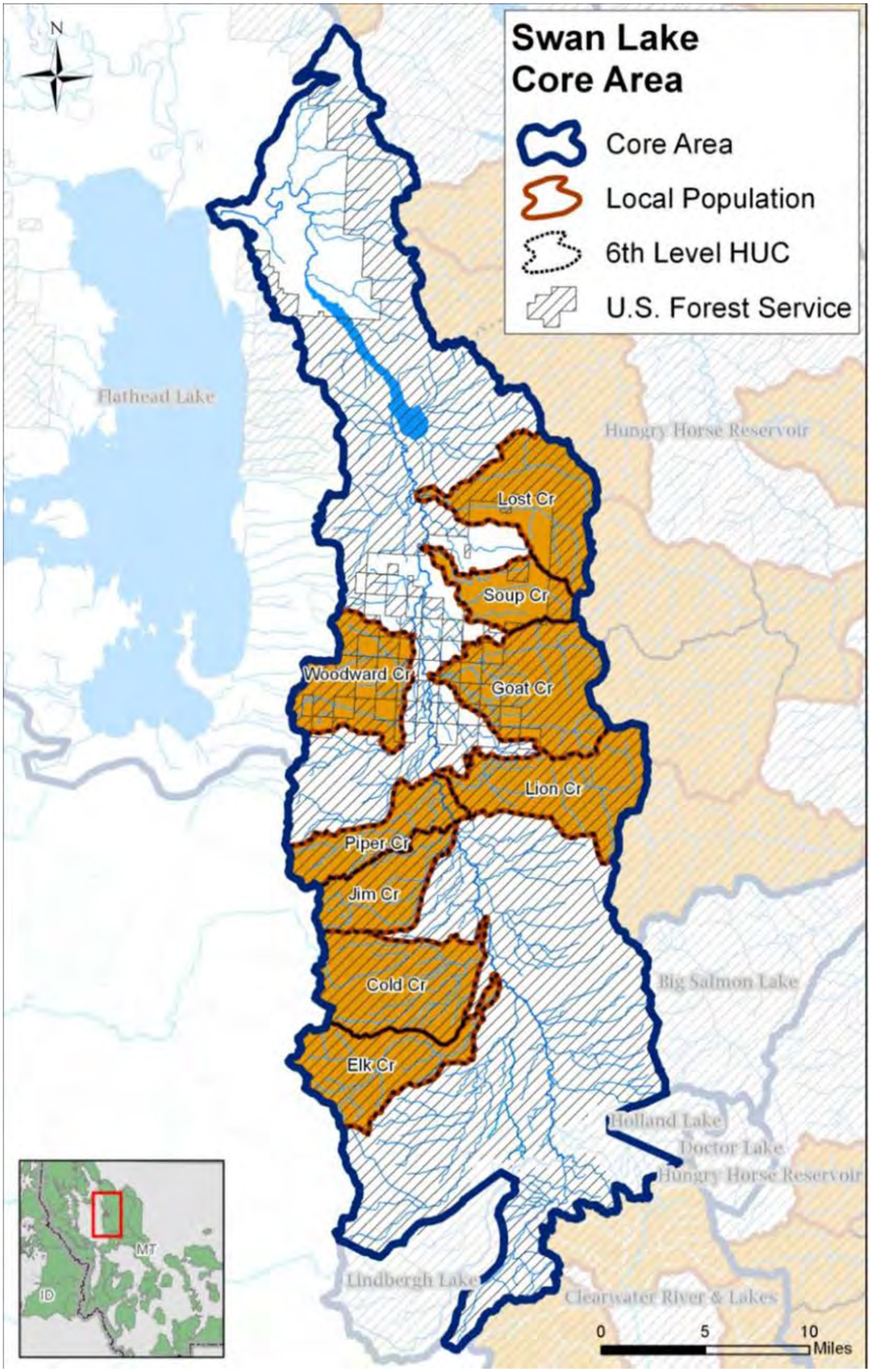


Figure 8. Swan Lake Bull Trout Core Area.

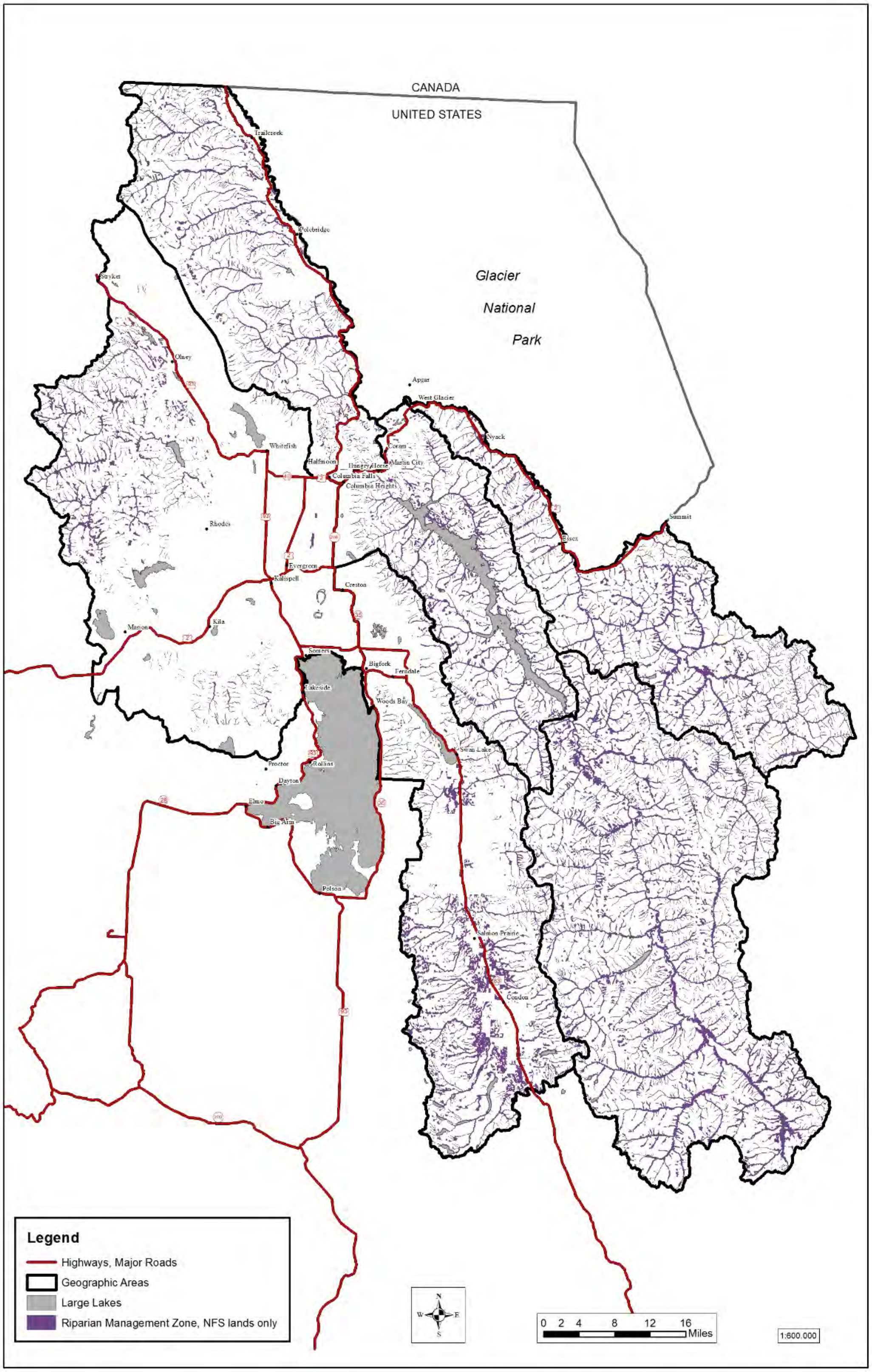


Figure 9. Areas that will be designated as riparian management zones (RMZ) on the FNF.

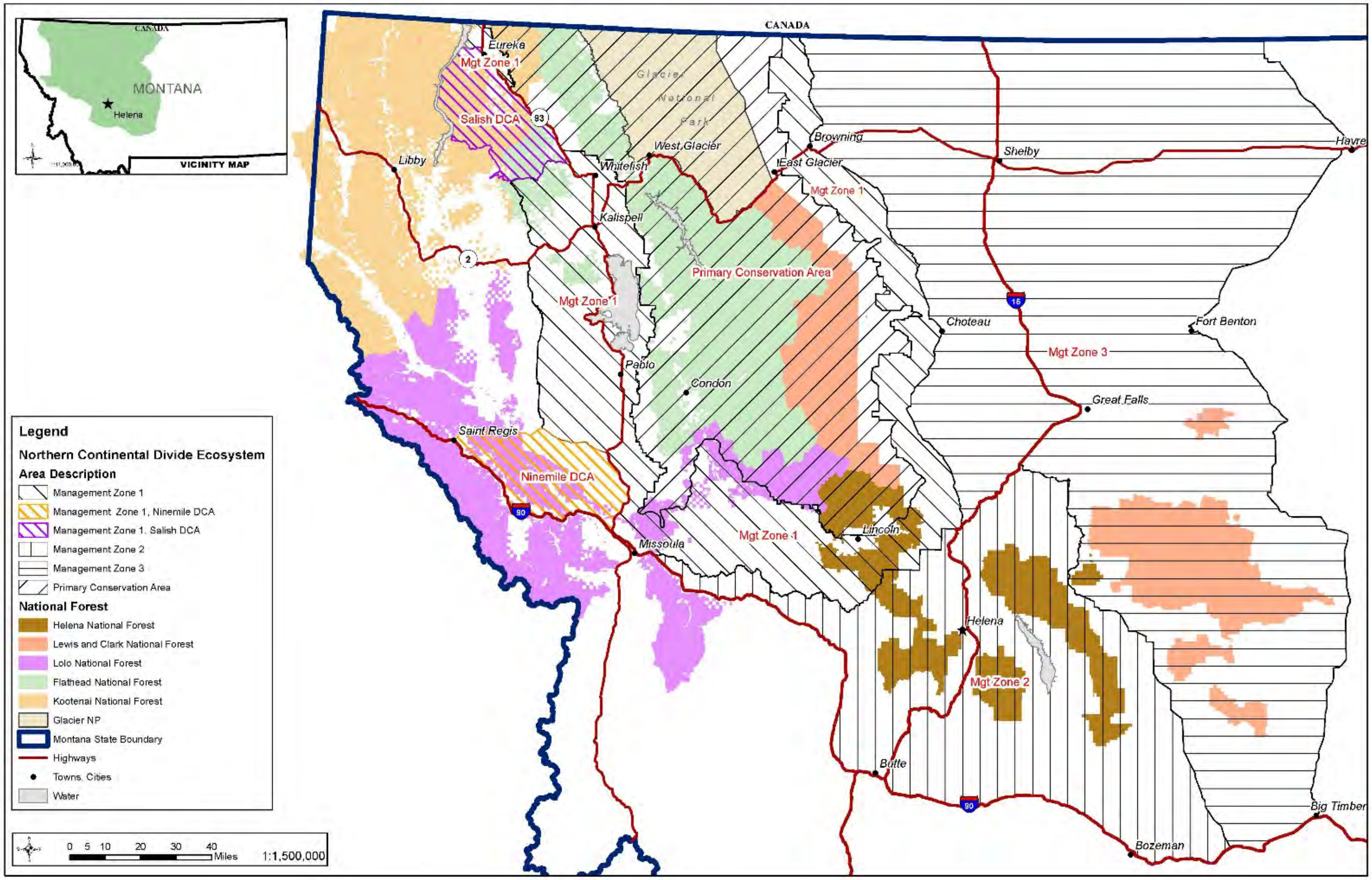


Figure 10. NCDE grizzly bear management zones.

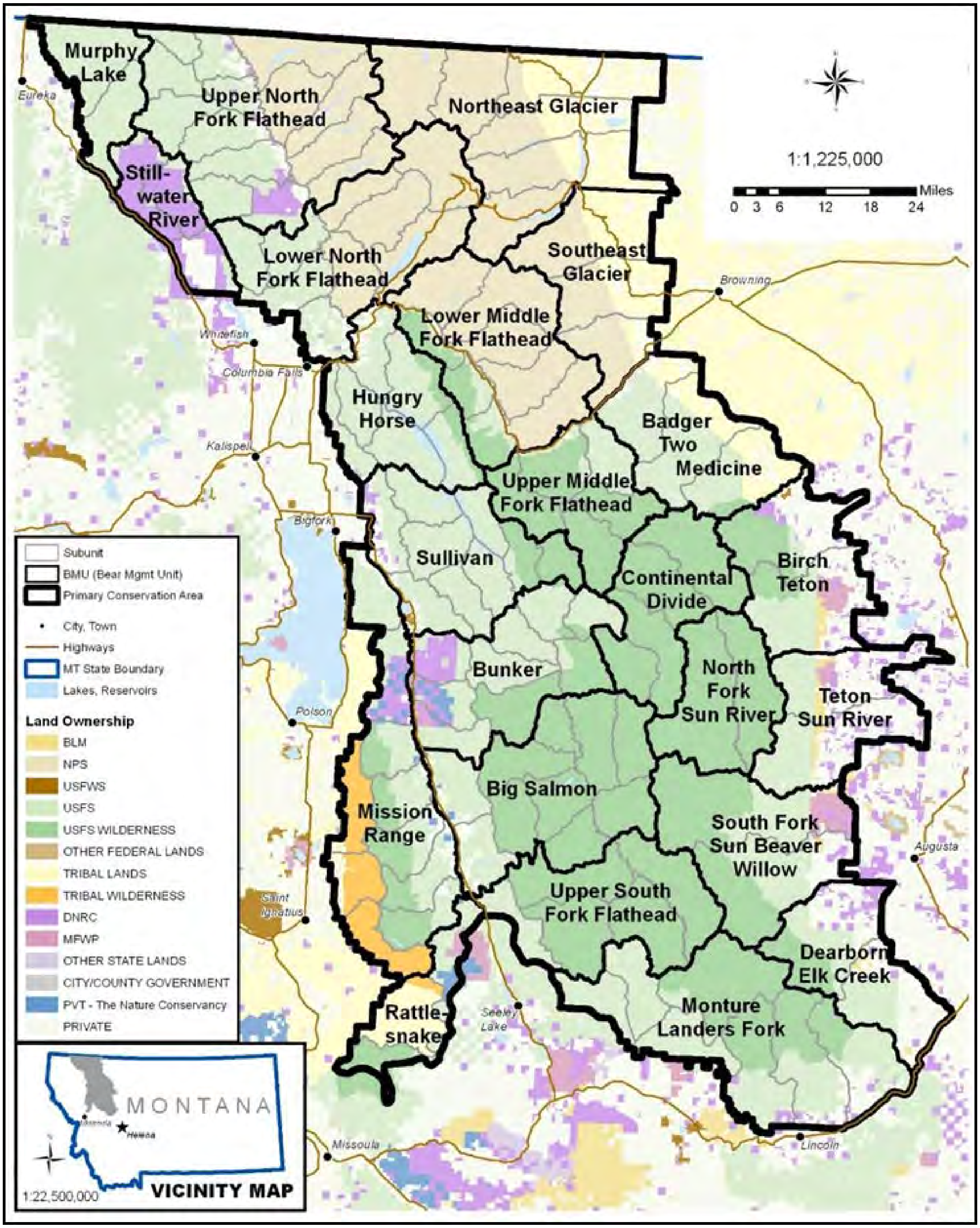


Figure 11. Bear management units (BMUs) in the NCDE primary conservation area of the Flathead National Forest (subunits outlined in light gray).

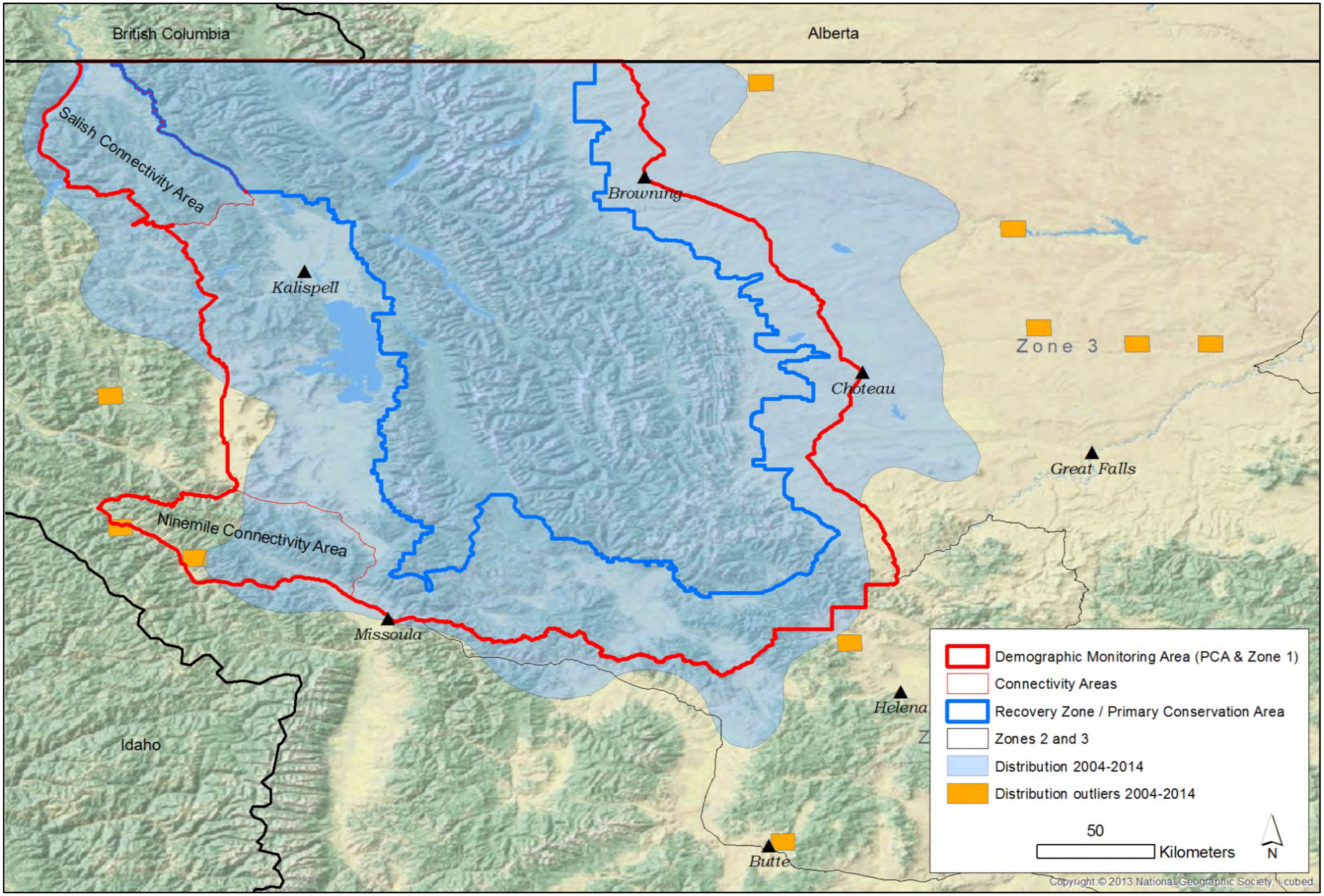


Figure 12. Distribution of grizzly bears (2004 to 2014) in the NCDE (Costello et al. 2016).

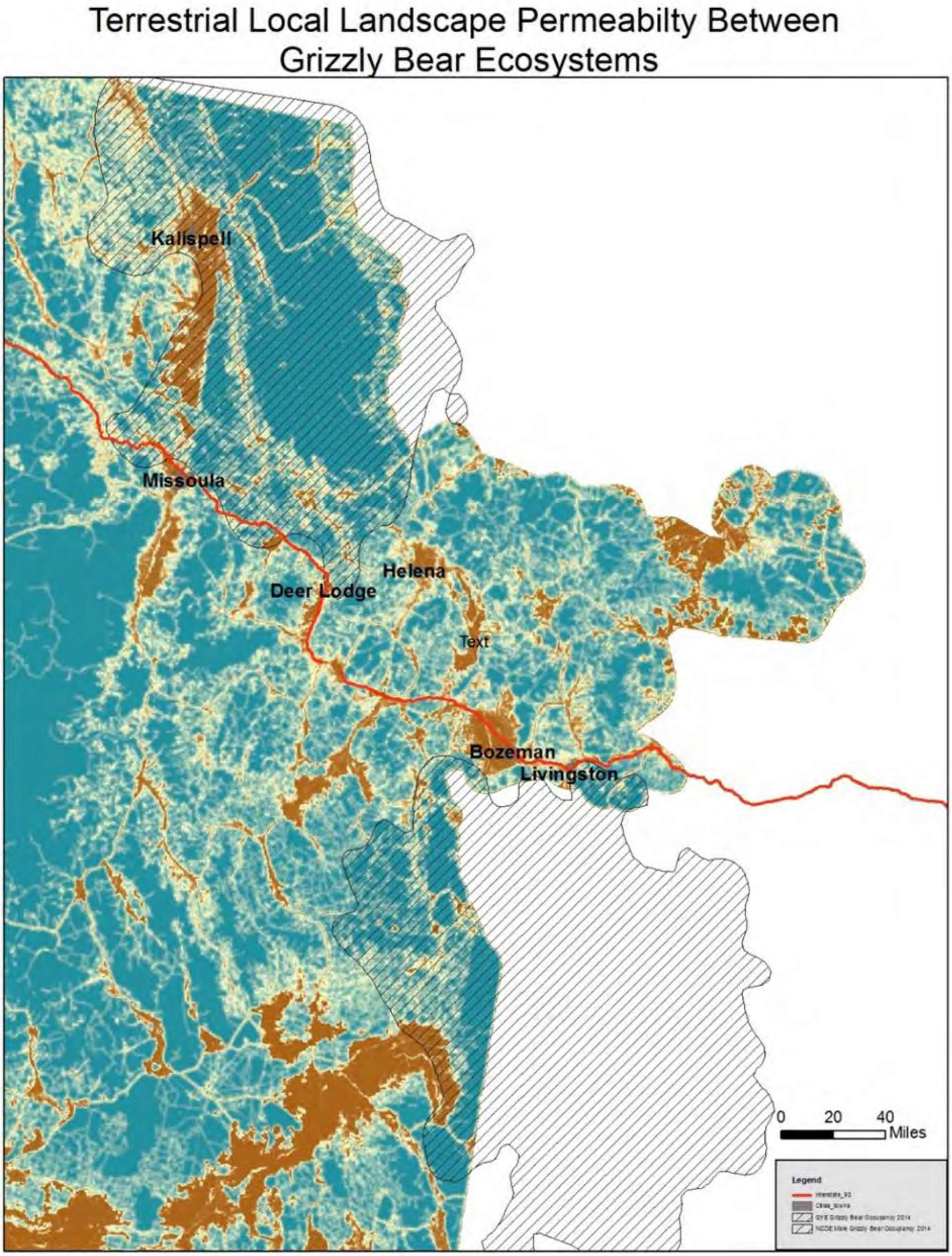


Figure 13. Terrestrial local landscape permeability between areas occupied by the grizzly bear in the Northern Continental Divide and Greater Yellowstone Ecosystems (obtained from databasin.org 2016).

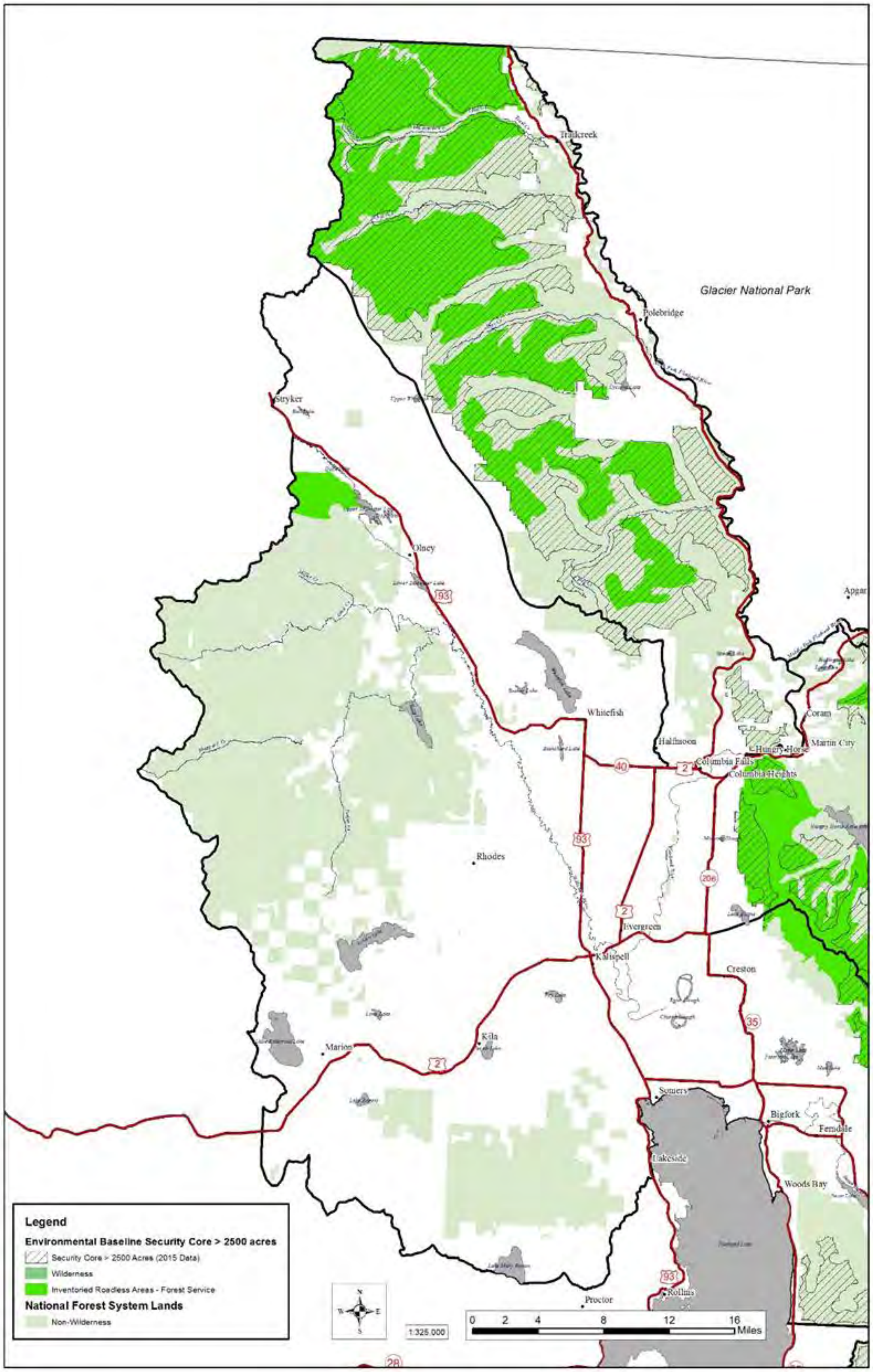


Figure 14. Grizzly Bear security core, wilderness, and IRAs on the north half of the Flathead National Forest.

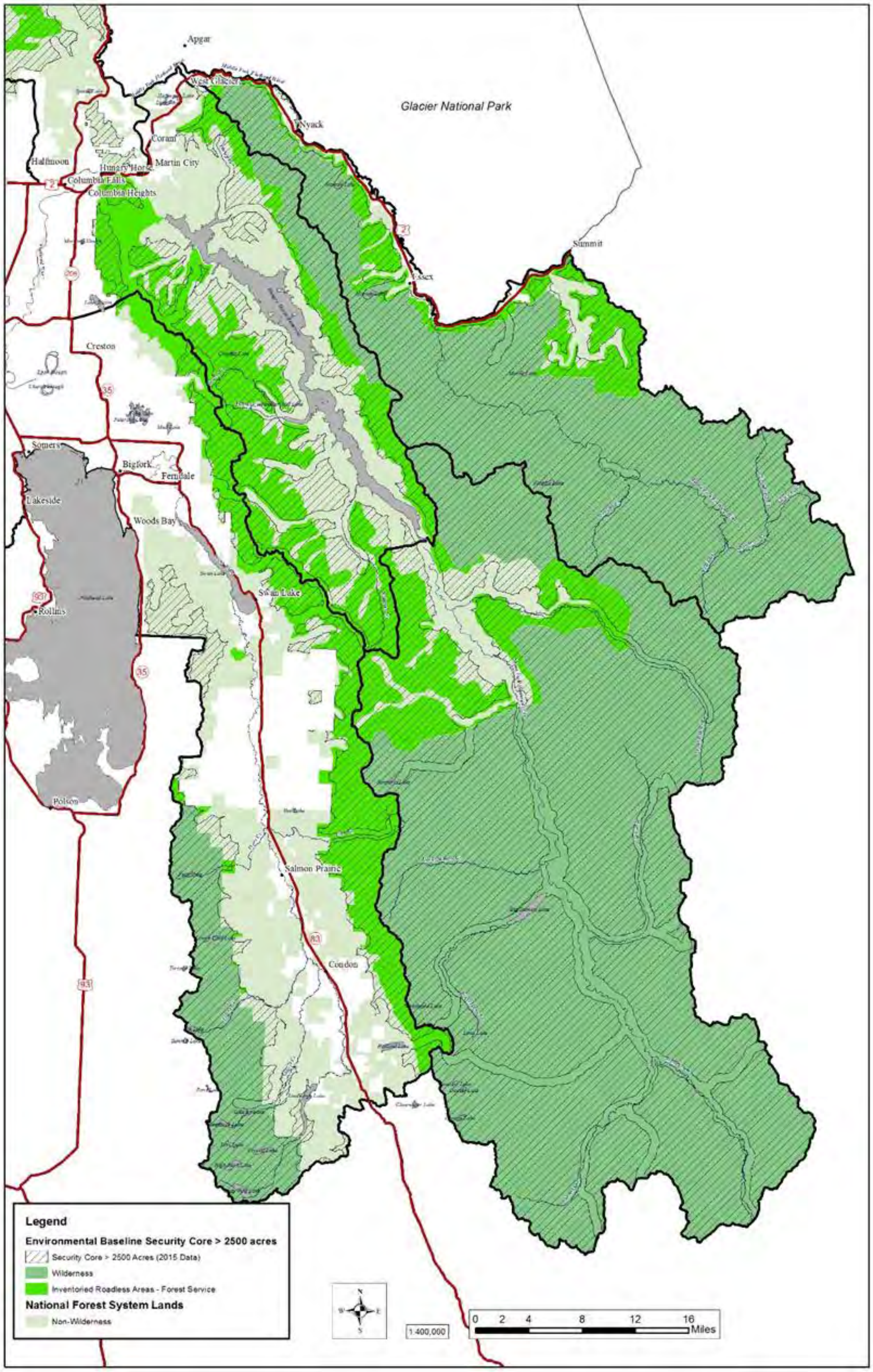


Figure 15. Grizzly Bear security core, wilderness, and IRAs on the south half of the Flathead National Forest.

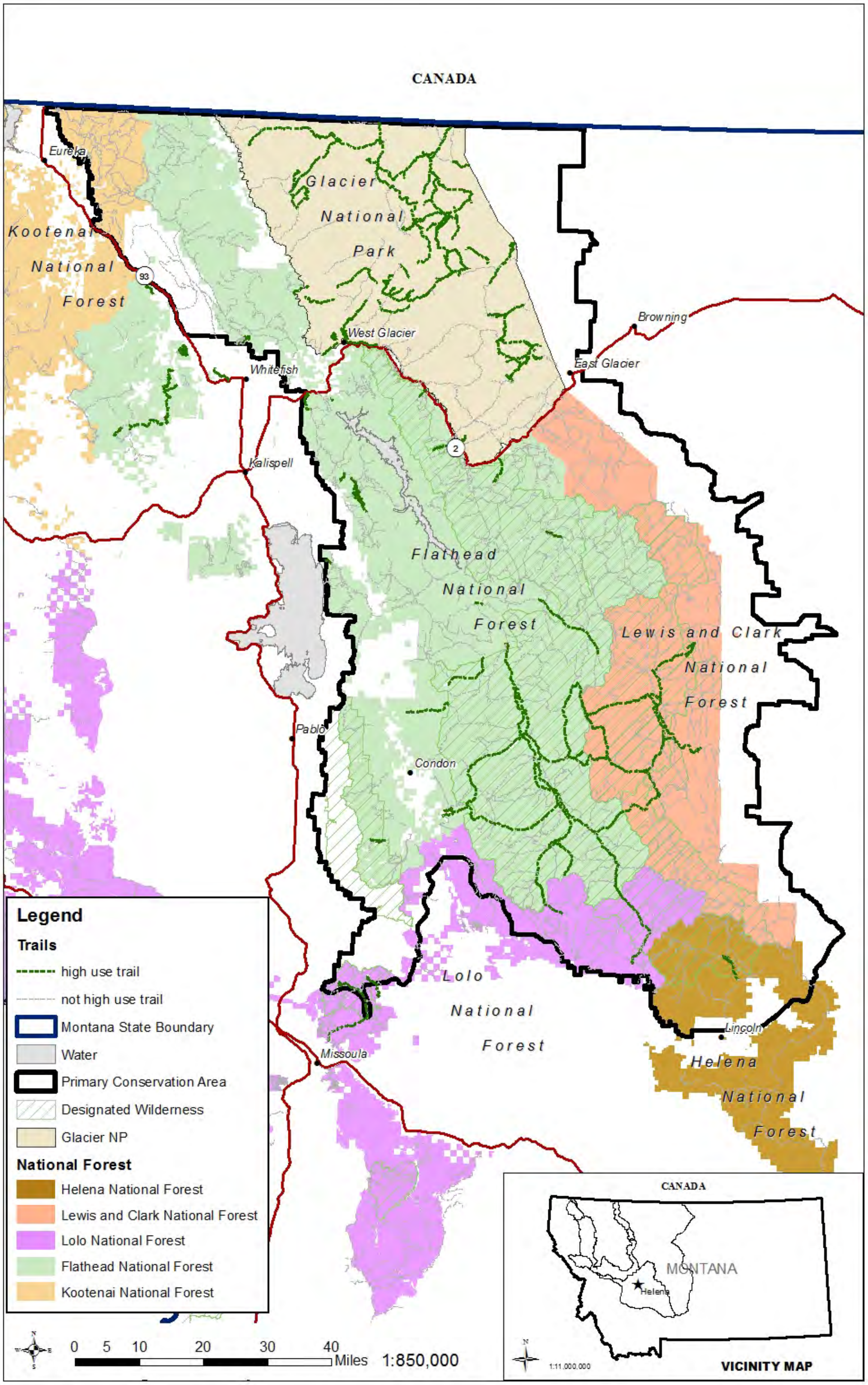


Figure 16. High use trails in the NCDE.

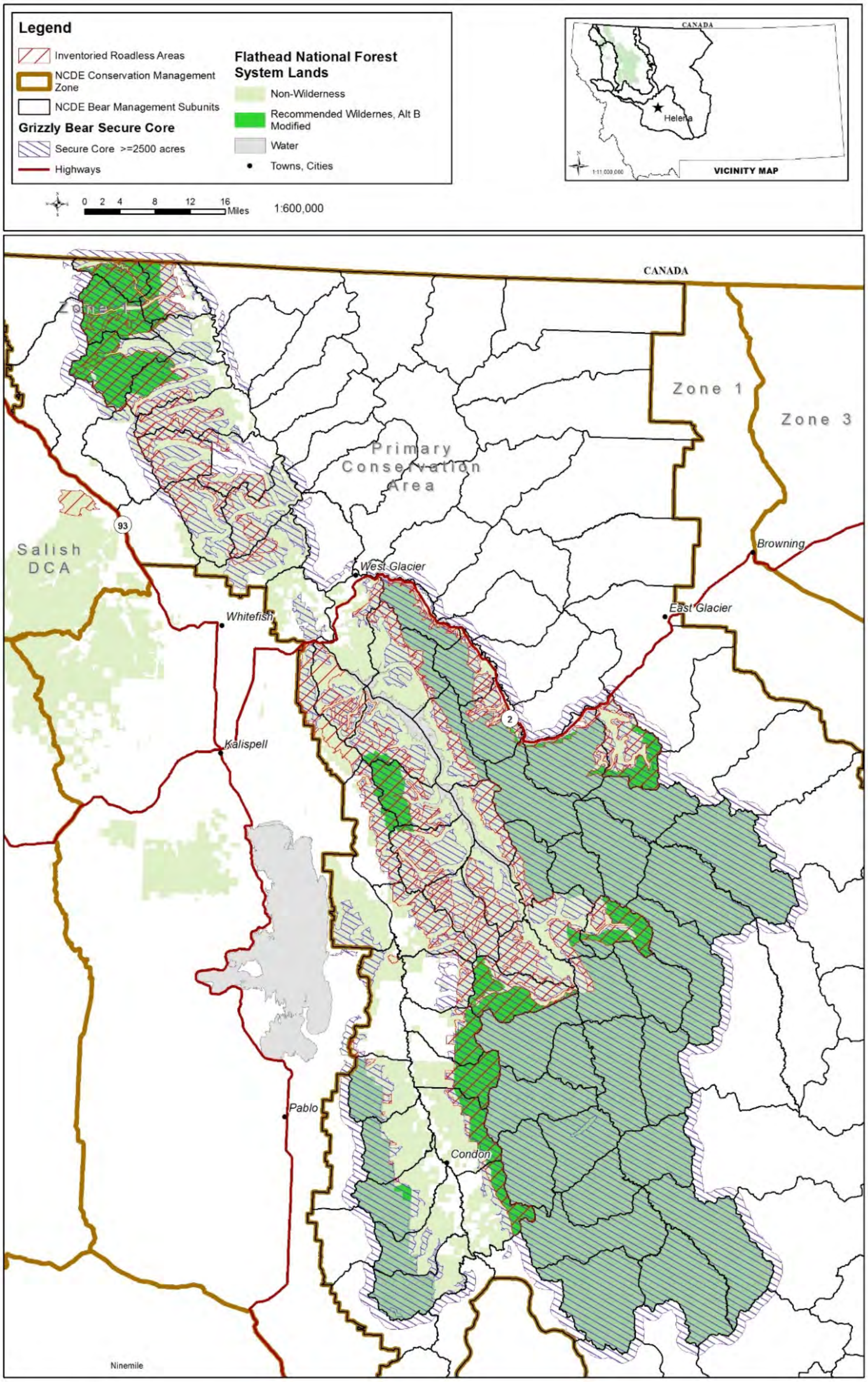


Figure 17. Grizzly bear security core with wilderness, recommended wilderness, and inventoried roadless areas under the Flathead National Forest's Revised Forest Plan.

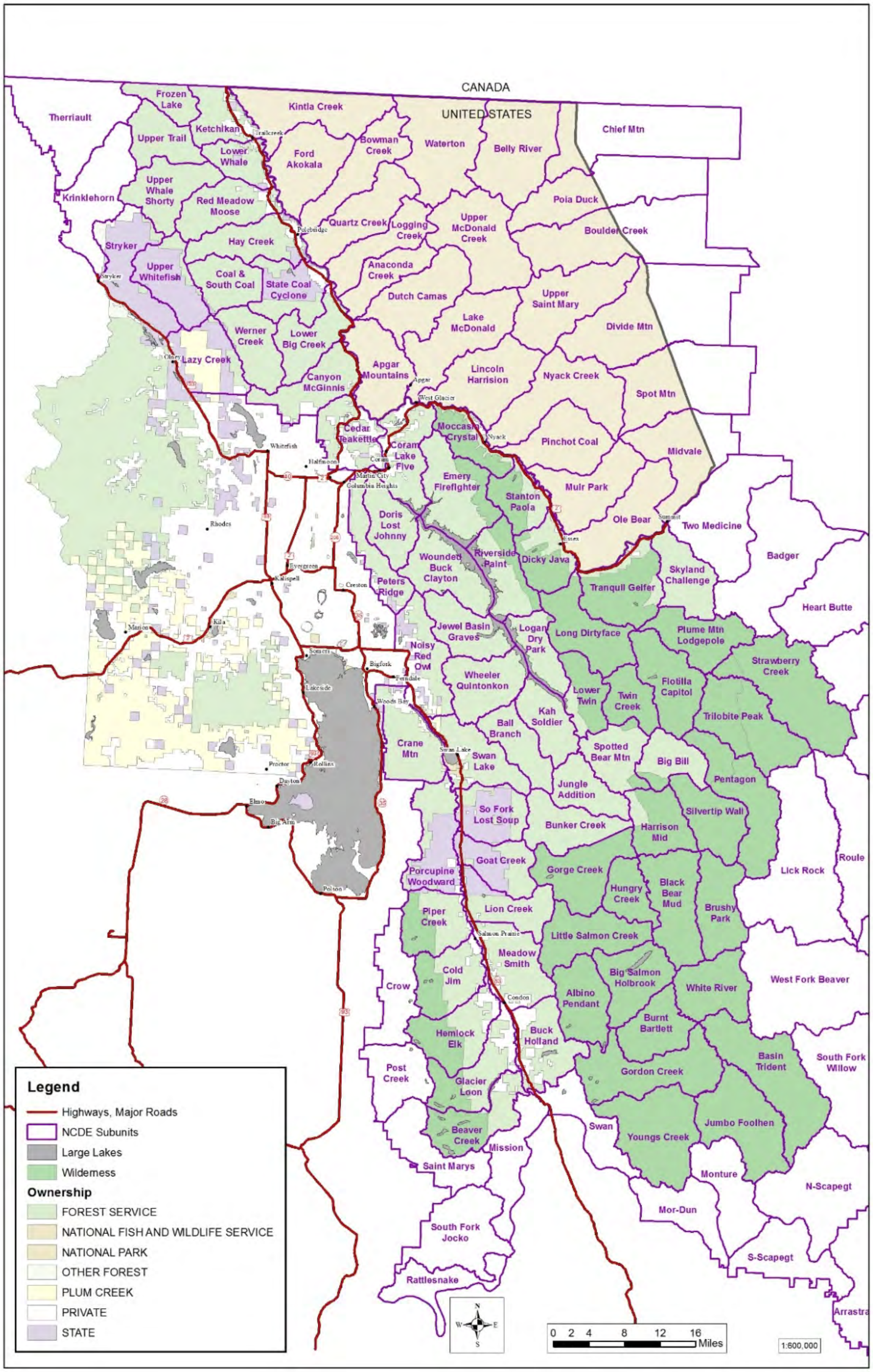


Figure 18. All bear management unit (BMU) subunits in the NCDE.

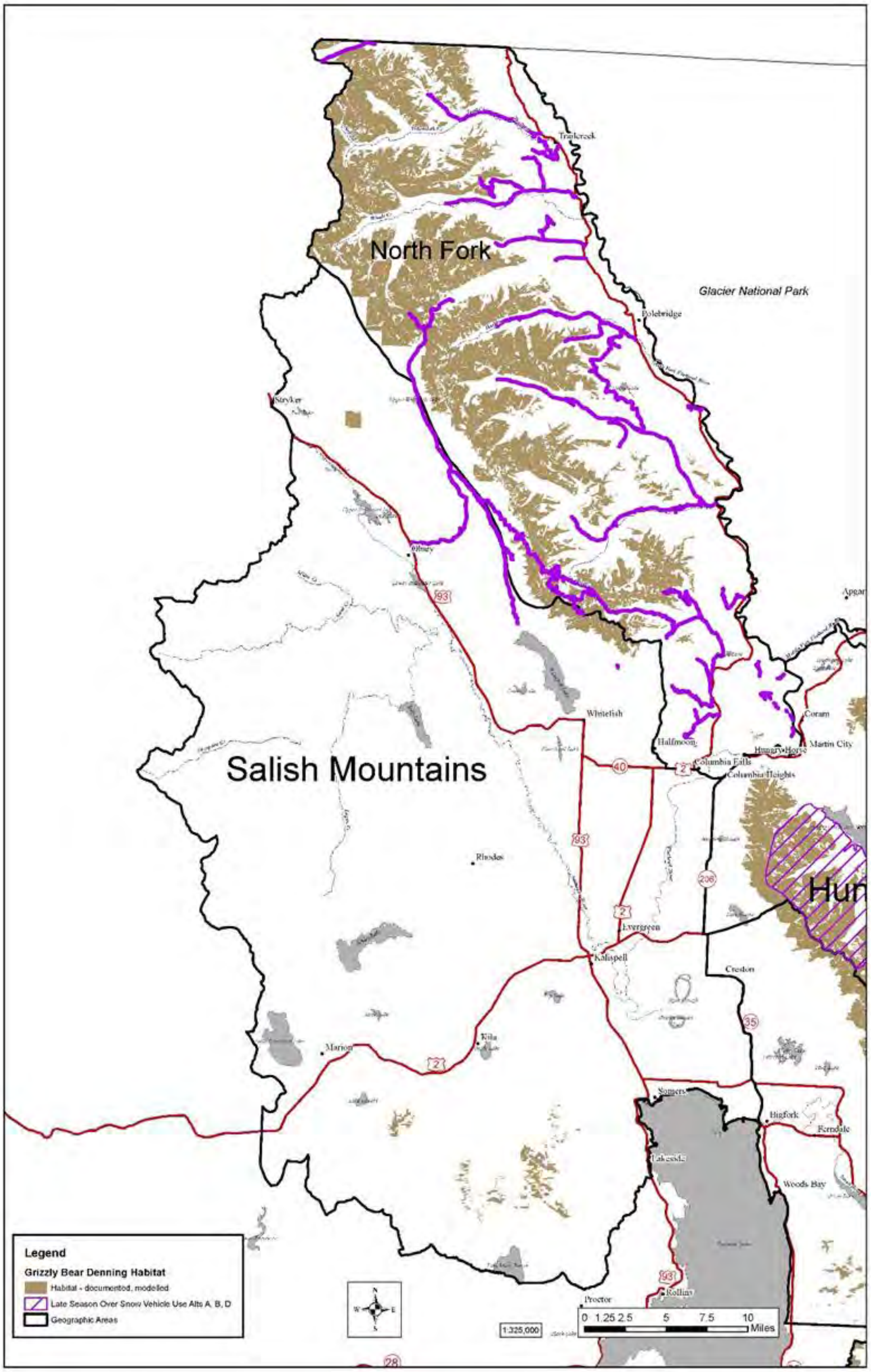


Figure19. Modeled grizzly bear denning habitat with amendment 19's designated late-season over-snow routes—north half Flathead National Forest.

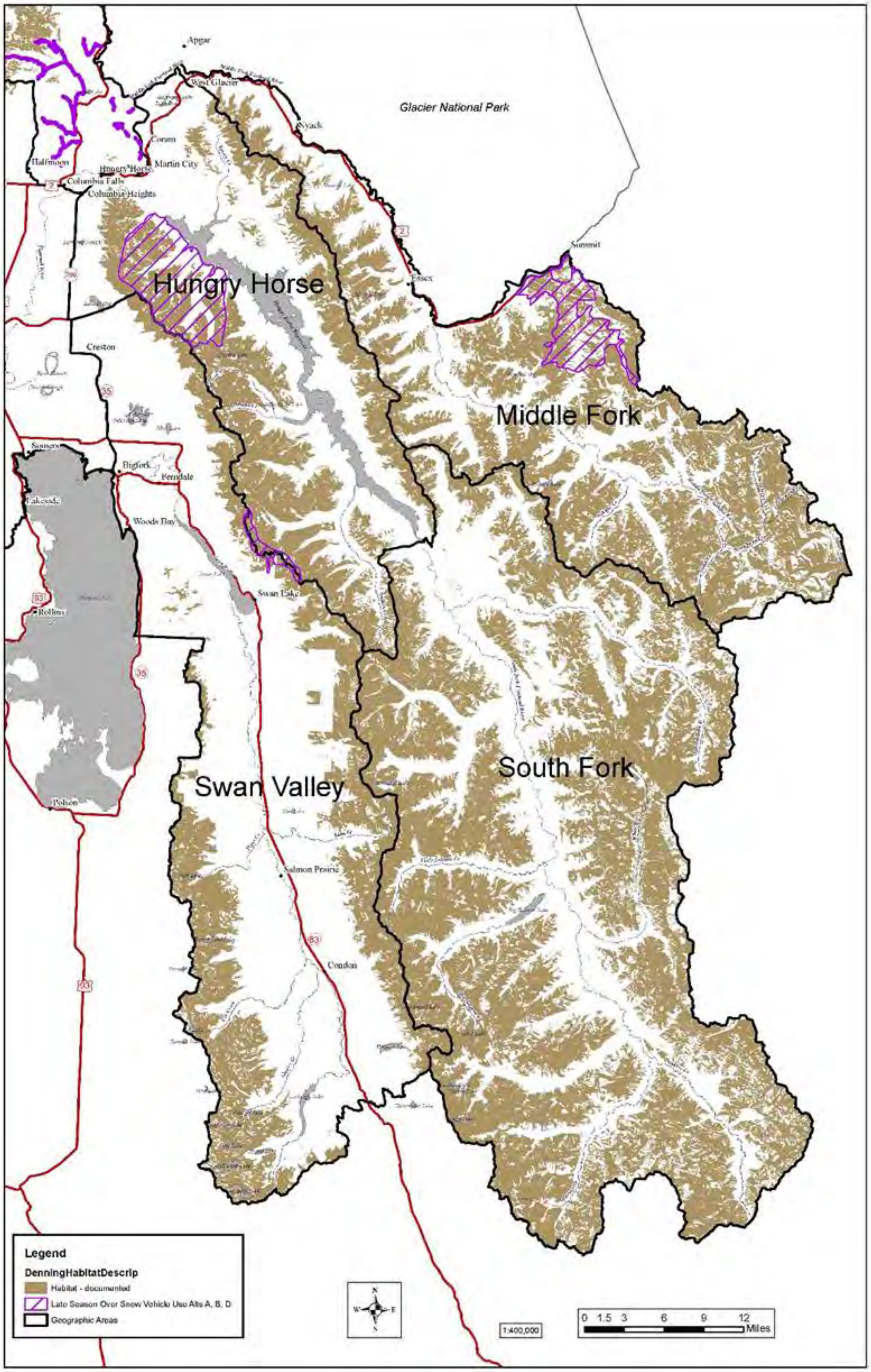


Figure 20. Modeled grizzly bear denning habitat with amendment 19's designated late-season over-snow areas—south half Flathead National Forest.

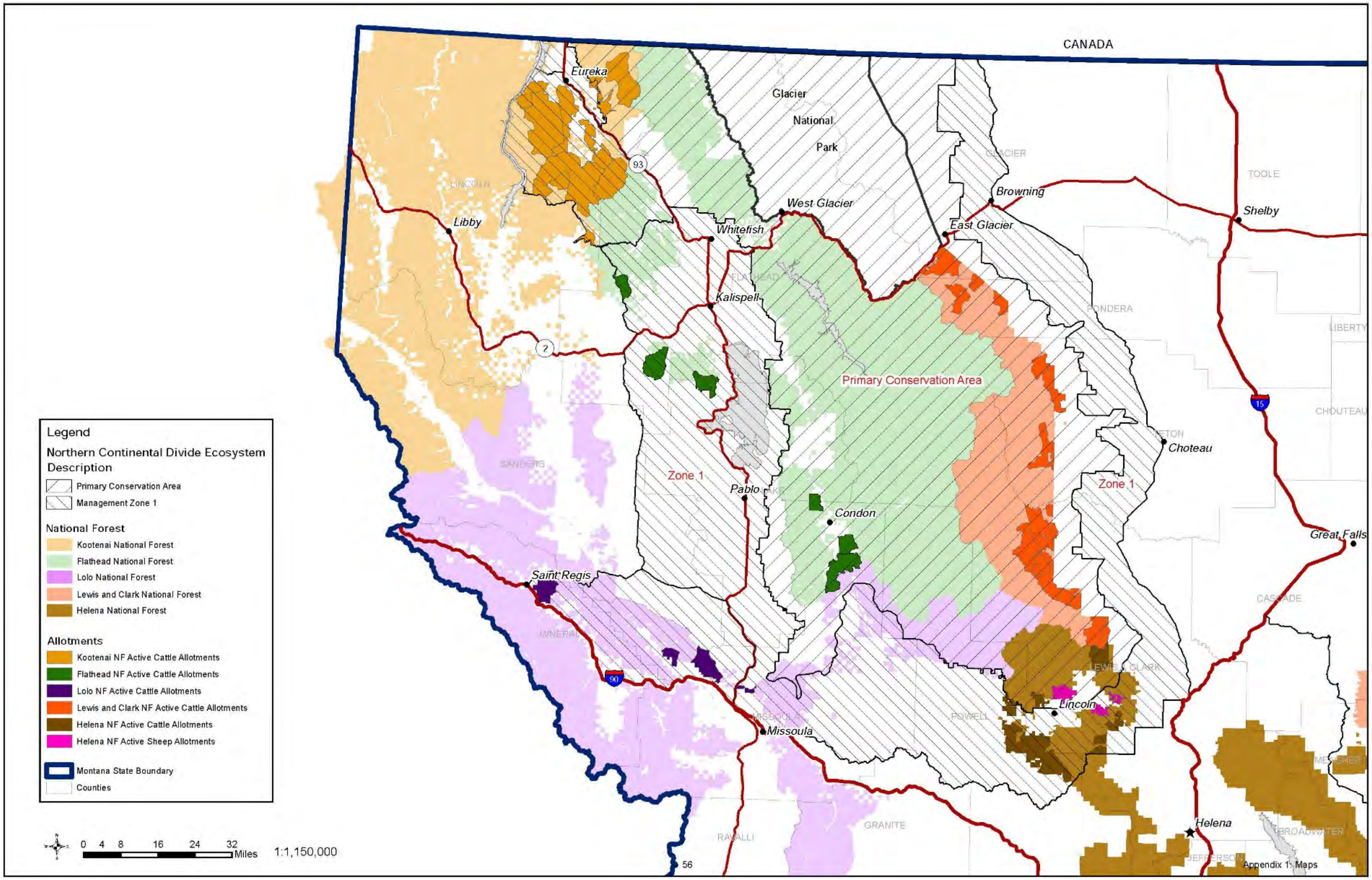


Figure 21. Grazing allotments on the NCDE.

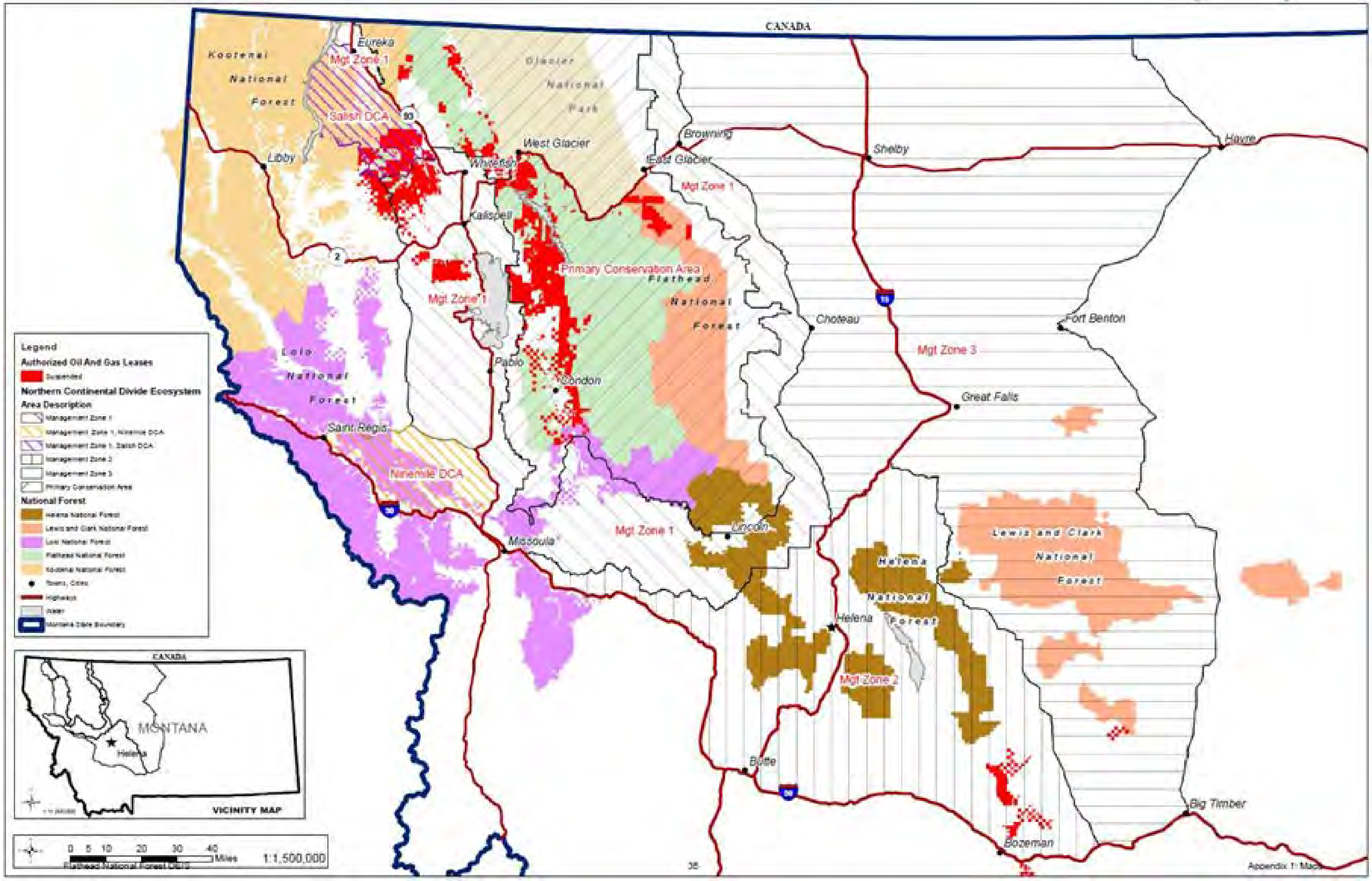


Figure 22. Suspended oil and gas leases in the Northern Continental Divide Ecosystem.

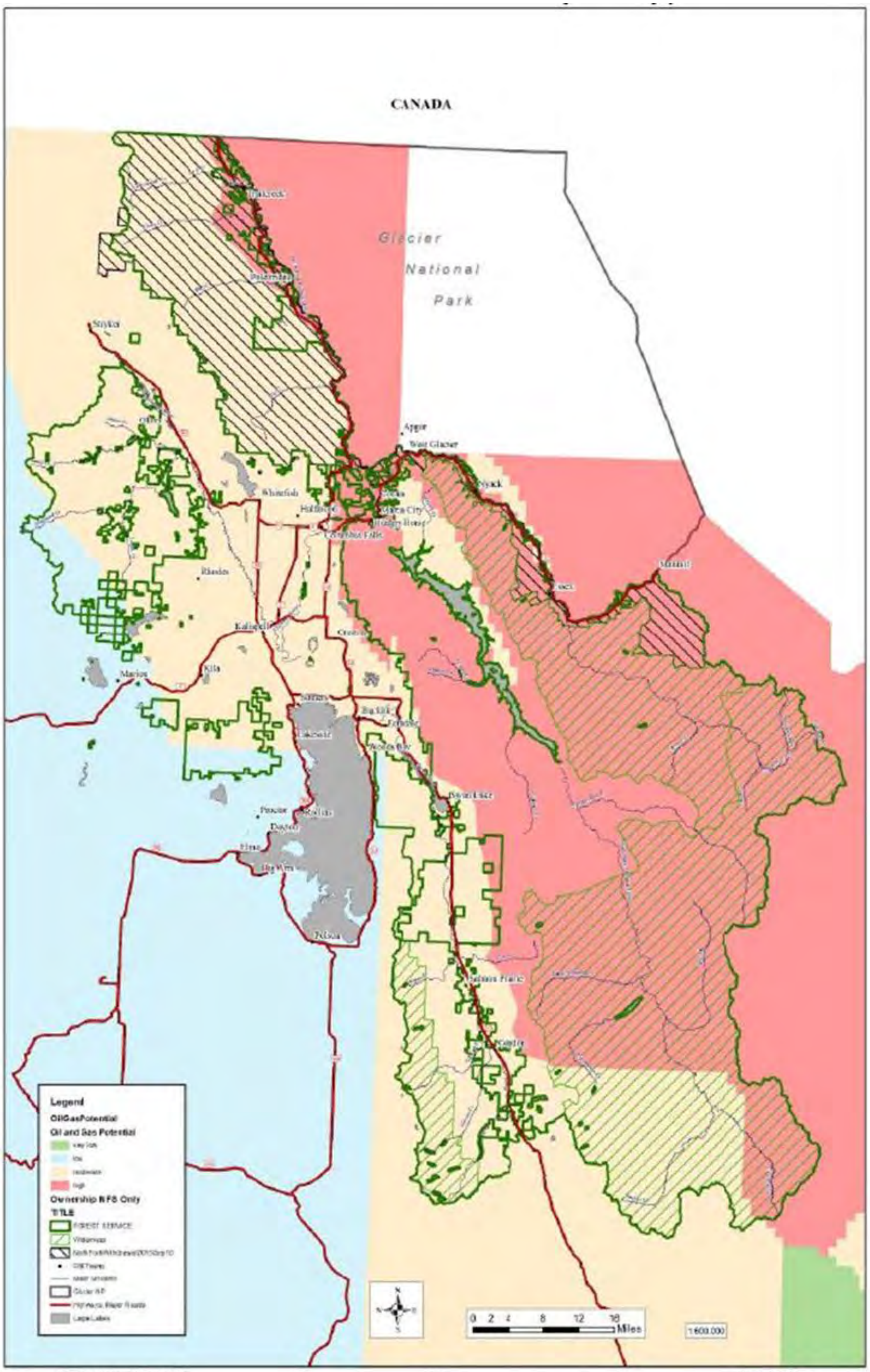


Figure 23. Oil and gas potential and withdrawal areas on the Flathead National Forest.

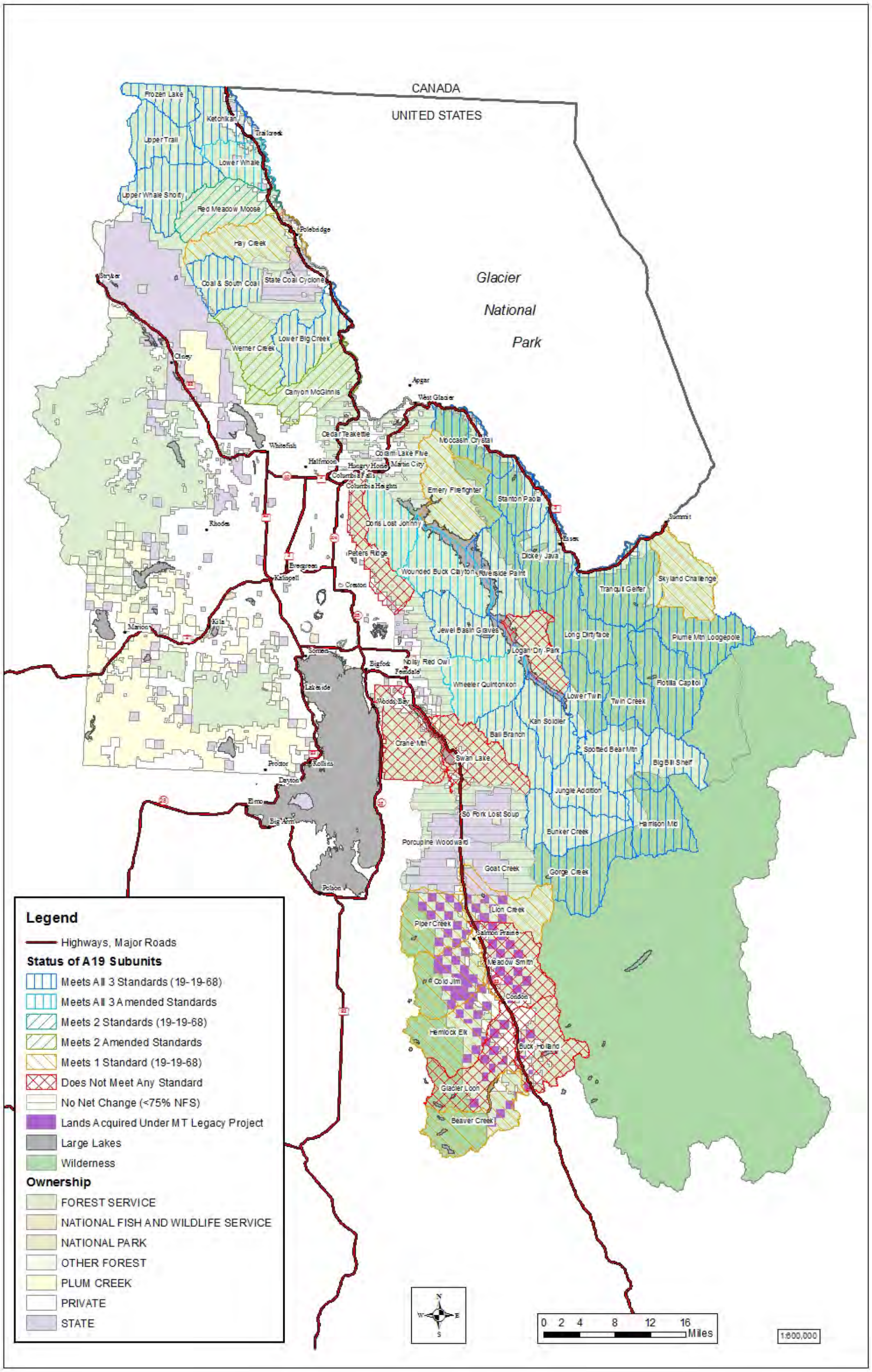


Figure 24. Status of grizzly bear subunits.

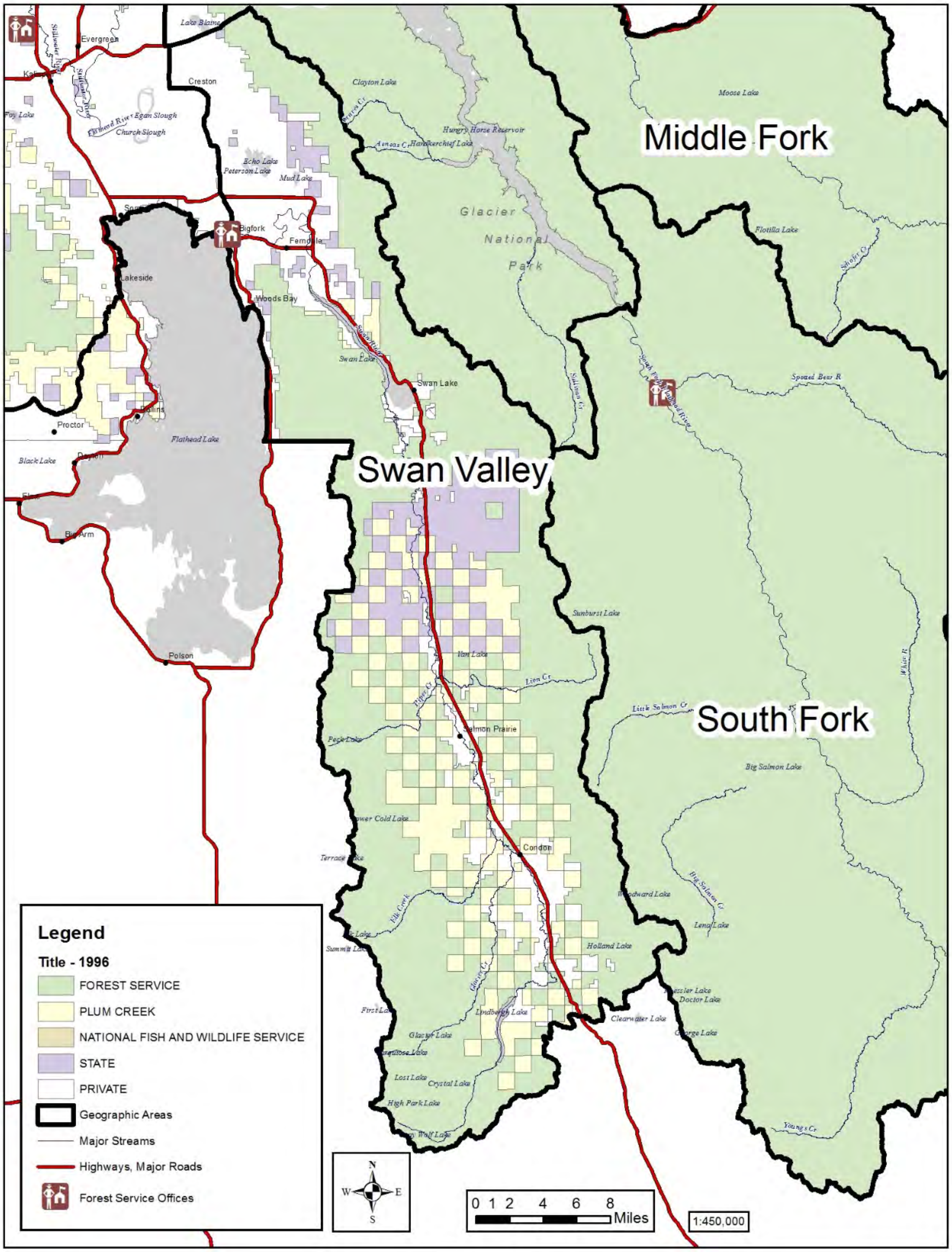


Figure 25. Swan Valley ownership prior to Legacy Land acquisition.

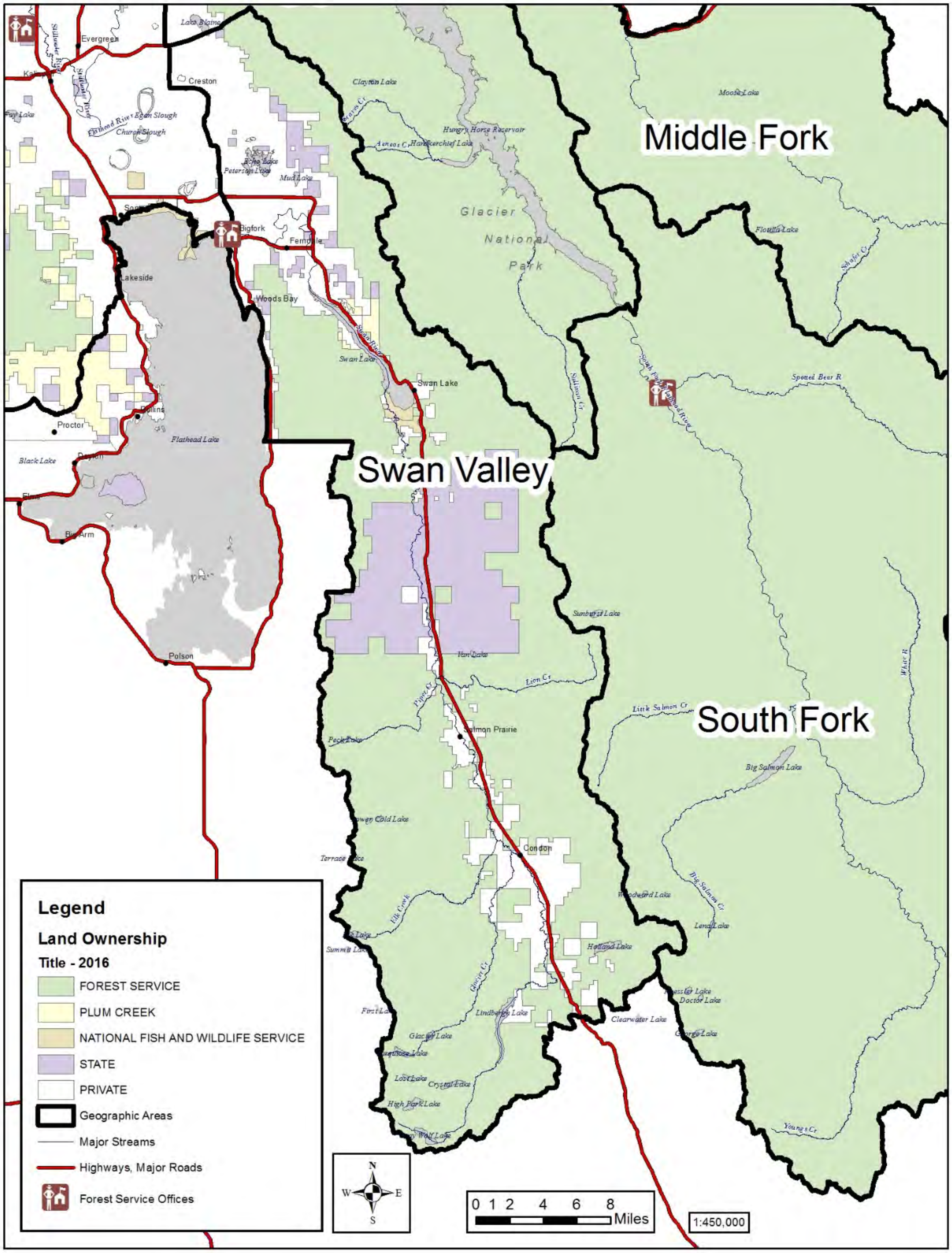


Figure 26. Swan Valley ownership following the Legacy Land acquisition and other acquisitions.

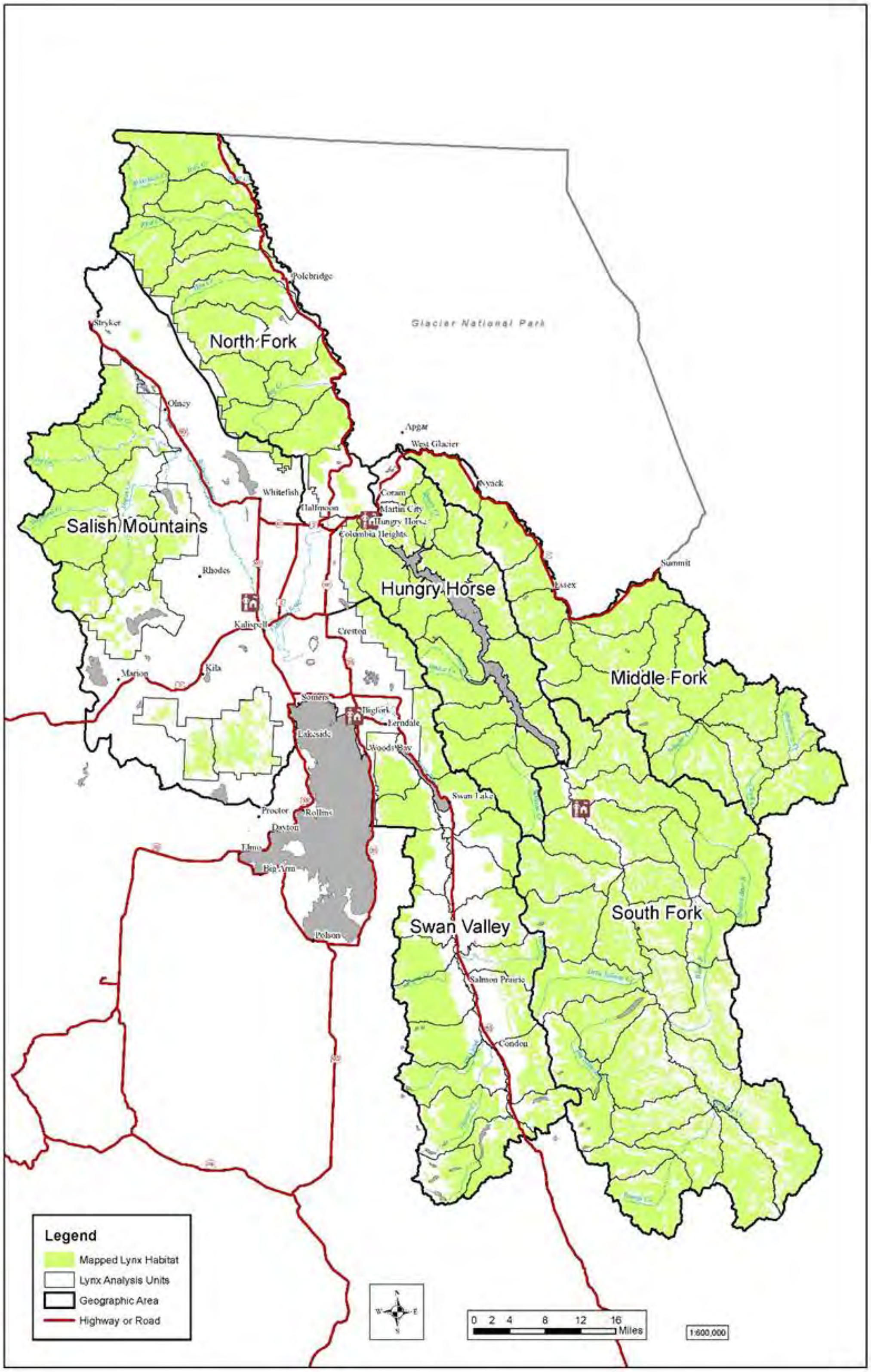


Figure 27. Lynx analysis units (LAUs) on the Flathead National Forest.

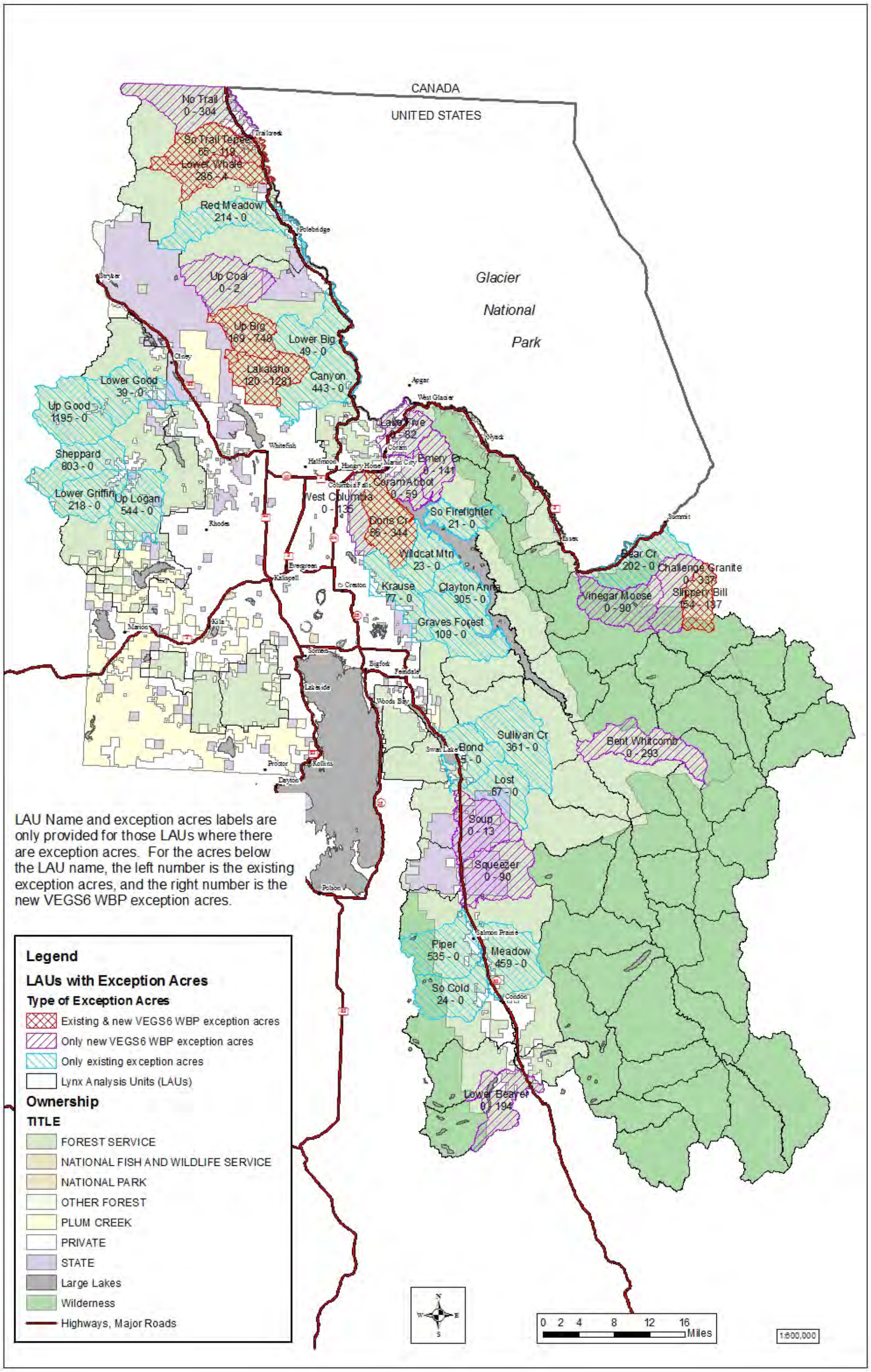
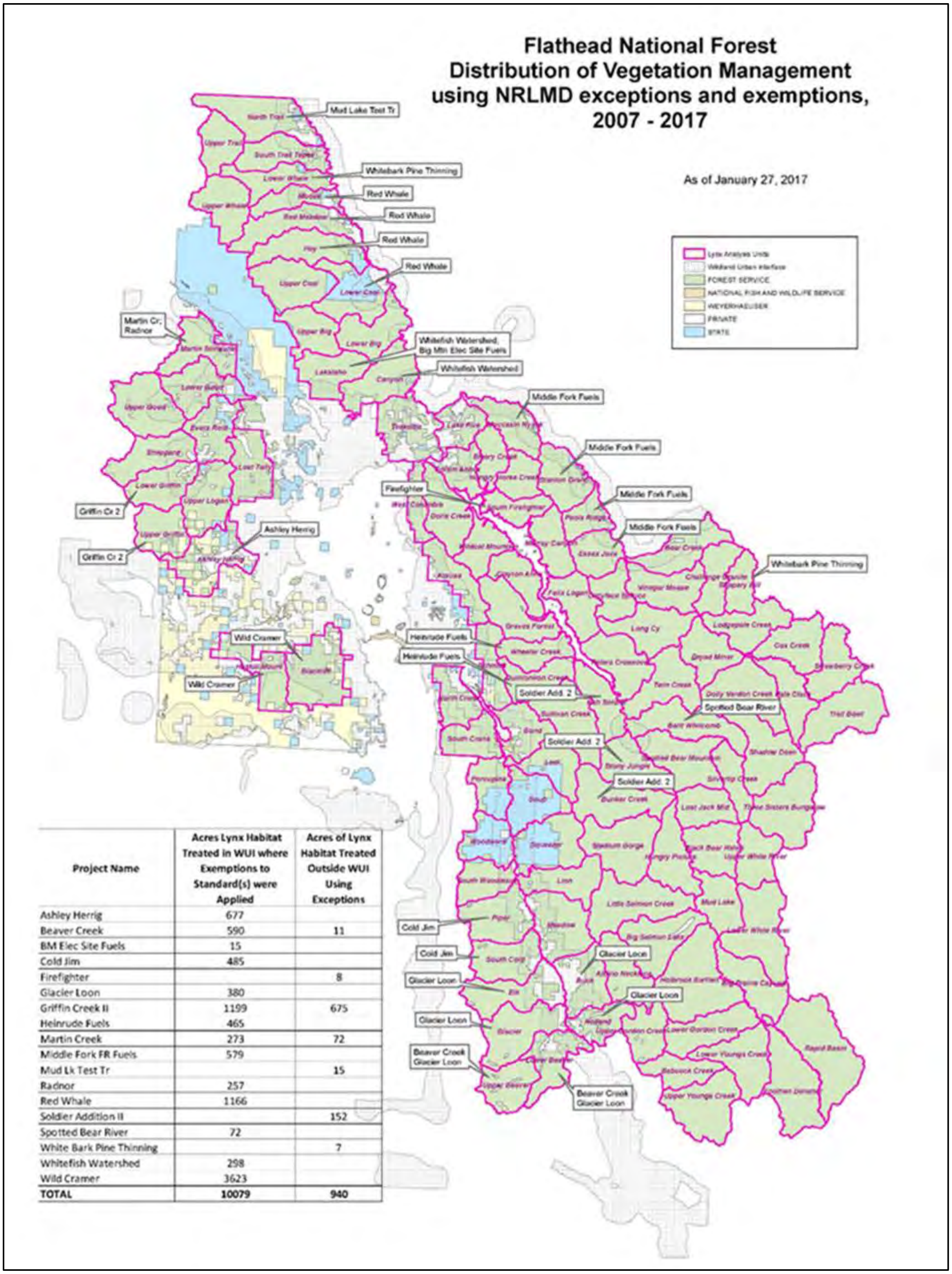


Figure 28. LAUs Lynx analysis units with exception acres to NRLMD standards.



Project Name	Acres Lynx Habitat Treated in WUI where Exemptions to Standard(s) were Applied	Acres of Lynx Habitat Treated Outside WUI Using Exceptions
Ashley Herrig	677	
Beaver Creek	590	11
BM Elec Site Fuels	15	
Cold Jim	485	
Firefighter		8
Glacier Loon	380	
Griffin Creek II	1199	675
Heinrude Fuels	465	
Martin Creek	273	72
Middle Fork FR Fuels	579	
Mud Lk Test Tr		15
Radnor	257	
Red Whale	1166	
Soldier Addition II		152
Spotted Bear River	72	
White Bark Pine Thinning		7
Whitefish Watershed	298	
Wild Cramer	3623	
TOTAL	10079	940

Figure 29. LAUs on the Flathead National Forest that have used NRLMD exceptions and exemptions from 2007 to 2017.

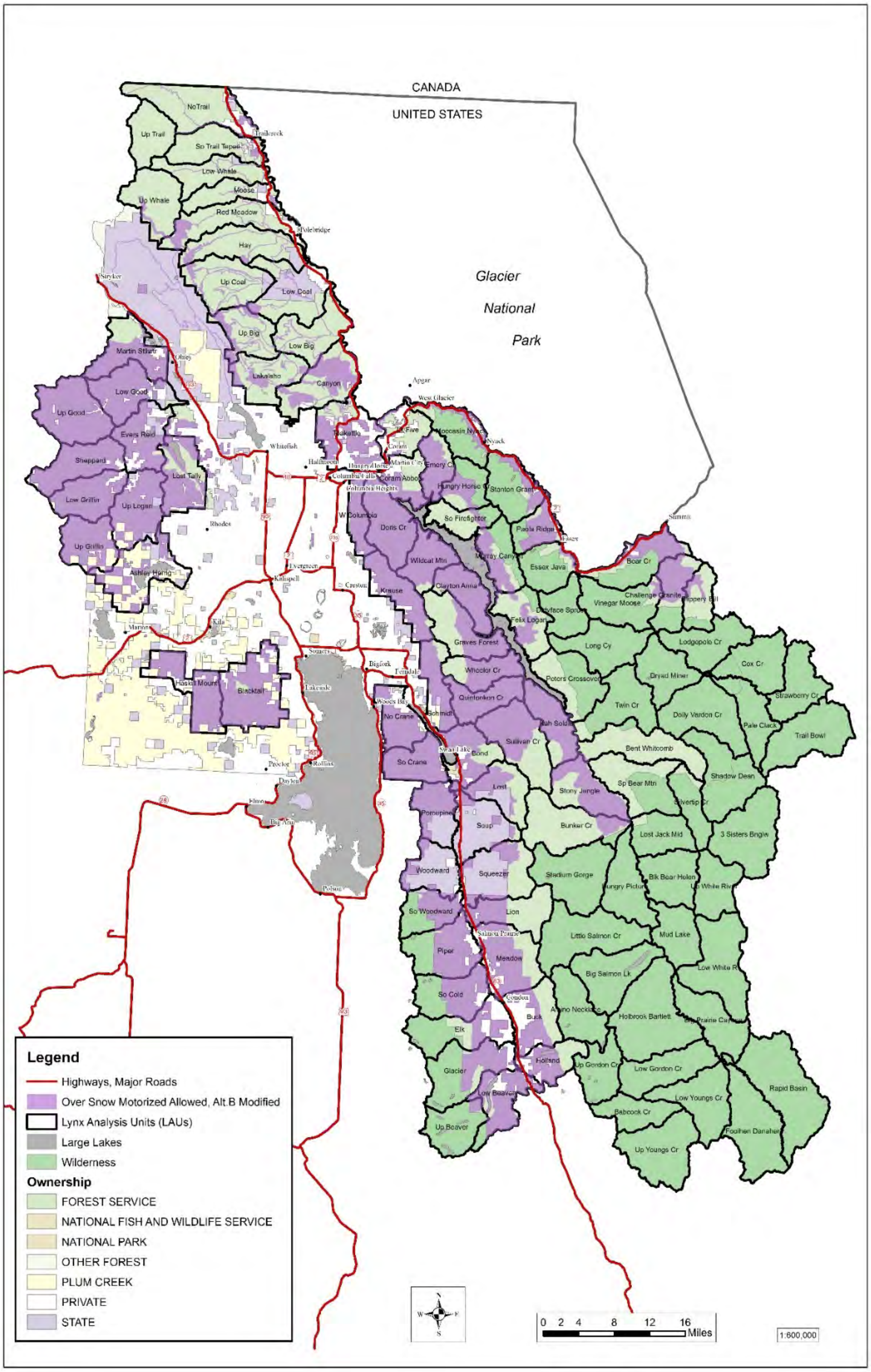


Figure 30. LAUs with over-snow motorized use under the Revised Forest Plan.

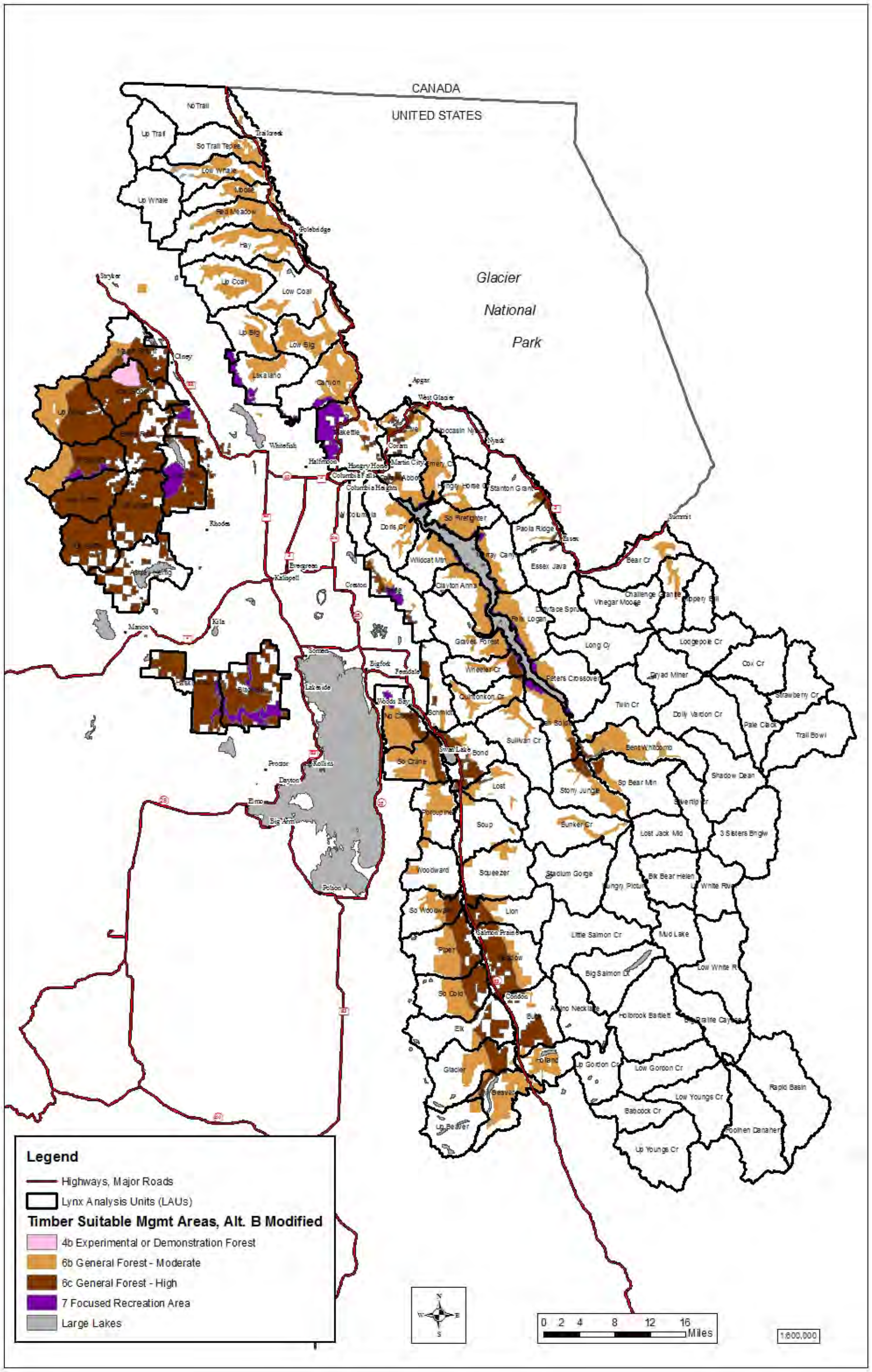


Figure 31. LAUs with timber suitable management areas under the Revised Forest Plan.

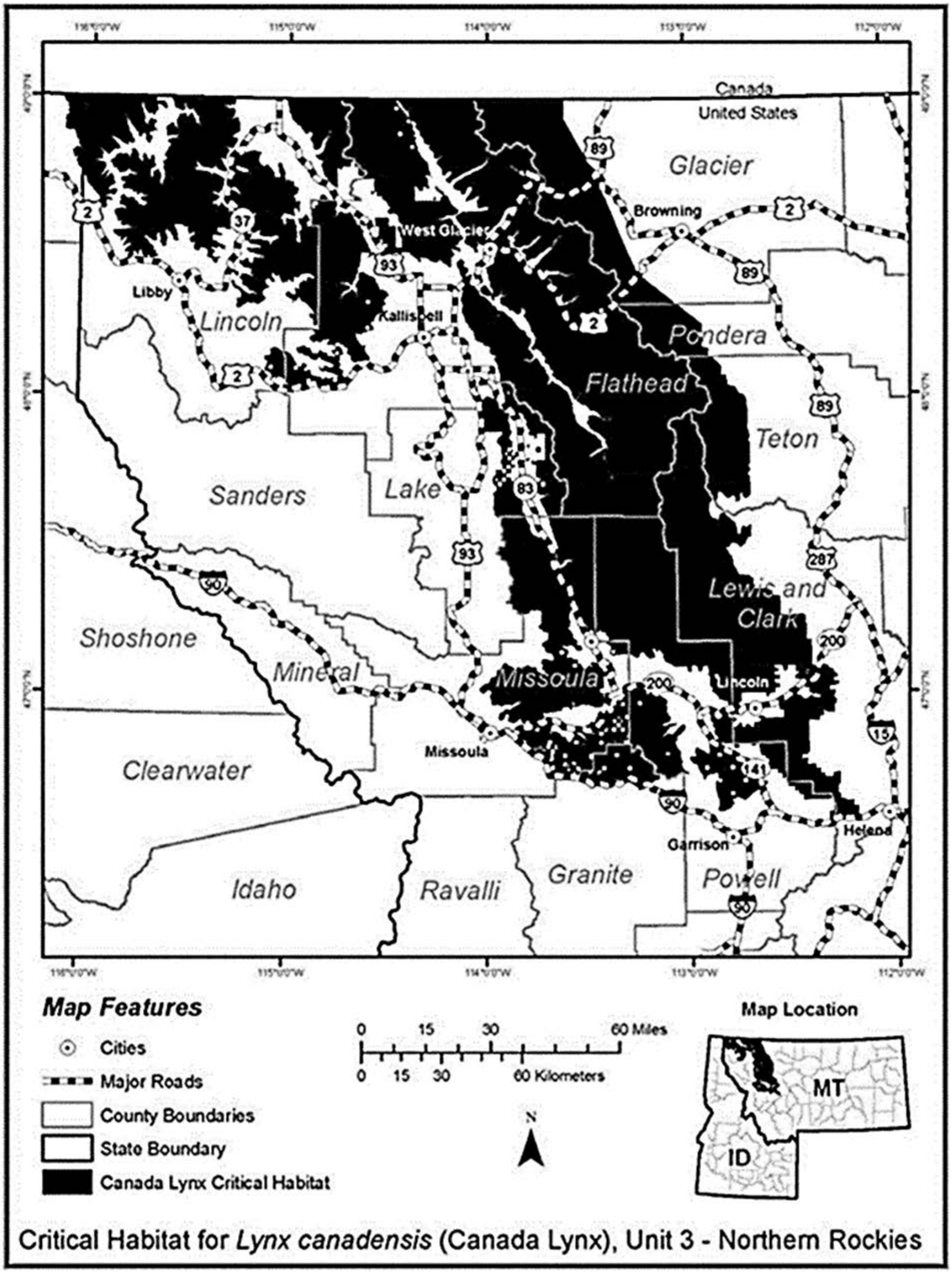


Figure 32. Canada lynx Critical Habitat Unit 3, as shown in the final rule (Federal Register Vol. 79, No. 177, Friday, September 12, 2014).

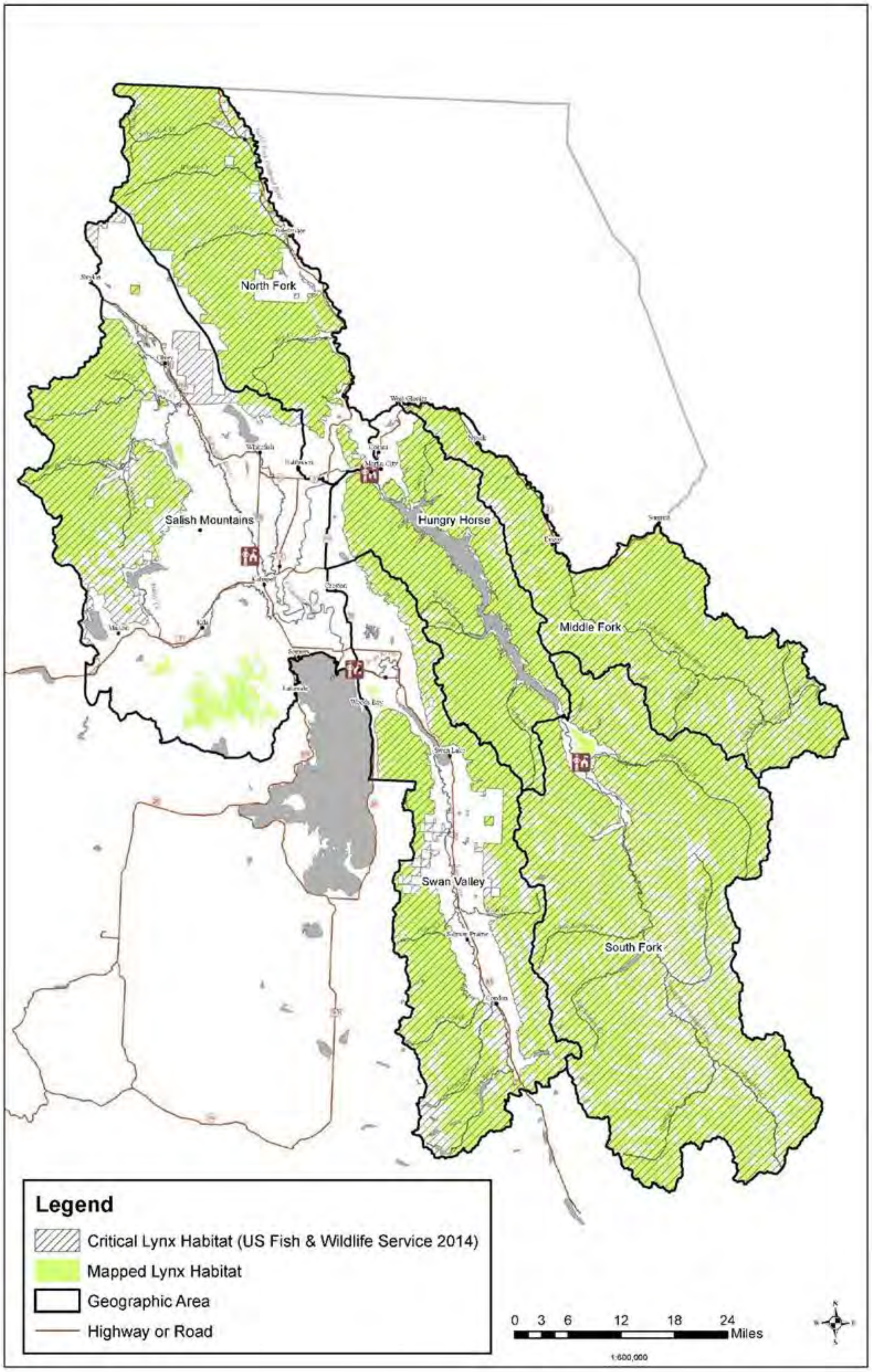


Figure 33. Canada lynx critical habitat and modeled potential lynx habitat on the Flathead National Forest.

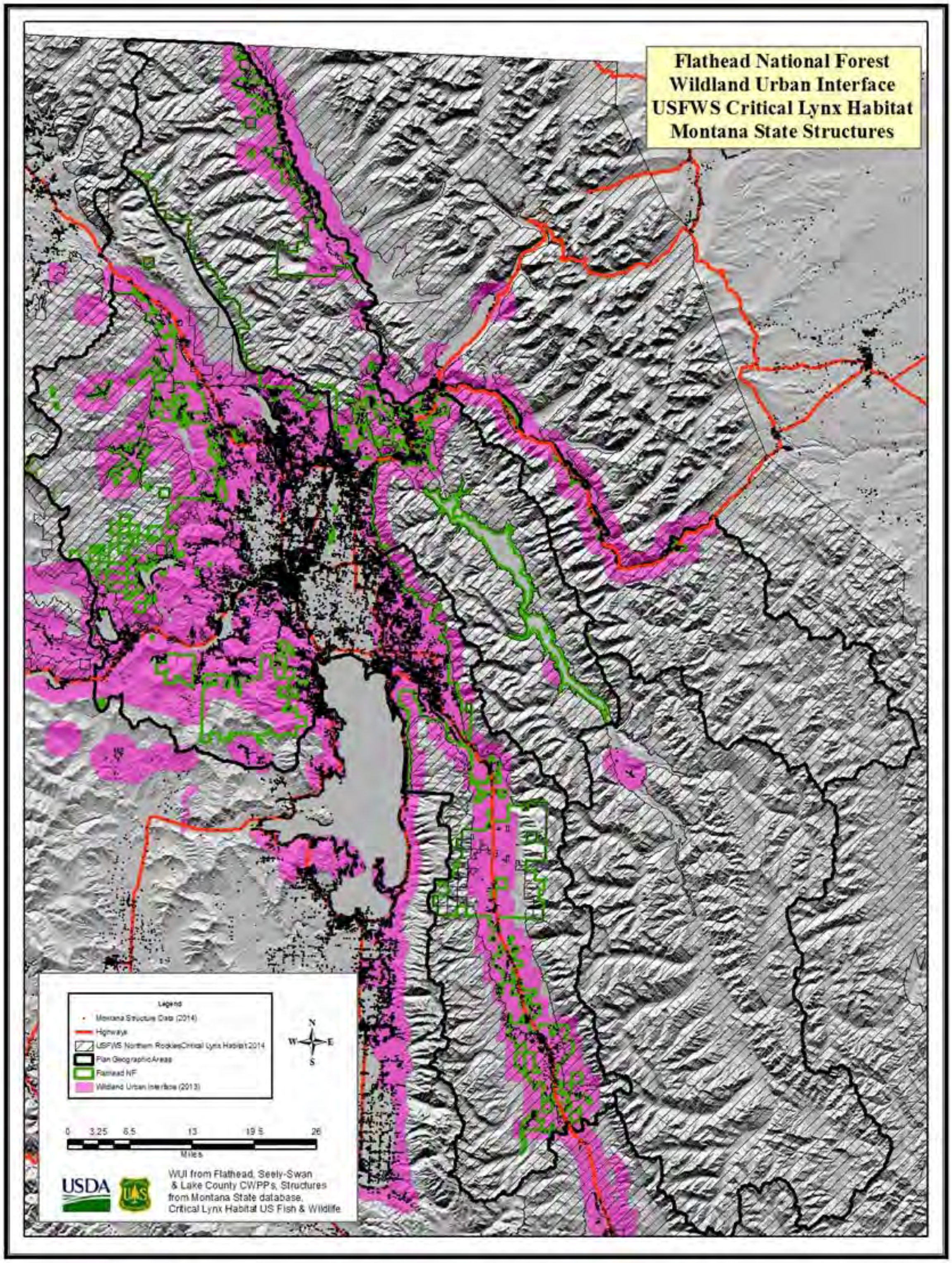


Figure 34. Canada Lynx critical habitat on the Flathead National Forest in relation to private lands and the wildland-urban interface (WUI).

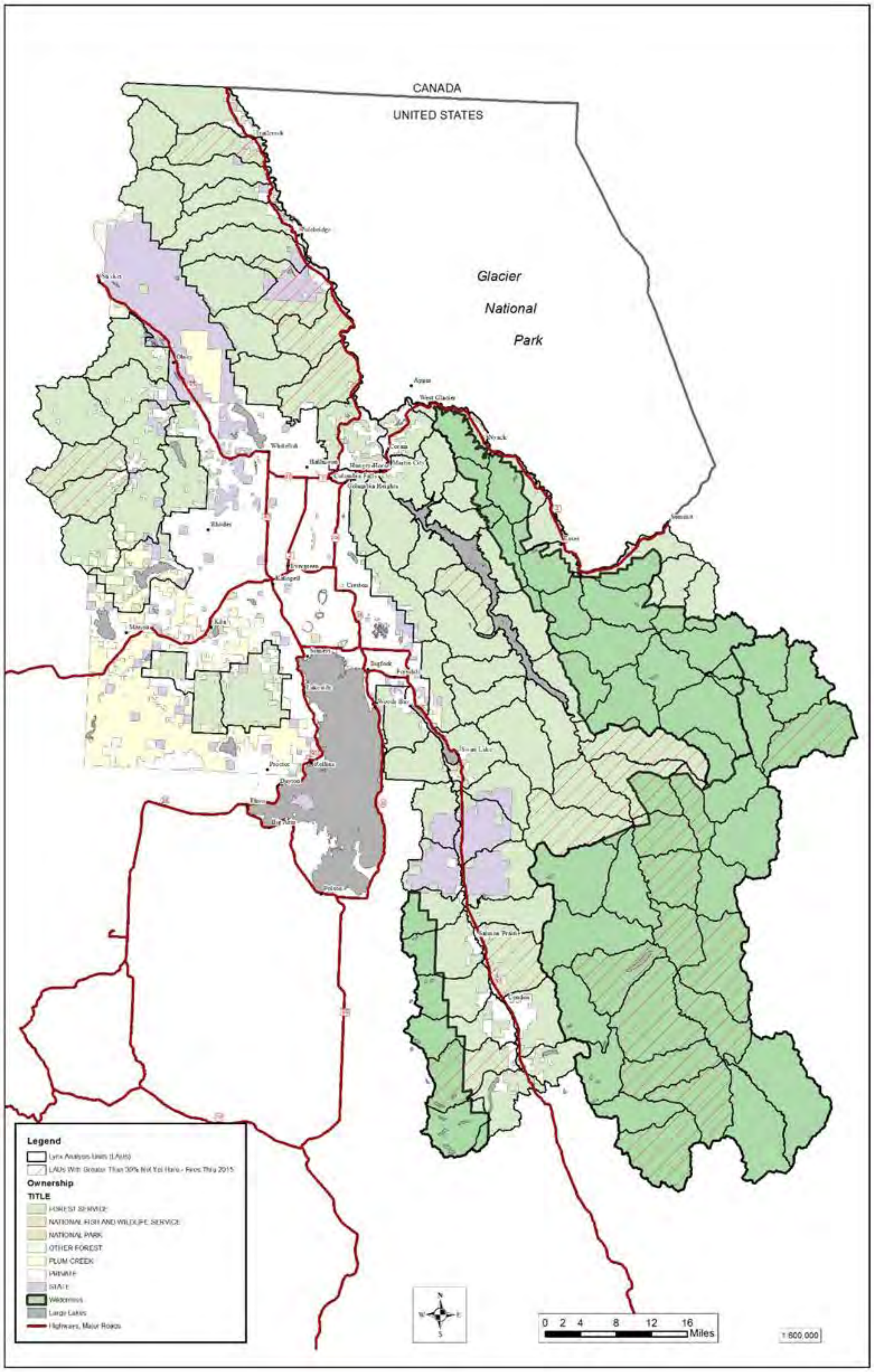


Figure 35. LAUs on the Flathead National Forest that have greater than 30% of lynx habitat that is not yet snowshoe hare habitat due to wildfires as of 2017.

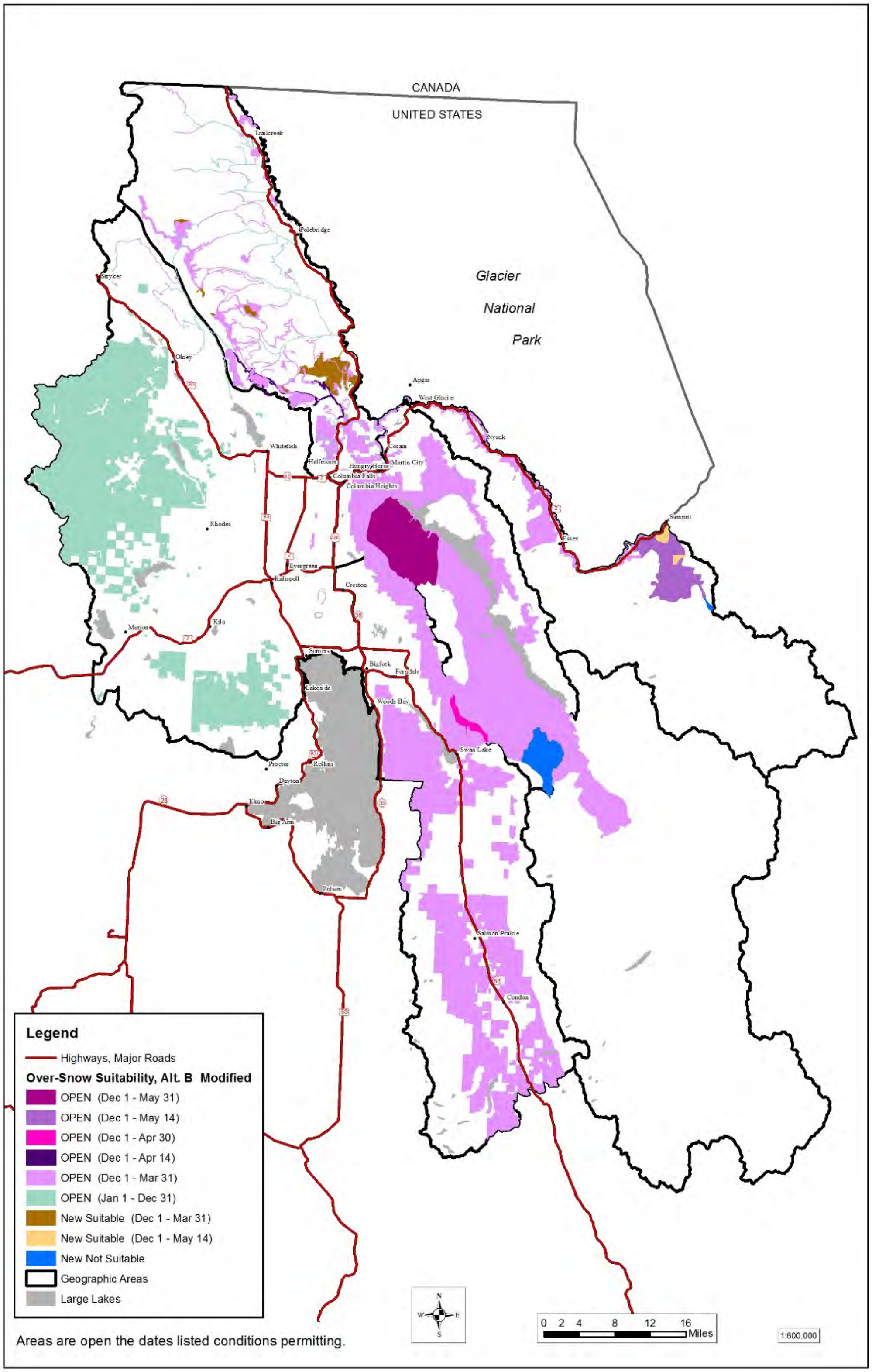


Figure 36. Over snow suitability for under the Revised Forest Plan.

Appendix 2: Flathead National Forest Revised Forest Plan Key Components: Bull Trout

The following presents component of the Flathead National Forest's Revised Forest Plan that pertain to bull trout. This appendix is organized by plan component (e.g., desired conditions, objectives, standards, etc.). The exact nomenclature of the plan component is either listed in the sub-heading, or an alphanumeric combination of the heading code and number following.

Example: FW-STD-WTR-02 would be forest-wide (FW) standard (STD) for watersheds (WTR) number two (02).

DESIRED CONDITIONS

A desired condition 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 do not include completion dates (36 CFR 219.7(e)(1)(i)).

Desired conditions describe the aspirations or visions of what the plan area (or portions thereof) should look like in the future and drive the development of the other plan components. Desired conditions essentially set forth the desired landscape of the future and the other plan components give guidance on how to get there. Desired conditions should be developed with the context of the plan area's distinctive roles and contributions within the broader landscape in mind (sec.22.32 of this Handbook). A plan's set of desired conditions must be internally consistent so they are feasible and attainable, and they must be written clearly so that they can be understood by the public as well as the Agency. The set of desired conditions must reflect the capability of the plan area and the fiscal capability of the Agency. The set of desired conditions for plan revision must cover ALL the requirements for a plan set out at 36 CFR 219.8 through 219.11—to provide for sustainable ecosystems with ecological integrity, in the context of multiple-use management. The set of desired conditions should integrate the ecological, economic, social, and cultural desired conditions. The format function of desired conditions is addressed in this section. Sections 23 through 24.44 of this Handbook set forth guidance for the resource requirements for plan components.

Desired conditions, as key plan components, are fundamental to determining monitoring strategies and requirements. Desired conditions should define the geographic scale, where applicable, used to measure change associated with them. Responsible Officials should include sufficiently detailed descriptions of desired conditions so they are useful to determine the purpose and need for many projects such as restoration projects and activities. Other plan content may identify, if applicable, how desired conditions may differ from existing conditions.

Implementation of the revised Plan is driven in large part by the Desired Conditions which were developed to move the affected forest resources toward environmental stability and diversity.

The intent of these desired conditions is to create a proactive commitment to the recovery of bull trout within the Flathead National Forest. These desired conditions make the commitment to implement the Bull Trout Recovery Plan. The forest determined making bull trout recovery a focus was the most effective way to benefit bull trout and minimize adverse effects due to ongoing management.

Desired Condition – Partnerships and Coordination (FW-DC-P&C)

16 The bull trout population trends towards recovery through cooperation and coordination with USFWS, tribes, State agencies, other Federal agencies, and interested groups. Recovery is supported through the Bull Trout Conservation Strategy and the Bull Trout Recovery Plan.

Desired conditions - Watersheds (FW-DC-WTR)

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 subbasin (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.

01 NFS lands provide the distribution, diversity, and complexity of watershed- and landscape-scale features, including natural disturbance regimes and the aquatic and riparian ecosystems, to which species, populations, and communities are uniquely adapted. Watersheds and associated aquatic ecosystems retain their inherent resilience and are able to respond and adjust to disturbances without long-term adverse changes to their 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, riparian-associated, and many upland species of plants and animals.

03 Habitat and ecological conditions support self-sustaining populations of native aquatic and riparian-associated plant and animal species.

04 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.

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

06 Water quality, including groundwater, meets or exceeds applicable state water quality standards, fully supports designated beneficial uses, and meets the ecological needs of native aquatic and riparian-associated plant and animal species. 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 (e.g., TMDLs) or are permanently above natural or background levels.

07 The sediment regime within waterbodies 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.

08 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, duration, and spatial distribution of peak, high, and low flows are retained. Streamflow regimes maintain riparian ecosystems and natural channel and floodplain dimensions. Stream channels transport sediment and woody material over time while maintaining reference dimensions (e.g., bankfull width, depth, entrenchment ratio, slope, and sinuosity).

09 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.

10 Groundwater-dependent ecosystems, including peatlands, bogs, fens, wetlands, seeps, springs, riparian areas, groundwater-fed streams and lakes, and groundwater aquifers, persist in size and seasonal and annual timing and exhibit water table elevations within the natural range of variation. Surface and groundwater flows are connected, provide late-season stream flows and cold water temperatures, and sustain the function of surface and subsurface aquatic ecosystems.

11 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. Non-forested areas in and surrounding wetlands are composed of plant and animal communities that support and contribute to wetland ecological and habitat diversity.

12 Habitats and native assemblages of aquatic and riparian-associated plants and animals are free of persistent non-native species such as zebra mussels, New Zealand mud snails, quagga mussels, Eurasian milfoil, and brown trout. Non-native species (e.g., non-native bullfrogs, Chytrid fungus, yellow flag iris, or reed canary grass) are not expanding into waterbodies.

13 Peatlands, including fens, have the necessary soil, hydrologic, water chemistry, and vegetative conditions to provide for continued fen development and resilience to changes in climate and other stressors. Peatlands support unique plant and animal species that are characteristic of historical conditions. Trees exist on drier hummocks within and on the edge of peatlands but do not retard development.

14 Beavers play an important ecological role benefiting groundwater, surface water, stream aquatic habitat complexity, and adaptation to changing climate conditions.

15 Watersheds provide high-quality water for downstream communities dependent upon them.

16 Educational and informational programs are provided to enhance understanding of wetlands, stream ecosystems, and watersheds.

17 The Forest cooperates with Federal, tribal, State, and local governments to identify and secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat.

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

01 The conservation watershed network has high-quality habitat and functionally intact ecosystems that are contributing to and enhancing the conservation and recovery of specific threatened or endangered fish species or aquatic species of conservation concern[1] and providing high water quality and quantity. The watersheds contribute to the conservation and recovery of native fish and other aquatic species and help make habitat conditions more resilient to climate change.

Desired Conditions – Riparian Management Zone (FW-DC-RMZ)

01 Riparian management zones reflect a natural composition of native flora and fauna and a distribution of physical, chemical, and biological conditions appropriate to natural disturbance regimes and processes affecting the area. In addition to natural processes, vegetation management activities contribute to vegetation conditions that are resilient. The species composition and structural diversity of native plant communities in riparian management zones, including wetlands, provide summer and winter thermal regulation, nutrient filtering and appropriate rates of surface erosion, bank erosion, and channel migration.

02 Riparian management zones provide key conditions, including slope stability and associated vegetative root strength, wood delivery to streams and streambanks, input of leaf and organic matter to aquatic and terrestrial systems, solar shading, microclimate, and water quality, operating consistently with local disturbance regimes.

03 Riparian management zones in forested settings have more diverse vegetation structure relative to areas outside the riparian management zone. This includes a higher density of large downed wood, snags, and decadent live trees and higher amounts of litter and duff to support terrestrial riparian-associated plants and animals that feed, nest, den, or roost near water. Downed wood greater than 9 inches in diameter is available, consisting of intact pieces of a variety of species, sizes, and stages of decay, including cull tree tops and cull logs.

04 Riparian management zones have more diverse vegetation composition relative to areas outside the riparian management zone. This includes riparian-associated grasses, forbs, shrubs (e.g., willows); deciduous trees (e.g., cottonwoods, birch, aspen), and conifer trees to support terrestrial animals that feed, nest, den, or roost near water.

05 A mosaic vegetation pattern, including forest patches of different shapes, successional stages, and tree densities, occurs within riparian management zones. Early successional forest openings are typically irregularly shaped, with variable tree densities or patches of larger trees along their boundaries that reduce the risk of windthrow and reduce edge effects for wildlife.

06 Cover conditions in riparian management zones contribute to habitat connectivity for a variety of wildlife species (e.g., Canada lynx, grizzly bear, marten, fisher).

Desired conditions (FW-DC-SOIL)

01 Soil function and long-term productivity is conserved.

[1] Species of conservation concern are identified by the Regional Forester; more information is available at http://bit.ly/NorthernRegion-SCC.

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 an unconstrained budgets, objectives under the proposed action are based upon current

Objectives - Watersheds (FW-OBJ-WTR)

01 Complete all essential work identified within the Class 2 priority watersheds as identified under the watershed condition framework (see appendix E).

02 Enhance or restore 25 to 50 miles of stream habitat to maintain or restore structure, composition, and function of habitat for fisheries and aquatic species other than fish. Activities include, but are not limited to, berm removal, large woody debris placement, road decommissioning or stormproofing, riparian planting, and channel reconstruction.

03 Reconnect 10 to 20 miles of habitat in streams disconnected by roads or culverts where aquatic and riparian-associated species' migratory needs are limiting distribution of those species.

04 Improve watershed conditions on 4,000 to 8,000 acres, with an emphasis on priority watersheds under the watershed condition framework and the conservation watershed network.

Objectives – Conservation Watershed Networks (FW-OBJ-CWN)

01 The conservation watershed network is the highest priority for restoration actions for native fish and other aquatic species. The stormproofing of 15 to 30 percent of the roads in the conservation watershed network is prioritized, as funding allows, to benefit aquatic species (e.g., bull trout). See appendix C for specific strategies for treatment options and for prioritization, such as of roads paralleling streams vs. ridgetop roads.

02 Over the life of the plan, stormproofing the transportation system (e.g., upsizing culverts, reducing sediment on roads, realigning stream-constraining road segments, etc.) will be accomplished as opportunities are identified on the following prioritized subwatersheds: Sullivan Creek, Wounded Buck Creek, Trail Creek in the North Fork, Whale Creek (includes Upper Whale, Lower Whale, and Shorty Creeks), Granite Creek, Bear Creek, Goat Creek, and Lion Creek.

Objectives – Riparian Management Zone (FW-OBJ-RMZ)

01 Improve 300 to 1,000 acres of riparian habitat.

Objectives - Infrastructure (FW-OBJ-IFS)

01 Decommission or place into intermittent stored service 30 to 60 miles of roads.[2] Priorities are roads causing resource damage in priority watersheds and/or roads located within desired nonmotorized recreation opportunity spectrum settings and/or roads within bull trout watersheds.

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.

Standards – Watersheds (FW-STD-WTR)

01 New stream diversions and associated ditches shall have screens placed on them to prevent capture of fish and other aquatic organisms.

02 Project-specific best management practices (including both Federal and State of Montana practices) shall be incorporated into project plans as a principle mechanism for controlling non-point pollution sources in order 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.

Standards – Riparian Management Zone (FW-STD-RMZ)

01 The entire width of the riparian management zones shall be delineated as follows.

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[2] USDA. (2014). Travel analysis report for Flathead National Forest. Kalispell, MT: USDA Forest Service, Flathead National Forest. Planning record exhibit # 00413.

Category 1 Fish-bearing streams: Riparian management zones consist of the stream and the area on both sides of the stream extending from the edges of the active channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to a distance equal to the height of two site-potential trees,[3] or 300 feet slope distance (600 feet total, which includes both sides of the stream channel), whichever is greatest.

Category 2 Permanently flowing non-fish-bearing streams: Riparian management zones consist of the stream and the area on both sides of the stream extending from the edges of the active channel to the top of the inner gorge, or to the outer edges of the riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, which includes both sides of the stream channel), whichever is greatest.

Category 3 Seasonally flowing or intermittent streams and lands identified as potentially unstable or landslide prone: This category includes features with high variability in size and site-specific characteristics. At a minimum, the riparian management zone must include (1) the intermittent stream channel and the area to the top of the inner gorge; (2) the intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation; (3) the area from the edges of the stream channel, wetland, or landslide-prone terrain to a distance equal to the height of one site-potential tree or 100 feet slope distance (200 feet total, which includes both sides of the stream channel), whichever is greatest; or (4) the extent of unstable and potentially unstable areas (including earthflows).

Category 4a Ponds, lakes, reservoirs, and wetlands greater than 0.5 acre and all sizes of howellia ponds and fens/peatlands: Riparian management zones consist of the body of water or wetland and the area to the outer edges of the riparian vegetation; or to the extent of the seasonally saturated soil; or to the distance of the height of one site-potential tree; or 300 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond, or lake—whichever is greatest. For management direction related to water howellia, refer to the following plan components: FW-DC-PLANT-01 and 02, FW-GDL-PLANT-01, 02, and 03, FW-DC-NNIP-01, MA3b-Special Area-DC-04, and GA-SV-DC-01 and 02.

Category 4b Ponds, lakes, reservoirs, and wetlands less than 0.5 acre (except howellia ponds and fens/peatlands; see category 4a): Riparian management zones consist of the body of water or wetland and the area to the outer edges of the riparian vegetation; or to the extent of the seasonally saturated soil; or to the distance of the height of one site-potential tree; or 100 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond, or lake—whichever is greatest.

The riparian management zone is divided into two areas called the inner and outer riparian management zones. Management direction may differ in these two zones. If an already established road is located within the riparian management zone, a site-specific determination shall be made as to the width of the inner riparian management zone. The width defined in the descriptions below can be made larger to protect sensitive resources.

The *inner* riparian management zones are defined as follows:

- For category 1 and 2 streams, the width of the inner riparian management zone shall be a minimum of 150 feet on each side of the stream.

[3] The height of a site-potential tree is the expected average maximum height a tree in the dominant crown class (upper forest canopy layer) would achieve, given the site productivity.

- ♦ For category 3 streams where side slopes are greater than 35 percent, the width of the inner riparian management zone shall be a minimum of 100 feet on each side of the stream or to the top of the inner gorge slope break, whichever is greater.
- ♦ For category 3 streams where side slopes are less than 35 percent, the inner riparian management zone shall be a minimum of 50 feet on each side of the stream.
- ♦ For category 4a and 4b ponds, lakes, reservoirs, and wetlands, the width of the inner riparian management zone shall be a minimum of 50 feet except for peatlands, fens, and bogs, where the minimum width is 300 feet.

The following standards apply to the entire riparian management zones for all categories:

02 Vegetation management activities within riparian management zones must be consistent with State law (e.g., Montana Streamside Management Zone Law).

03 Storage and refueling sites within riparian management zones must be approved by a Forest aquatics specialist or resource advisor and have an approved spill containment plan.

04 Herbicides, pesticides, and other chemicals shall not be applied within riparian management zones. Exceptions may be made if chemical use is necessary to maintain, protect, or enhance aquatic and riparian resources or to restore native plant or animal communities.

The following standard applies to the entire riparian management zone for peatlands, fens, and bogs within category 4a:

05 Ground-disturbing vegetation treatments in the riparian management zones for peatlands, fens, and bogs shall only occur in order to restore or enhance aquatic and riparian-associated resources.

The following standard applies to the inner riparian management zone for all categories except peatlands, fens, and bogs within category 4a:

06 Vegetation management shall only occur in the *inner* riparian management zone in order to restore or enhance aquatic and riparian-associated resources. Exceptions may occur as long as aquatic and riparian-associated resources are maintained. Exceptions shall be limited to (1) non-mechanical treatments such as prescribed fire, sapling thinning, or hand fuel reduction treatments; (2) mechanical fuel reduction treatments in the wildland-urban interface within 300 feet of private property boundaries; or (3) treatments that address human safety hazards (e.g., hazard trees) adjacent to infrastructure or within administrative or developed recreation sites.

Standards – Soil (FW-STD-SOIL)

01 Vegetation management activities do not create detrimental soil conditions on more than 15 percent of an activity area. In activity areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current condition and proposed activity must not exceed 15 percent following project implementation and restoration. In areas where more than 15 percent detrimental soil conditions exist from prior activities, the effects from project implementation and restoration must address currently impaired soil functions to improve the long-term soil condition.

02 Project-specific best management practices and design features shall be incorporated into land management activities as a principle mechanism for protecting soil resources.

03 Soil function shall be restored on temporary roads (and decommissioned road prisms used as temporary roads) when management activities that use these roads are completed. Restoration treatments shall be based on site characteristics and methods that have been demonstrated to measurably improve soil productivity.

04 When decommissioning existing roads, soil function shall be restored. Restoration treatments shall be based on site characteristics and methods that have been demonstrated to measurably improve soil productivity.

Standards - Infrastructure (FW-STD-IFS)

05 During dust abatement applications on roads, chemicals shall not be applied directly to watercourses, waterbodies (e.g., ponds, lakes), or wetlands.

06 For new road construction and reconstruction of existing road segments within or adjacent to riparian management zones, side-casting of fill material shall not occur.

07 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.

Standards – Grazing (FW-STD-GR)

08 New livestock handling and/or management facilities must be located outside of riparian management zones. New areas for livestock trailing, bedding, watering, salting, loading, and other handling or management efforts shall be limited to those areas and times that would not adversely affect listed animal and plant species or animal and plant species of conservation concern.

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)).

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.

Guidelines – Watershed (FW-GDL-WTR)

01 In order to restore watersheds, sediment-producing activities in watersheds with approved TMDLs should be designed to comply with the Montana Department of Environmental Quality's TMDL implementation plan.

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 or human safety, such as mid-channel bridge piers, or poses long-term risks to bull trout passage.

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

04 When beaver dams are threatening infrastructure or impairing bull trout spawning, preferred techniques that sustain beavers (e.g., using pipes to reduce water levels, notching dams to restore fish passage) should be used.

05 To protect spawning fish, eggs, and embryos, in-stream management activities that may disturb native salmonids or that have the potential to directly deliver sediment to their habitats should be limited to times outside of spawning and incubation seasons for those species, as displayed in table 1.

Table 1. Operational restrictions to protect spawning fish and fry emergence while operating within the high water mark

Species	Location	Inoperable activity period
Westslope cutthroat trout	Known spawning streams	May 1 through July 15
Bull trout	Known spawning streams	September 1 through March 15

06 Information on preventive measures related to aquatic invasive species should be provided at water-based recreation sites such as boat ramps to help prevent the introduction of non-native species.

07 To prevent the introduction of non-native species, equipment that comes in contact with a waterbody should be inspected and cleaned of aquatic invasive species prior to use in a waterbody or when moving between watersheds, including drafting equipment, water tenders, and helicopter buckets.

08 When aquatic invasive species (e.g., zebra mussels, quagga mussels, Eurasian milfoil, reed canary grass) are detected, they should be controlled in cooperation with appropriate agencies.

09 New management activities shall be consistent with applicable state source water protection requirements and goals. Short-term effects[4] from activities may be acceptable when those activities support long-term benefits[5] to aquatic resources.

Guideline – Conservation Watershed Networks (FW-GDL-CWN)

01 To reduce sedimentation, for subwatersheds included in the conservation watershed network, net increases in stream crossings and road lengths should be avoided in riparian management zones unless the net increase improves ecological function in aquatic ecosystems. The net increase is measured from the beginning to the end of each project.

Guidelines – Riparian Management Zone (FW-GDL-RMZ)

The following guidelines apply to entire riparian management zones for all categories:

01 Downed trees (e.g., windthrow) should be left on-site inside of riparian management zones to meet large wood desired conditions, where it is safe and practical to do so.

[4] Effects that occur during, or immediately following, implementation of activity.

[5] Benefits that occur following completion of the activity.

02 Aerial application of chemical retardant, foam, or other fire chemicals and petroleum should not occur in mapped aerial retardant avoidance areas (see glossary) in order to protect terrestrial and aquatic resources associated with riparian management zones.

03 Temporary fire facilities (e.g., incident bases, camps, staging areas, helispots, and retardant batch plants) for incident activities should not be located in riparian management zones in order to protect terrestrial and aquatic resources associated with riparian management zones.

04 To protect the integrity of aquatic and riparian ecosystems, refueling, equipment maintenance, and storage of fuels or other toxicants should not occur in riparian management zones.

05 When conducting wildland fire operations within riparian management zones, minimum impact suppression tactics should be used to protect terrestrial and aquatic resources associated with riparian management zones.

06 Sand and gravel mining and extraction at new sites should not occur within riparian management zones to protect terrestrial and aquatic resources associated with riparian management zones. Exceptions may occur for trail work.

07 At developed recreation sites and administrative sites, trees within the riparian management zone that are determined to be a hazard should be felled to provide for public safety, in consultation with a Forest aquatics specialist. If felled, downed trees should be left on-site as needed to meet large wood desired conditions, where it is safe and practical to do so.

08 If tree harvest activities occur within riparian management zones, live reserve trees should be retained (if present) to protect water quality and contribute to forest live tree structural diversity (and future dead standing and downed wood) for aquatic- and riparian-dependent species (e.g., the clearcut harvest method should not be used). Because site and forest conditions vary considerably, the sizes, species, density, and pattern of reserve trees would be determined at the project level.

09 If new openings are created in riparian management zones through even-aged regeneration harvest (see glossary) or fuel reduction activities, each created opening's distance to cover (see glossary) should not exceed 350 feet to provide wildlife habitat structural diversity, connectivity, and cover.

10 If harvest activities occur within riparian management zones, all snags greater than or equal to 12 inches d.b.h. should be retained within the harvest area to contribute towards more diverse forest structure and desired habitat conditions by providing higher snag and downed wood densities (once the snags fall) as compared to areas outside riparian management zones. Exceptions to this guideline and development of an alternative snag prescription may be considered where there are issues of human health and safety (i.e., developed recreation sites, sites adjacent to landings) or where a decreased amount of wildland fuels is desired to protect communities and community assets (i.e., within the wildland-urban interface). Due to the high density and variability in snags and landscape conditions created by wildfire, exceptions and alternative prescriptions may also be considered in areas burned by stand-replacing fire based on a site-specific analysis.

11 To reduce the risk of sediment input and to protect the integrity of aquatic and riparian ecosystems, new roads (including temporary roads) and new landings should not be constructed in category 1, 2 or 3 riparian management zones, except where it is necessary for a road to cross a stream. Exceptions may be considered where site-specific analysis and implementation of mitigation measures are determined appropriate by a Forest aquatics specialist to protect aquatic and riparian resources.

The following guidelines apply to the entire riparian management zone for category 1, 2, and 3 streams and for fens/peatlands:

12 Vegetation management activities should be designed to include one or more of the following measures to avoid ground disturbance that may deliver sediment and reduce the risk of alteration of hydrologic processes:

- no ground-based logging equipment except during suitable winter logging periods;
- full suspension yarding;
- falling and yarding methods that promote retention of understory vegetation and other groundcover

13 If prescribed fire activities occur, ignition should take place outside the riparian management zone and fire should be allowed to naturally spread into the riparian management zones. The intent is to allow fire to enter and cross the zone at predominantly low to moderate intensity and create vegetation conditions consistent with natural fire regimes.

The following guidelines apply only to the inner riparian management zone for categories 4a and 4b (except fens/peatlands):

14 To reduce the risk of sediment input and to protect the integrity of aquatic and riparian ecosystems, new landings and new roads (including temporary roads) should not be constructed. Exceptions for temporary roads and landings may be considered only where site-specific analysis and implementation of mitigation measures are determined to be appropriate by a Forest aquatics specialist to protect aquatic and riparian resources.

15 If vegetation treatments occur in the inner riparian management zones, they should be designed to include one or more of the following measures to avoid ground disturbance that may deliver sediment to wetlands and to reduce the risk of alteration of hydrologic processes:

- no ground-based logging equipment unless occurring during suitable winter logging periods;
- full suspension yarding;
- falling and yarding methods that promote retention of understory vegetation and other groundcover

Guidelines (FW-GDL-SOIL)

01 Ground-based equipment for vegetation management should only operate on slopes less than 40 percent to protect soil quality. Exceptions will be considered only with site-specific analysis where soil, slope, and equipment are determined appropriate to maintain soil functions.

02 To maintain soil quality and stability, ground-disturbing management activities should not occur on landslide-prone areas.

03 Project activities should provide sufficient effective ground cover with a post-implementation target of 85 percent to provide nutrients and reduce soil erosion.

04 To maintain organic matter for soil function, vegetation management activities should conserve coarse woody debris at levels described in FW-DC-TE&V-17 and FW-GDL-TE&V-08 in the Vegetation and Terrestrial Ecosystems section. Management activities should either retain forest floor at half the current thickness or no less than 1 centimeter thick on average across activity areas.

Guidelines (FW-GDL-IFS)

03 Roads, skid trails, temporary roads, and trails should have water drainage systems that possess minimal hydrological connectivity to waterbodies (except at designated stream crossings) to maintain the hydrologic integrity of watersheds and protect them from the delivery of water, sediment, and pollutants.

04 To reduce the risk to aquatic resources when decommissioning roads, making roads impassable, or storing roads, roads should be left in a hydrologically stable condition. For example, drainage off roads should be routed away from resources and landslide prone areas and towards stable areas of the forest floor to provide filtering and infiltration.

05 Prior to placing physical barriers such as berms on travel routes (e.g., roads, skid trails, temporary roads, or trails), the Forest should ensure that road drainage features are in place to protect aquatic and other resources.

06 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[6] should not be located on lands with high mass wasting potential.

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

08 When constructing or reconstructing trail and road fords, measures to harden the streambed, banks, and approaches for new trail and road fords should be included in the project design in order to maintain channel stability and reduce sediment delivery to watercourses.

09 To protect water quality, maintenance activities such as road blading and snowplowing on existing roads, should not side-cast into or adjacent to waterbodies. When plowing snow, breaks should be designed in the snow berms to direct water off the road.

10 When constructing or reconstructing roads, drainage should be routed away from potentially unstable channels, fills, and hillslopes to reduce sediment delivery into streams.

11 To provide safe and functioning airstrips, management and maintenance of airstrips should follow Federal Aviation Administration recommendations.

12 Within areas specifically identified as being important for wildlife connectivity across highways (see table 18), the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety.

[6] Linear features include powerline rights-of-way and utility corridors.

Table 2. Key highway crossing areas for wildlife

Area	Route	Mile Marker
east of Essex[1]	U.S. 2	181-184
east of Essex[1]	U.S. 2	189-190
east of Columbia Falls[1]	U.S. 2	141-143
north of Columbia Falls[1]	Rt. 486	7-9
between Whitefish and Eureka[1]	U.S. 93	148
between Whitefish and Eureka[1]	U.S. 93	157-160
Swan Valley[2, 3, 4]	U.S. 83	31-36
Swan Valley[2, 3, 4]	U.S. 83	45-58

1. Based on R. Ament, P. McGowen, M. McClure, A. Rutherford, C. Ellis, & J. Grebenc (2014), *Highway mitigation for wildlife in northwest Montana*, Bozeman, MT: Sonoran Institute, Northern Rockies Office, retrieved from http://largelandscapes.org/media/publications/Highway-Mitigation-Wildlife-NW-Montana.pdf.

2. Based on M. P. Huijser, K. E. Gunson, & C. Abrams (2006), Animal-vehicle collisions and habitat connectivity along Montana Highway 83 in the Seeley-Swan Valley, Montana: A reconnaissance, Western Transportation Institute, retrieved from http://www.mdt.mt.gov/research/projects/env/seeley.shtml.

3. Based on P. L. Sandstrom (1996), *Identification of potential linkage zones for grizzly bears in the Swan-Clearwater valley using GIS* (MS thesis), University of Montana, Missoula, retrieved from http://scholarworks.umt.edu/etd/.

4. Based on J. L. Weaver (2014), *Conservation legacy on a flagship forest: Wildlife and wildlands on the Flathead National Forest, Montana*, Bozeman, MT: Wildlife Conservation Society, retrieved from http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjI5LmQ19nKAhUK6mMKHeRNC38QFggcMAA&url=http%3A%2F%2Fwww.wcsnorthamerica.org%2FAdmin-Plus%2FDocustore%2FCommand%2FCore_Download%2FEntryId%2F28194.aspx&usg=AFQjCNFbCN6XJslT6iW_LSda_zKBLU1O8g&bvm=bv.113034660,d.cGc.

13 To maintain and protect natural hydrologic flow paths, the transportation infrastructure should not alter stream courses. For example, streams should have crossing structures and not be routed down ditches.

14 To provide and maintain native aquatic organisms 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 are created or maintained to prevent spread or invasion of non-native species in alignment with fish and wildlife management agencies.

15 When designing, constructing, or reconstructing system trails, information on how to avoid and respond to bear-human encounters should be posted at trailheads. In addition, site-specific trail design should include one or more methods to limit the risk of bear-human conflicts such as, but not limited to,

- locating trails outside of riparian management zones or avalanche chutes unless it is necessary to cross or to access an existing developed recreation site, and
- designing and/or maintaining trails to increase sight distance and/or to address speed of travel consistent with site-specific conditions for the managed use of the trail.

16 To protect fisheries resources and riparian-associated resource conditions and to maintain quality and quantity of water flows to, within, or between groundwater-dependent ecosystems, groundwater use developments (e.g., drinking water wells, wastewater facilities) should not:

- be developed in riparian management zones (unless no alternatives exist);

- measurably lower river flows, lake levels, or flows to wetlands or springs (e.g., change springs from perennial to intermittent or eliminate springs altogether); and/or
- discharge pollutants directly to groundwater.

Guidelines – Lands and Special Uses (FW-GDL-LSU)

01 Special use authorizations in the primary conservation area should have permit requirements to help reduce or limit the risk of grizzly bear-human conflicts.

02 To maintain or improve habitat conditions for fish, water, and other riparian associated species and resources, authorizations for new special-use permits should include requirements for best management practices and at the conclusion of the permit should restore in-stream and riparian conditions if necessary.

03 To protect riparian and aquatic habitat, new support facilities should be located outside of riparian management zones. Support facilities include any facilities or improvements (e.g., workshops, housing, switchyards, staging areas, transmission lines) not directly integral to the production of hydroelectric power or necessary for the implementation of prescribed protection, mitigation, or enhancement measures. At time of permit reissuance, the removal of such support facilities, where practical, should be considered.

Guidelines - Recreation (FW-GDL-REC)

02 To protect resources, new solid and sanitary waste facilities should be located outside of the inner riparian management zone.

06 To protect fishery resources and riparian-associated plant and animal species, new developed recreation sites should not be located within the inner riparian management zone, except when they are related to health and safety or water, such as boat ramps and fish platforms. Structures should be developed with a Forest aquatics specialist so that fisheries and riparian-associated plant and animal species are protected.

Guidelines - Grazing (FW-GDL-GR)

03 Livestock trailing, bedding, watering, salting, loading, and other handling activities should be avoided in riparian management zones.

04 To reduce bank trampling of perennial vegetation on or near the water's edge (i.e., the greenline):

- do not exceed 20 percent streambank alteration;
- do not exceed 40 percent utilization of mean annual vegetative production on woody vegetation; and
- maintain at least 4-6 inches or do not exceed 40 percent utilization of mean annual vegetative production on herbaceous vegetation.

SUITABILITY

FW-SUIT-RMZ-01 Riparian management zones are not suitable for timber production. Timber harvesting for other multiple-use purposes is allowable.

AQUATIC ECOSYSTEM MONITORING

Plan monitoring questions and indicators for aquatic ecosystems

Table 3. Plan monitoring questions and indicators for aquatic ecosystems

Monitoring Question(s)	Plan Component(s)	Potential Indicator(s)
MON-WTR-01: What are the changed conditions of instream physical habitat parameters in managed vs. unmanaged sites?	**FW-DC-WTR-04**	**IND-WTR-** **01.** PIBO monitoring: positive trend in PIBO metrics such as bank angle, wood frequency, percent fines, residual pool depth, percent pools, and median substrate size (D50) **02**. Results of McNeil core samples of percent fines
MON-WTR-02: To what extent are forest management activities moving towards habitat objectives for native fish?	**FW-OBJ-CNW-01** **FW-OBJ-WTR-01 through 04**	**IND-WTR-** **03.** Number of fish passage barriers removed or created **04.** Number of roads decommissioned within the riparian management zone **05.** Number of culverts removed or upgraded **06.** Number of activities with stream miles of habitat improvements
MON-WTR-03: What activities have occurred in the riparian management zone?	**FW-STD-RMZ-03, 04** **FW-DC-RMZ-03**	**IND-WTR-** **07.** Treatment type and acres within riparian management zones **08.** Number of entries and road crossing inside riparian management zones
MON-WTR-04: What is the condition of water quality in waterbodies?	**FW-DC-WTR-06**	**IND-WTR-09**: Number of waterbodies listed on the Montana Department of Environmental Quality integrated report (305b/303d)
MON-WTR-05: What is the status of native fish populations?	**FW-DC-CNW-01**	**IND-WTR-** **10.** Number of redds (bull trout) **11.** Fish density—number/100 square meters **12.** Degree of spread of hybridization (MFWP data, redd counts)
MON-WTR-06: Do management activities contribute nutrients to Flathead Lake?	**FW-DC-WTR-17**	**IND-WTR-13**: Amount of phosphorus, nitrites, and nitrates that originate from NFS lands.
MON-WTR-07: What is the status of streambanks within grazing allotments?	**FW-GDL-05**	**IND-WTR-** **13.** Percent streambank alteration **14.** Percent utilization on woody vegetation **15.** Percent utilization on herbaceous vegetation

Appendix 3: Bull Trout Framework/Matrix and PCE Description

Table A3-1. Framework/matrix indicators and values describing each functional level.

DIAGNOSTIC OR PATHWAY	INDICATORS	FUNCTIONING APPROPRIATELY	FUNCTIONING AT RISK	FUNCTIONING AT UNACCEPTABLE RISK
SPECIES:				
Subpopulation Characteristics within subpopulation watersheds	***Subpopulation Size***	Mean total subpopulation size or local habitat capacity more than several thousand individuals. All life stages evenly represented in the subpopulation.[1]	Adults in subpopulation are less than 500 but >50.[1]	Adults in subpopulation has less than 50. [1]
	Growth and Survival	Subpopulation has the resilience to recover from short term disturbances (e.g. catastrophic events, etc) or subpopulation declines within one to two generations (5 to 10 years).[1] The subpopulation is characterized as increasing or stable. At least 10+ years of data support this estimate.[2]	When disturbed, the subpopulation will not recover to predisturbance conditions within one generation (5 years). Survival or growth rates have been reduced from those in the best habitats. The subpopulation is reduced in size, but the reduction does not represent a long-term trend. [1]. At least 10+ years of data support this characterization.[2] If less data is available and a trend can not be confirmed, a subpopulation will be considered at risk until enough data is available to accurately determine its trend.	The subpopulation is characterized as in rapid decline or is maintaining at alarmingly low numbers. Under current management, the subpopulation condition will not improve within two generations (5 to 10 years). [1] This is supported by a minimum of 5+ years of data.
	Life History Diversity and Isolation	The migratory form is present and the subpopulation exists in close proximity to other spawning and rearing groups. Migratory corridors and rearing habitat (lake or larger river) are in good to excellent condition for the species. Neighboring subpopulations are large with high likelihood of producing surplus individuals or straying adults that will mix with other	The migratory form is present but the subpopulation is not close to other subpopulations or habitat disruption has produced a strong correlation among subpopulations that do exist in proximity to each other. [1]	The migratory form is absent and the subpopulation is isolated to the local stream or a small watershed not likely to support more than 2,000 fish.[1]

		subpopulation groups. [1]		
	Persistence and Genetic Integrity	Connectivity is high among multiple (5 or more) subpopulations with at least several thousand fish each. Each of the relevant subpopulations has a low risk of extinction. [1] The probability of hybridization or displacement by competitive species is low to nonexistent.	Connectivity among multiple subpopulations does occur, but habitats are more fragmented. Only one or two of the subpopulations represent most of the fish production. [1] The probability of hybridization or displacement by competitive species is imminent, although few documented cases have occurred.	Little or no connectivity remains for refounding subpopulations in low numbers, in decline, or nearing extinction. Only a single subpopulation or several local populations that are very small or that otherwise are at high risk remain.[1] Competitive species readily displace bull trout. The probability of hybridization is high and documented cases have occurred.
HABITAT:				
Water Quality:	***Temperature***	7 day average maximum temperature in a reach during the following life history stages: [1, 3] incubation 2 - 5°C rearing 4 - 12 °C spawning 4 - 9°C also temperatures do not exceed 15□C in areas used by adults during migration (no thermal barriers)	7 day average maximum temperature in a reach during the following life history stages: [1, 3] incubation <2°C or 6°C rearing <4°C or 13 - 15 °C spawning <4°C or 10°C also temperatures in areas used by adults during migration sometimes exceeds 15°C	7 day average maximum temperature in a reach during the following life history stages: [1, 3] incubation <1°C or >6°C rearing >15 °C spawning <4 °C or > 10°C also temperatures in areas used by adults during migration regularly exceed 15°C (thermal barriers present)
	Sediment (in areas of spawning and incubation; rearing areas will be addressed under substrate embeddedness)	Similar to chinook salmon [1]: for example (e.g.): < 12% fines (<0.85mm) in gravel[4]; e.g. ≤20% surface fines of ≤6mm[5, 6]	Similar to chinook salmon [1]: e.g. 12-17% fines (<0.85mm) in gravel[4]; e.g. 12-20% surface fines [7]	Similar to chinook salmon [1]: e.g. >17% fines (<0.85mm) in gravel[4]; e.g. >20% fines at surface or depth in spawning habitat[7]
	Chemical Contamination/ Nutrients	low levels of chemical contamination from agricultural, industrial and other sources, no excess nutrients, no CWA 303d designated reaches[8]	moderate levels of chemical contamination from agricultural, industrial and other sources, some excess nutrients, one CWA 303d designated reach[8]	high levels of chemical contamination from agricultural, industrial and other sources, high levels of excess nutrients, more than one CWA 303d designated reach[8]
Habitat Access:	***Physical Barriers*** (address subsurface flows impeding fish passage under the pathway	man-made barriers present in watershed allow upstream and downstream fish	man-made barriers present in watershed do not allow upstream and/or downstream fish passage at	man-made barriers present in watershed do not allow upstream and/or downstream fish passage at a

	flow/hydrology)	passage at all flows	base/low flows	range of flows
Habitat Elements:	***Substrate Embeddedness*** in rearing areas (spawning an1d incubation areas were addressed under the indicator sediment)	reach embeddedness <20%[9, 10]	reach embeddedness 20-30% [9,10]	reach embeddedness >30%[4,10]
	Large Woody Debris	current values are being maintained at greater than 80 pieces/mile that are >24"diameter and >50 ft length on the Coast [9], or >20 pieces/ mile >12"diameter >35 ft length on the Eastside[11] ; also adequate sources of woody debris are available for both long and short-term recruitment	current levels are being maintained at minimum levels desired for □functioning appropriately□ but potential sources for long term woody debris recruitment are lacking to maintain these minimum values	current levels are not at those desired values for □functioning appropriately□, and potential sources of woody debris for short and/or long term recruitment are lacking
	Pool Frequency and Quality	pool frequency in a reach closely approximates [5]: Wetted width (ft) #pools/mile 0-5 39 5-10 60 10-15 48 15-20 39 20-30 23 30-35 18 35-40 10 40-65 9 65-100 4 (can use formula: pools/mi = 5,280/wetted channel width #channel widths per pool); also, pools have good cover and cool water[4], and only minor reduction of pool volume by fine sediment	pool frequency is similar to values in □functioning appropriately□ but pools have inadequate cover/temperature[4], and/or there has been a moderate reduction of pool volume by fine sediment	pool frequency is considerably lower than values desired for □functioning appropriately□; also cover/temperature is inadequate[4], and there has been a major reduction of pool volume by fine sediment
	Large Pools (in adult holding, juvenile rearing, and overwintering reaches where streams are >3m in wetted width at baseflow)	each reach has many large pools >1 meter deep[4]	reaches have few large pools (>1 meter) present[4]	reaches have no deep pools (>1 meter)[4]

	Off-channel Habitat (see reference 18 for identification of these characteristics)	watershed has many ponds, oxbows, backwaters, and other off-channel areas with cover; and side-channels are low energy areas[4]	watershed has some ponds, oxbows, backwaters, and other off-channel areas with cover; but side-channels are generally high energy areas[4]	watershed has few or no ponds, oxbows, backwaters, or other off-channel areas[4]
	Refugia (see Checklist footnotes for definition of this indicator)	habitats capable of supporting strong and significant populations are protected and are well distributed and connected for all life stages and forms of the species [12, 13]	habitats capable of supporting strong and significant populations are insufficient in size, number and connectivity to maintain all life stages and forms of the species[12, 13]	adequate habitat refugia do not exist[12]
Channel Condition & Dynamics:	***Average Wetted Width/ Maximum Depth*** Ratio in scour pools in a reach	≤10[7, 5]	11 - 20[5]	>20[5]
	Streambank Condition	>80% of any stream reach has ≥90% stability[5]	50 - 80% of any stream reach has ≥90% stability[5]	<50% of any stream reach has ≥90% stability[5]
	Floodplain Connectivity	off-channel areas are frequently hydrologically linked to main channel; overbank flows occur and maintain wetland functions, riparian vegetation and succession	reduced linkage of wetland, floodplains and riparian areas to main channel; overbank flows are reduced relative to historic frequency, as evidenced by moderate degradation of wetland function, riparian vegetation/succession	severe reduction in hydrologic connectivity between off-channel, wetland, floodplain and riparian areas; wetland extent drastically reduced and riparian vegetation/succession altered significantly
Flow/Hydrology:	***Change in Peak/Base Flows***	watershed hydrograph indicates peak flow, base flow and flow timing characteristics comparable to an undisturbed watershed of similar size, geology and geography	some evidence of altered peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography	pronounced changes in peak flow, baseflow and/or flow timing relative to an undisturbed watershed of similar size, geology and geography
	Increase in Drainage Network	zero or minimum increases in active channel length correlated with human caused disturbance	low to moderate increase in active channel length correlated with human caused disturbance	greater than moderate increase in active channel length correlated with human caused disturbance
Watershed Conditions:	***Road Density & Location***	<1mi/mi [13]; no valley bottom roads	1 - 2.4 mi/mi [13]; some valley bottom roads	>2.4 mi/mi [13]; many valley bottom roads
	Disturbance History	<15% ECA of entire watershed with no concentration of disturbance in unstable or	<15% ECA of entire watershed but disturbance concentrated in unstable or	>15% ECA of entire watershed and disturbance concentrated in unstable

	potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area there is an additional criteria of □15% LSOG in watersheds[14]	potentially unstable areas, and/or refugia, and/or riparian area; and for NWFP area there is an additional criteria of □15% LSOG in watersheds[14]	or potentially unstable areas, and/or refugia, and/or riparian area; does not meet NWFP standard for LSOG
Riparian Conservation Areas (RHCA - PACFISH and INFISH) (Riparian Reserves - Northwest Forest Plan)	the riparian conservation areas provide adequate shade, large woody debris recruitment, and habitat protection and connectivity in subwatersheds, and buffers or includes known refugia for sensitive aquatic species (>80% intact), and adequately buffer impacts on rangelands: percent similarity of riparian vegetation to the potential natural community/ composition >50%[15]	moderate loss of connectivity or function (shade, LWD recruitment, etc.) of riparian conservation areas, or incomplete protection of habitats and refugia for sensitive aquatic species (□70-80% intact), and adequately buffer impacts on rangelands : percent similarity of riparian vegetation to the potential natural community/composition 25-50% or better[15]	riparian conservation areas are fragmented, poorly connected, or provides inadequate protection of habitats for sensitive aquatic species (<70% intact, refugia does not occur), and adequately buffer impacts on rangelands : percent similarity of riparian vegetation to the potential natural community/composition <25%[15]
Disturbance Regime	Environmental disturbance is short lived; predictable hydrograph, high quality habitat and watershed complexity providing refuge and rearing space for all life stages or multiple life-history forms. [1] Natural processes are stable.	Scour events, debris torrents, or catastrophic fire are localized events that occur in several minor parts of the watershed. Resiliency of habitat to recover from environmental disturbances is moderate.	Frequent flood or drought producing highly variable and unpredictable flows, scour events, debris torrents, or high probability of catastrophic fire exists throughout a major part of the watershed. The channel is simplified, providing little hydraulic complexity in the form of pools or side channels. [1] Natural processes are unstable.
SPECIES AND HABITAT:			
Integration of Species and Habitat Conditions	Habitat quality and connectivity among subpopulations is high. The migratory form is present. Disturbance has not altered channel equilibrium. Fine sediments and other habitat characteristics influencing survival or growth are consistent with pristine habitat. The subpopulation has the resilience to recover from short-term disturbance within one to two generations (5 to 10 years). The subpopulation is	Fine sediments, stream temperatures, or the availability of suitable habitats have been altered and will not recover to predisturbance conditions within one generation (5 years). Survival or growth rates have been reduced from those in the best habitats. The subpopulation is reduced in size, but the reduction does not represent a long-term trend. The subpopulation is	Cumulative disruption of habitat has resulted in a clear declining trend in the subpopulation size. Under current management, habitat conditions will not improve within two generations (5 to 10 years). Little or no connectivity remains among subpopulations. The subpopulation survival and recruitment responds sharply to

	fluctuating around an equilibrium or is growing.[1]	stable or fluctuating in a downward trend. Connectivity among subpopulations occurs but habitats are more fragmented.[1]	normal environmental events. [1]

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[2] Rieman, B.E. and D.L. Meyers. 1997. Use of redd counts to detect trends in bull trout (*Salvelinus confluentus)* populations. Conservation Biology 11(4): 1015-1018.

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[4] Washington Timber/Fish Wildlife Cooperative Monitoring Evaluation and Research Committee, 1993. Watershed Analysis Manual (Version 2.0). Washington Department of Natural Resources.

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[6] Overton, C.K., S.P. Wollrab, B.C. Roberts, and M.A. Radko. 1997. R1/R4 (Northern/Intermountain Regions) Fish and Fish Habitat Standard Inventory Procedures Handbook. U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Gen Tech. Rep. INT-GTR-346.

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[8] A Federal Agency Guide for Pilot Watershed Analysis (Version 1.2), 1994.

[9] Biological Opinion on Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). National Marine Fisheries Service, Northwest Region, January 23, 1995.

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[11] Interior Columbia Basin Ecosystem Management Project Draft Environmental Impact Statement and Appendices.

[12] Frissell, C.A., Liss, W.J., and David Bayles, 1993. An Integrated Biophysical Strategy for Ecological Restoration of Large Watersheds. Proceedings from the Symposium on Changing Roles in Water Resources Management and Policy, June 27-30, 1993 (American Water Resources Association), p. 449-456.

[13] Lee, D.C., J.R. Sedell, B.E. Rieman, R.F. Thurow, J.E. Williams and others. 1997. Chapter 4: Broadscale Assessment of Aquatic Species and Habitats. *In* T.M. Quigley and S. J. Arbelbide eds □An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins Volume III. U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management, Gen Tech Rep PNW-GTR-405.

[14] Northwest Forest Plan, 1994. Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. USDA Forest Service and USDI Bureau of Land Management.

[16] Winward, A.H., 1989 Ecological Status of Vegetation as a base for Multiple Product Management. Abstracts 42nd annual meeting, Society for Range Management, Billings MT, Denver CO: Society For Range Management: p277.

Table A3-2. Descriptive relationships between Framework indicators and PCEs of bull trout critical habitat.

PCE 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.

PCE 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.

PCE 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.
PCE 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 will be greatly reduced.

PCE 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.

PCE 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.

PCE 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.

PCE 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.

PCE 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.

Appendix 4: Flathead National Forest Revised Forest Plan Key Components: Grizzly Bear

The following presents component of the Flathead National Forest's Revised Forest Plan that pertain to grizzly bear. This appendix is organized by plan component (e.g., desired conditions, objectives, standards, etc.). The exact nomenclature of the plan component is either listed in the sub-heading, or an alphanumeric combination of the heading code and number following.

Example: FW-STD-WTR-02 would be forest-wide (FW) standard (STD) for watersheds (WTR) number two (02).

The following set of plan components are consistent with the other amendment forests in the NCDE. The Flathead National Forest has additional plan components which affect the grizzly bear and these are also discussed in the biological assessment. The full set of plan components are listed in the revised Flathead National Forest Plan (2017).

Wildlife (WL)

Desired Conditions

FW-DC-WL-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area; see figure B-010), bear attractants on NFS lands are stored in a manner that reduces the risk of grizzly bear-human conflicts in the NCDE.

FW-DC-WL-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), grizzly bear habitat on NFS lands contributes to sustaining recovery of the grizzly bear population in the NCDE and contributes to connectivity with neighboring grizzly bear recovery zones.

FW-DC-WL-03. The risk of bear-human conflicts is reduced by information, education, and design features or criteria for management activities.

Standards

FW-STD-WL-01. Grizzly bear habitat on NFS lands in the NCDE shall be delineated and managed as the primary conservation area, zone 1 (including the Salish demographic connectivity area) (see figure B-10 or subsequent USFWS updates, if applicable).

FW-STD-WL-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area; see figure B-10), food/wildlife attractant storage special order(s) shall apply to all NFS lands.

FW-STD-WL-03. In each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density, and secure core shall be allowed for roads used for projects (as defined by "project (in grizzly bear habitat in the NCDE)" during the non-denning season (see glossary). Calculations will include estimated changes for each year of the anticipated duration of the project and shall be incorporated into the 10-year running average required by standard FW-STD-IFS-03.

Guidelines

FW-GDL-WL-01. Within the NCDE primary conservation area, zone 1 (including the Salish demographic connectivity area), contractors, permittees, lessees, operators, and their employees should be informed of procedures for safely working and recreating in grizzly bear country and of food/wildlife attractant storage special order(s) prior to turn-out of livestock or beginning work and annually thereafter, in order to reduce the risk of grizzly bear-human conflicts.

FW-GDL-WL-02. Within the NCDE primary conservation area, zone 1 (including the Salish demographic connectivity area), if a contractor, permittee, lessee, operator, or their employee elects to camp on NFS lands other than in a developed recreation site, the site should be evaluated and written authorization (i.e., a campsite agreement that includes the food/attractant storage special order) should be provided before the campsite is established. The purpose is to reduce the risk of grizzly bear-human conflicts.

FW-GDL-WL-03. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), clover should not be used in seed mixes on NFS lands. Native seed mixes or those that are less palatable to grizzly bears should be used so that seeded areas do not become an attractant.

Infrastructure (IFS) and Recreation (REC)

Desired Conditions

FW-DC-IFS-01. Within the NCDE primary conservation area, motorized access provides for multiple uses (such as harvesting of timber and non-timber forest products; hunting, fishing, and recreation opportunities) on NFS lands and also provides open motorized route density, total motorized route density, and secure core levels that contribute to sustaining the recovery of the grizzly bear population in the NCDE.

FW-DC-REC-01. Within the NCDE primary conservation area, the number, capacity, and improvements of developed recreation sites (NCDE definition) provide for user comfort and safety while minimizing the risk of grizzly bear-human conflicts on NFS lands.

FW-DC-REC-02. Within each bear management unit in the primary conservation area, increases in the number and capacity of developed recreation sites (NCDE definition) on NFS lands that are designed and managed for overnight use during the non-denning season are at levels that contribute to sustaining the recovery of the grizzly bear population in the NCDE.

Standards

FW-STD-IFS-01. Within the NCDE primary conservation area, motorized use of roads with public restrictions shall be permitted for administrative use (see glossary), as long as it does not exceed either six trips (three round trips) per week *or* one 30-day unlimited use period during the non-denning season (see glossary).

The exception to this standard is:

- emergency situations as defined by 36 CFR § 218.21.

Note: Administrative use is not included in baseline calculations and is not included in calculations of net increases or decreases. If the level of administrative use exceeds this standard, the use is counted as a project (see “project (in grizzly bear habitat in the NCDE)” in the glossary).

FW-STD-IFS-02. In each bear management subunit within the NCDE primary conservation area, there shall be no net decrease to the baseline (see glossary) for secure core and no net increase to the baseline open motorized route density or total motorized route density on National Forest System lands during the non-denning season (see glossary). The following conditions are not considered a net increase/decrease from the baseline:

- administrative use (see glossary);
- temporary use of a motorized route for a project (see “project in grizzly bear habitat in the NCDE” definition in the glossary and FW-STD-IFS-03);
- mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) conducted in accordance with valid existing rights and applicable standards and guidelines;
- updated/improved data on a motorized route without an actual change on the ground;

- changes in technology or projections that result in changed calculations without actual change on the ground (e.g., a switch from the North American Datum of 1927 to the North American Datum of 1983 geodetic reference system);
- a road closure location is moved a short distance (e.g., to the nearest intersection or turnout) to a better location to allow turn-arounds providing for public safety, to reduce vandalism, or to improve enforcement of the road closure;
- **the agency exchanges, acquires, buys**, or sells lands;
- a change in a motorized route is necessary to comply with Federal laws (e.g., Federal Rehabilitation Act);
- a change in a motorized route is necessary to address grizzly bear-human conflicts, human safety concerns, or resource damage/concerns (e.g., a road paralleling a stream may be decommissioned and replaced by a new upslope road to reduce water quality impacts);
- a change is made by an adjacent landowner that decreases secure core or increases motorized route densities on a particular national forest;
- emergency situations as defined by 36 CFR § 218.21; and
- temporary roads (see glossary).

FW-STD-IFS-03. In each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density, and secure core shall be calculated for projects (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary).

- 5 percent temporary increase in open motorized route density in each subunit (i.e., open motorized route density baseline plus 5 percent);
- 3 percent temporary increase in total motorized route density in each subunit (i.e., total motorized route density baseline plus 3 percent);
- 2 percent temporary decrease in secure core in each subunit (i.e., secure core baseline minus 2 percent).

Exceptions to this standard include:

- emergency situations as defined by 36 CFR 218.21;
- actions where valid existing rights preclude or constrain agency discretion (e.g., certain contracts, permits, leases, etc.).

Refer to appendix 1 for examples of how to calculate and apply the 10-year running average and temporary increase/decrease.

FW-STD-IFS-04. Within the NCDE primary conservation area, the number and capacity of developed recreation sites on NFS lands that are designed and managed for overnight use by the public during the non-denning season (e.g., campgrounds, cabin rentals, huts, guest lodges, recreation residences) shall be limited to one increase above the baseline (see glossary) in number or capacity per decade per bear management unit. The following conditions are not considered an increase from the baseline:

- the agency obtains better information or updated information in its database(s);
- the agency acquires land that contains developed recreation sites;
- the agency increases the number or capacity of a developed recreation site in order to comply with Federal laws;

- the agency maintains or modifies an existing overnight developed or dispersed recreation site in such a way that does not increase the number or capacity of the site (e.g., installing a pit toilet to avoid damage to water resources or installing a bear-resistant food storage structure to reduce grizzly bear-human conflicts);
- the agency modifies an existing developed recreation site to enhance human safety (e.g., enlarging a road pull-out to allow trailers to turn around safely); or
- the agency operates a developed recreation site to allow overnight use only during the denning season (see glossary).

The agency makes a corresponding reduction in the number or capacity of overnight developed recreation sites in the same bear management unit through any of the following means: (1) equal reduction in capacity at another site; (2) closure of a developed site(s); or (3) consolidation and/or elimination of dispersed camping, when and where it can be enforced effectively and it is reasonably assured that new dispersed sites will not develop nearby. Note: If these measures are used to offset an increase in number or capacity, they must be in place before the initiation of the increase. If the agency reduces the number or capacity of developed sites below baseline levels, these reductions may be used at a future date to mitigate equivalent impacts of an increase, expansion, or change of use in developed sites within that bear management unit.

Note: This standard does not apply to dispersed recreation sites or to developed recreation sites managed for day-use only (e.g., outfitter camps, roadside trail crossings or interpretive pull-outs; trailheads, picnic areas, or boat launches that are closed at night; ski areas that do not have overnight lodging).

FW-STD-REC-02. Within the NCDE primary conservation area, new or reauthorized recreation permits shall include a clause providing for modification, cancellation, suspension, or temporary cessation of activities if needed to resolve a grizzly bear-human conflict situation.

FW-STD-REC-04. Within the NCDE primary conservation area, new or reauthorized permits for ski areas on NFS lands that operate during the non-denning season shall include measures to limit the risk of grizzly bear-human conflicts (e.g., a requirement to store garbage in a bear-resistant manner).

FW-STD-REC-05. Within grizzly bear denning habitat modeled by MTFWP in the NCDE primary conservation area, there shall be no net increase in percentage of area or miles of routes designated for motorized over-snow vehicle use on NFS lands during the den emergence time period (see glossary).

Guidelines

FW-GDL-IFS-01. In each bear management subunit within the NCDE primary conservation area, each project (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary) should be designed so that on-the-ground implementation does not exceed 5 years to reduce the potential of grizzly bears being disturbed or displaced. Exceptions may be made where necessary to accommodate, for example,

- actions where existing rights preclude or constrain agency discretion (e.g., certain contracts, permits, leases);
- prescribed burning (including slash disposal), best management practices to protect water quality, or required reforestation activities; or
- emergency situations as defined by 36 CFR § 218.21.

If an extension to the five-year time limitation is required (e.g., to meet contractual obligations or to complete on-the-ground treatments), the reasons should be documented in writing prior to authorization of the extension.

FW-GDL-IFS-02. Within the NCDE primary conservation area, levels of secure core, open motorized route density, and total motorized route density should be restored to pre-project levels (as defined by "project (in grizzly bear habitat in the NCDE)" in the glossary) within one year after completion of the project in order to reduce the duration of grizzly bear displacement or disturbance due to project-related activities. Exceptions may be made where necessary to accommodate, for example,

- actions where existing rights preclude or constrain agency discretion (e.g., certain contracts, permits, leases);
- prescribed burning (including slash disposal), best management practices to protect water quality, or required reforestation activities; or
- emergency situations as defined by 36 CFR § 218.21.

If an extension to the one-year time limitation is made (e.g., to meet contractual obligations or to complete on-the-ground treatments), the reasons should be documented in writing prior to authorization of the extension.

FW-GDL-REC-01. Within the NCDE primary conservation area, if the number or capacity of day use or overnight developed recreation sites is increased, the project should include measures to reduce the risk of grizzly-bear human conflicts in that bear management unit (e.g., with additional public information and education; by providing backcountry food-hanging poles or bear-resistant food or garbage storage devices; by including design criteria that would limit capacity increases to those needed for public health and safety; by increasing law enforcement and patrols).

Terrestrial Ecosystems Vegetation (VEG)

Desired Conditions

FW-DC-TE&V-01. Within the NCDE primary conservation area, the amount, type, and distribution of vegetation provides for the ecological, social, and economic sustainability of NFS lands while also providing habitat components that contribute to sustaining the recovery of the grizzly bear population in the NCDE.

FW-DC-TE&V-02. Within the NCDE primary conservation area, there is a mosaic of successional stages to provide for grizzly bear habitat needs over the long term.

Guidelines

FW-GDL-TE&V-01. Within the NCDE primary conservation area, measures to reduce the risk of disturbance to the grizzly bear population should be incorporated into vegetation and fuels project design criteria, which vary on a site-specific basis (e.g., some activities should be restricted in spring habitat during the spring time period; areas with low levels of human activity should be provided adjacent to areas with high levels of disturbance). Note: Management activities such as pre-commercial thinning, burning, weed spraying, and implementation of road best management practices may need to be completed during the spring time period in order to meet resource objectives (especially if needed to prevent resource damage), in which case other measures should be used to reduce the risk of disturbance (e.g., limiting the duration of the activity or limiting the use of closed roads).

FW-GDL-TE&V-02. Within the NCDE primary conservation area, vegetation management activities should be designed to avoid detrimental effects on the grizzly bear population and to include one or more measures to protect, maintain, increase, and/or improve grizzly habitat quantity or quality (e.g., promoting growth of berry-producing shrubs, forbs, or grasses known to be bear foods) in areas where it would not increase the risk of grizzly bear-human conflicts.

FW-GDL-TE&V-03. Within the NCDE primary conservation area, measures to retain cover (where present) along a portion of grass/forb/shrub openings, riparian wildlife habitat, or wetlands should be incorporated in project design criteria (this varies on a site-specific basis).

FW-GDL-TE&V-04. Within the NCDE primary conservation area, vegetation management projects (including timber sales and other non-commercial vegetation management contracts) should include a provision providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve grizzly bear-human conflict situations.

FW-GDL-TE&V-05. To reduce the risk of grizzly-bear human conflicts within the NCDE primary conservation area, vegetation management activities designed to enhance grizzly habitat (e.g., to increase huckleberry production) should not occur in or next to campgrounds, administrative facilities, or other developed recreation sites that operate during the non-denning season.

Grazing (GRZ)

Desired Condition

FW-DC-GR-01. Within the NCDE primary conservation area, the number, capacity of, and improvements on livestock grazing allotments support ecologically sustainable grazing, and temporary grazing permits are used effectively for management of noxious weeds, while minimizing the risk of bear-human conflicts on NFS lands.

Standards

FW-STD-GR-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), new or reauthorized livestock grazing permits and annual operating plans shall incorporate requirements to reduce the risk of grizzly bear-human conflicts (e.g., food/wildlife attractant storage special order). New or reauthorized permits shall include a clause providing for modification, cancellation, suspension, or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation.

NCDE-STD-GR-02. Within the NCDE primary conservation area and zone 1, a sheep grazing permit in non-use status shall not be allowed to increase allowable animal unit months beyond what was previously permitted prior to being in non-use when it is returned to use. Note: The Flathead National Forest does not have any sheep allotments.

FW -STD-GR-03. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), permits for livestock grazing shall include a provision that requires reporting livestock carcasses within 24 hours of discovery, which shall be followed by proper disposal of the carcass. Boneyards shall not be established on NFS lands.

FW -STD-GR-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), there shall be no net increase in the number of active sheep allotments on NFS lands. Note: The Flathead National Forest does not have any sheep allotments.

FW-STD-GR-05. Within the NCDE primary conservation area, there shall be no increase in the number of active cattle grazing allotments above the baseline (see glossary) on NFS lands. Note: Existing allotments may be combined or divided as long as that does not result in grazing allotments in currently unallotted lands.

FW-STD-GR-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), temporary permits for grazing by small livestock for purposes such as controlling invasive exotic weeds or reducing fire risk, or for trailing of small livestock across NFS lands, shall not result in an increase in bear-small livestock conflicts.

Guidelines

FW-GDL-GR-02. Within the NCDE primary conservation area, an allotment management plan and plan of operation should specify any needed measures to protect key grizzly bear food production areas (e.g., wet meadows, stream bottoms, aspen groves, and other riparian wildlife habitats) from conflicting and competing use by livestock (this varies on a site-specific basis).

Other Forest Products (OFP)

Desired Condition

FW-DC-OFP-01. Provide a variety of public services and special forest products (such as mushrooms, huckleberries, firewood) from NFS lands while minimizing the risk of grizzly bear–human conflicts on NFS lands in the NCDE.

Standard

FW-STD-OFP-01. Special-use permits for apiaries (beehives) located on NFS lands shall incorporate measures including electric fencing to reduce the risk of grizzly bear–human conflicts, as specified in the food/wildlife attractant storage special order.

Renewable/Non-Renewable Energy and Mineral Resources (MIN)

Desired Condition

FW-DC-E&M-01. Mineral materials are available based upon public interest, in-service needs, material availability, and valid existing rights, where consistent with desired conditions for other resources.

Standards

FW-STD-E&M-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) occurring on NFS lands, where feasible, shall avoid, minimize, and/or mitigate environmental impacts to grizzly bears or their habitat, subject to existing rights. Stipulations or mitigation measures already included in existing leases, permits, or plans of operation on NFS lands shall not be changed, nor will additional stipulations or mitigation measures be added without the agreement of the holder of the lease, permit, or plan of operation.

FW-STD-E&M-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), new or reauthorized permits, leases, and/or plans of operation shall include a clause providing for modification or temporary cessation of activities, if needed, to resolve a grizzly bear-human conflict situation.

FW-STD-E&M-03. New plans of operation, permits, and/or leases for mineral activities shall include measures to reasonably mitigate potential impacts of mineral development for the following:

- land surface and vegetation disturbance;
- water table alterations that affect bear foods on the surface; and
- construction, operation, and reclamation of mine-related facilities such as impoundments, rights of way, motorized routes, pipelines, canals, transmission lines or other structures.

FW-STD-E&M-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), in addition to measures included in the food/wildlife attractant storage special order(s), new plans of operation, permits, and/or leases for mineral activities shall include the following measures regarding grizzly bear attractants:

- bear resistant food storage and garbage containers shall be used at development sites and at any campgrounds or dispersed sites where exploration or production-related human occupancy is anticipated;
- garbage shall be removed in a timely manner;
- road kills shall be removed daily during active operating periods to a designated location determined in close coordination with Montana Fish, Wildlife and Parks;

- feeding of wildlife shall not be allowed;
- locations of work camps shall be approved in advance of operations. Food storage requirements shall be strictly adhered to in any work camps.

FW-STD-E&M-05. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), if minerals activities have the potential to adversely affect grizzly bears or their habitat as determined by a site-specific analysis, new plans of operation, permits, and/or leases for mineral activities shall include the following mitigation measures, stipulations, and surface use criteria regarding grizzly bear habitat:

- Ground-disturbing activities in identified grizzly bear spring habitat (as identified in a site-specific biological evaluation or other environmental document) shall be avoided between April 1 and June 30. If timing restrictions are not practicable, other measures shall be taken to reasonably mitigate negative impacts of mineral activity to grizzly bears.
- Seismic activity in identified grizzly bear denning habitat (as identified in a site-specific biological evaluation or other environmental document) shall be avoided during the denning season (see glossary). If timing restrictions are not practicable, other measures shall be taken to reasonably mitigate negative impacts of mineral activity to grizzly bears.
- Cumulative impacts of multiple, concurrent seismic and/or drilling operations shall be limited by timing restrictions. If timing restrictions are not practicable, reasonable and appropriate measures shall be taken to mitigate negative impacts to the grizzly bear.
- Reasonable and appropriate measures regarding the maintenance, rehabilitation, restoration, or mitigation of functioning aquatic systems and riparian management zones shall identify how reclamation will occur, plant species to be used in reclamation, a time frame of when reclamation will be completed, and monitoring criteria.
- Reclamation and revegetation of motorized routes, drilling pads, and other areas disturbed from mineral activities shall be completed as soon as practicable by the operator.

FW-STD-E&M-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), if mineral activities have the potential to adversely affect grizzly bears or their habitat as determined by a site-specific analysis, new plans of operations, permits, and/or leases shall include the following mitigation measures regarding motorized access:

- public motorized use that is not associated with minerals activities shall be prohibited on motorized routes constructed for exploration and/or development;
- a traffic management plan shall be developed as part of the proposed activity to identify when and how motorized routes will be used, maintained, and monitored (if required) and how motorized route standards and guidelines will be implemented after activities have ended;
- helicopter use associated with seismic activity, exploration, drilling, or development must follow an approved plan or permit; and
- speed limits shall be adopted on motorized routes if needed to prevent or reduce collisions with grizzly bears.

FW-STD-E&M-07. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), minerals contractors and lessees shall require employees to attend training related to safely living near and working in grizzly bear habitat prior to starting work and on an annual basis thereafter.

FW-STD-E&M-08. Within the NCDE primary conservation area, new leases for leasable minerals shall include a no surface occupancy stipulation (see glossary).

Guidelines

FW-GDL-E&M-01. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), in addition to forestwide guidelines, the following guidelines apply to new leasable minerals activities including leases, surface use plans for proposed wells or operations, or permits to conduct seismic exploration or drilling. To reduce potential grizzly bear disturbance or displacement, helicopter use plans should:

- avoid establishing recurring helicopter use (see glossary), especially in spring habitats or other known important grizzly bear habitats or use areas;
- avoid establishing landing zones, especially in spring habitats or other known important grizzly bear habitats or use areas. If a landing zone is deemed necessary for safe implementation of the seismic or surface use plan or permit to drill, the landing zone should be constructed only in an area that has had site-specific analysis and approval.

FW-GDL-E&M-02. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), leasable energy activities should use the best available noise-reduction technology on equipment and motorized vehicles to reduce potential disturbance or displacement of grizzly bears, whenever possible.

FW-GDL-E&M-03. Within the NCDE primary conservation area and zone 1 (including the Salish and demographic connectivity area), along motorized routes, seismic corridors, and pipelines constructed for leasable energy activities, wildlife cover should be maintained at regular intervals, where present (this varies on a site specific basis), in order to provide habitat connectivity for grizzly bears.

FW-GDL-E&M-04. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), for locatable and non-energy leasable minerals activities with the potential to adversely affect the grizzly bear or its habitat, the following tiered measures should be used to mitigate impacts to grizzly bear habitat. Beginning at step 1, any subsequent steps would be implemented only if the prior steps are not possible or achievable.

- Step 1: The operator should reclaim the affected area back to suitable bear habitat that has similar or improved characteristics and qualities compared to the original habitat (such as the same native vegetation).
- Step 2: If step 1 is not attainable, operators should either acquire a perpetual conservation easement (or easements) or purchase comparable or better replacement grizzly bear habitat within the primary conservation area. Acquisition of habitat within connectivity corridors could also be considered for mitigation, when appropriate. Habitat acquired for mitigation may require a purchase rate of > 1:1 on an acreage basis, depending on the quality of habitat degraded and the habitat available for acquisition.
- Step 3: If steps 1 and 2 are not achievable, the next option is to offset negative effects to bears and grizzly bear habitat with other appropriate types of actions.

FW-GDL-E&M-05. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), carrying bear spray should be recommended to mineral permittees, lessees, and operators to reduce the risk of grizzly bear-human conflicts.

FW-GDL-E&M-06. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), available resources at existing gravel pits should be used before constructing new pits to reduce the risk of grizzly bear disturbance or displacement associated with blasting of rock or crushing of gravel.

How changes in route density and secure core would be implemented

As stated in FW-STD-IFS-03, in each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density and secure core shall be allowed for projects (as defined by “project (in grizzly bear habitat in the NCDE)” in the glossary).

The 10-year running average for open motorized route density, total motorized route density, and secure core numeric parameters shall not exceed the following limits per bear management subunit:

- 5% temporary increase in open motorized route density in each subunit (i.e., open motorized route density baseline plus 5%);
- 3% temporary increase in total motorized route density in each subunit (i.e., total motorized route density baseline plus 3%);
- 2% temporary decrease in secure core in each subunit (i.e., secure core baseline minus 2%).

Hypothetical example

The following hypothetical example (displayed as Table D-2 and Table D-3) shows how temporary changes in open motorized route density (OMRD), total motorized route density (TMRD), and secure core would be implemented for a project.

Hypothetical example of how temporary changes in OMRD, TMRD, and Secure Core would be implemented for a project. Table D-2 shows the baseline values in a BMU subunit for OMRD, TMRD, and Secure Core from previous years and anticipated increases during the project (i.e., years 11 – 14).

Table D-3 uses the data from table D-2 to show the 10 year running averages for OMRD, TMRD, and Secure Core before, during, and after project completion, demonstrating that these 10-year running averages do not violate the Application Rules for Temporary Changes in Motorized Access. It should be noted that in this hypothetical example, another project in this subunit would not be possible until yr 24, unless that project did not require any changes in values for OMRD, TMRD, or Secure Core.

Table D-4. Values in a bear management subunit for OMRD, TMRD, and secure core for project in years 11 through 14

Variable	Baseline Value	Allowed Value for Project	year 1	year 2	year 3	year 4	year 5	year 6	year 7	year 8	year 9	year 10	project year 11	project year 12	project year 13	project year 14	year 15	year 16	year 17
OMRD	19	24	19	19	19	19	19	19	19	19	19	19	31	31	31	31	19	19	19
TMRD	19	22	19	19	19	19	19	19	19	19	19	19	22	22	22	22	19	19	19
Secure Core	69	67	69	69	69	69	69	69	69	69	69	69	63	63	63	69	69	69	69

Table D-5. Using data from table 5 to show the 10-year running averages for OMRD, TMRD, and secure core before, during, and after project completion

Variable	Before yr 1-10	During yr 2-11	During yr 3-12	During yr 4-13	During yr 5-14	During yr 6-15	After yr 7-16	After yr 8-17
OMRD	19	20	21	23	24	24	24	24
TMRD	19	19	20	20	20	20	20	20
Secure Core	69	69	68	67	67	67	67	67

Flathead NF - Zone 1

Desired Conditions

GA-SM-DC-01 Within the Flathead National Forest portion of NCDE zone 1 (including the Salish demographic connectivity area) (see figure B-10), roads and trails provide for public and administrative access to NFS lands while contributing to sustaining the grizzly bear population in the NCDE. Grizzly bear habitat in zone 1 contributes to sustaining recovery of the grizzly bear population in the NCDE. The demographic connectivity area provides habitat that can be used by female grizzly bears and allows for bear movement between grizzly bear ecosystems.

GA-SM-DC-03 In areas between the primary conservation area and the Salish demographic connectivity area, NFS lands are consolidated and conservation easements with willing landowners are supported in a manner that provides habitat connectivity and facilitates movement of wildlife. National Forest System lands in the Swift Creek-Stillwater connectivity area (see figure B-30) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges.

Standards

GA-SM-STD-01 Within the Flathead National Forest portion of NCDE zone 1 *outside* the Salish demographic connectivity area (see figure B-10), there shall be no net increase above the baseline (see glossary) in the density of roads open to public motorized use on NFS lands. *Inside* the Salish demographic connectivity area, there shall be no net increase above the baseline (see glossary) in the density of roads and trails open to public motorized use during the non-denning season on NFS lands. Density is calculated by dividing the total miles open to public motorized use on NFS lands during the non-denning season, by the total square miles of NFS lands in that same area. This standard does not apply to the following:

- motorized use by agency personnel or others authorized by the appropriate agency personnel;
- the temporary opening of a road for a short period of time to allow for public firewood gathering and other authorized uses (see also standard FW-STD-IFS-04);
- updated/improved road data without an actual change on the ground;
- changes in technology or projections that result in changed calculations without actual changes on the ground (e.g., a switch in geodetic systems from the North American Datum of 1927 to the North American Datum of 1983);
- moving a road closure location a short distance (e.g., to the nearest intersection or turnout) to a better location to allow turn-arounds that provide for public safety, to reduce vandalism, or to improve enforcement of the road closure;
- exchanging, acquiring, buying, or selling lands by the agency;
- a change in an open road that is necessary to comply with Federal laws (e.g., the Architectural Barriers Act of 1968, as amended);
- motorized use for mining activities (as authorized under the Mining Law of 1872) and oil and gas activities (as authorized under the Federal Onshore Oil and Gas Leasing Reform Act of 1987) because these types of permitted resource development are subject to existing rights and have a separate set of standards and guidelines;

- a change in an open road that is necessary to address grizzly bear-human conflicts, human safety concerns, or resource damage or concerns (e.g., a road paralleling a stream may be decommissioned and replaced by a new upslope road to reduce water quality impacts);
- motorized use for emergency situations as defined by 36 CFR § 218.21;
- temporary roads (see glossary).

Grizzly Bear Monitoring

Plan monitoring questions and indicators for grizzly bear

Monitoring Question	Plan Component(s)	Potential Indicator(s)
MON-NCDE-01: Within the NCDE primary conservation area, what is the level of secure core, open motorized route density (> 1 square mile) and total motorized route density (> 2 square miles) within each bear management subunit during the non-denning season?	**FW-STD-IFS-02**	**IND-WLD-** For each grizzly bear subunit in the PCA: **01**. Open motorized route density percentage **02**. Total motorized route density percentage **03**. Secure core percentage
MON-NCDE-02: Within the NCDE PCA, what is the number and overnight capacity of developed recreation sites designed and managed for overnight use on NFS lands within each bear management unit, and how does this compare to the baseline? Within the NCDE primary conservation area, what is the status of administrative sites, day-use developed recreation sites, and trailheads in each bear management unit?	**FW-STD-REC-01** **FW-GDL-REC-01**	**04.** Number of developed recreation sites (NCDE definition) managed for overnight use in each grizzly bear management unit. **05.** Capacity of sites managed for overnight developed recreation use in each grizzly bear management unit. **06.** If increases in number or capacity occur, measures used to reduce the risk of grizzly-bear human conflicts. **07.** Number of new administrative sites, day-use developed recreation sites or trailheads (NCDE definition) in each grizzly bear management unit.
MON- NCDE-03: Within the NCDE primary conservation area, is there a change in the number of allotments? Have conflicts occurred between grizzly bears and livestock on NFS lands?	**FW-STD-GR-05**	**IND-WLD-** **08**. Number of livestock allotments in the PCA (by livestock type). **09**. Permitted animal unit months for sheep allotments. **10.** Number of grizzly bear-livestock conflicts on NFS lands by grizzly bear management zone (e.g., PCA, DCA) and livestock type.
MON- NCDE-04: If new leasable and locatable mineral activities occur in the PCA, do the record of decision and permit/plan of operation include a monitoring plan for changes in habitat and/or measures to avoid, minimize, or mitigate environmental impacts to grizzly bears or their habitat?	**FW-STD-E&M-01, 03 through 06**	**IND-WLD-** **11**: Number of permits authorized in the PCA and mitigation measures included in the permit/plan of operations where it is determined there is potential for adverse effects to the grizzly bear population or its habitat resulting from leasable or locatable mineral activities.

Monitoring Question	Plan Component(s)	Potential Indicator(s)
MON- NCDE-05: Within the NCDE primary conservation area, what is the status of grizzly bear subunits that have temporary increases in motorized access due to projects (see glossary)?	**FW-STD-IFS-03**	**IND-WLD-** **12**. Percent change in the 10-year running average of open motorized route density, total motorized route density, and secure core for each subunit that has had temporary increases in projects (see appendix C for examples of methods). If the 10-year running average allowed by FW-STD-IFS-03 is exceeded, what are the reasons?
MON-NCDE-06: Within the NCDE primary conservation area, are projects (see glossary) completed within the five-year time period specified by guideline FW-GDL-IFS-01?	**FW-GDL-IFS-01**	**IND-WLD-** **13**. For each grizzly bear subunit in the PCA with a project (see glossary): Number of years to complete a project (see the definition of "project (in grizzly bear habitat in the NCDE)" in the glossary). If an extension to a project beyond five years is necessary, what is the reason?
MON-NCDE-07: In the Salish DCA, what is the density of roads and motorized trails on NFS lands that are open to public use during the non-denning season? In zone 1 outside the Salish DCA, what is the density of roads on NFS lands that are open to public use during the non-denning season?	**GA-SM-STD-01**	**IND-WLD-** **14.** Density of roads and motorized trails on NFS lands in the DCA that are open to public motor vehicle use during the non-denning season. **15.** Density of roads on NFS lands in zone 1 outside the DCA that are open to public motor vehicle use during the non-denning season.
MON-NCDE-08: What is the risk of human disturbance in areas modeled as grizzly bear denning habitat during the den emergence time period (see glossary)?	**FW-STD-REC-05**	**IND-WDL-** **16.** Percentage of modeled grizzly bear denning habitat where public motorized over-snow vehicle use is allowed during the den emergence time period (MFWP model for the NCDE or subsequent updates)

NCDE Glossary

administrative site a location or facility constructed for use primarily by government employees to facilitate the administration and management of public lands. Examples on National Forest Service lands include, but are not limited to, ranger stations, warehouses, and guard stations.

administrative use a generic term for authorized agency activity. Specifically, in the portion of the NCDE for grizzly bears mapped as the primary conservation area, motorized use of roads closed to the public is permitted for Federal agency personnel or personnel authorized to perform duties by appropriate agency officials, as long as it does not exceed either 6 trips (3 round trips) per week OR one 30-day unlimited use period during the non-denning season (see **non-denning season**).

baseline the baseline for the NCDE is defined as conditions as of December 31, 2011, as modified by changes in numbers that were evaluated and found to be acceptable through the Endangered Species Act Section 7 consultation with USFWS while the grizzly bear was listed as Threatened. The baseline will be updated to reflect changes allowed under the standards and guidelines.

bear management subunit an area of a bear management unit, in the portion of the NCDE for grizzly bears mapped as the primary conservation area, representing the approximate size of an average annual female grizzly bear home range (e.g., 31-68 mi^2 [Mace and Roberts 2012]).

bear management unit an area about 400 m^2, in the portion of the NCDE for grizzly bears mapped as the primary conservation area that meets yearlong habitat needs of both male and female grizzly bears.

best management practice (BMP) the method(s), measure(s), or practice(s) selected by an agency to meet its nonpoint source control needs. BMPs include but are not limited to structural and nonstructural controls and operation and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (36 CFR 219.19).

boneyard an established site that is used by a grazing permittee for disposing of entire animal carcasses.

capacity (of developed recreation sites within the NCDE primary conservation area) the number of sites available in a campground; or the number of rooms available for lodging (as a commercial rental); or the number of cabins, bunkhouses or recreation residences available for overnight use (managed under a special use permit).

cover the elements of the environment used by an animal for hiding. Cover varies depending upon the species or the time of year and may include a variety of vegetation types as well as topography. The amount and quality of cover needed depends on the animal's size, mobility, and reluctance or willingness to venture into relatively open areas.

demographic connectivity area an area intended to allow female grizzly bear occupancy and potential dispersal beyond the NCDE to other recovery areas.

den emergence time period the spring-time period when a grizzly bear emerges from its den and remains in the vicinity before moving to lower elevations. The den emergence time period occurs at the beginning of the non-denning season. Females with cubs usually emerge later and spend more time (a few days to a few weeks) near the den after emergence, than do male bears.

denning season the typical time period, within the NCDE, during which most grizzly bears are hibernating in dens. There are no restrictions on motorized use related to grizzly bears during the denning season, which occurs:

- west side of the Continental Divide: from 1 December through 31 March.
- east of the Continental Divide: from 1 December through 15 April.

emergency situation a circumstance on National Forest System lands for which immediate implementation of all or part of a decision is necessary for relief from hazards threatening human health and safety or natural resources on those National Forest System or adjacent lands; or that would result in substantial loss of economic value to the Federal Government if implementation of the decision were delayed. (36 CFR 218.21)

grazing allotment a designated area of land that is available for livestock grazing and is represented on a map. A grazing allotment can include National Forest Service (NFS) and non-NFS lands. Permits are issued for the use of allotments or portions of allotments. Allotments may be:

- **active**: Livestock grazing allotments that are in use, including pack and saddle stock allotments.
- **closed**: Areas having suitable livestock range that have been closed to livestock grazing by administrative decision or action.
- **combined**: An allotment that has been combined into another allotment and therefore, no longer exists as an independent allotment.
- **vacant**: An allotment that does not have a current grazing permit issued. (Forest Service Manual 2205)

grazing permit in non-use status a term that applies to livestock numbers. Non-use of a term grazing permit, in whole or in part, must be approved by a Forest Supervisor and is allowed for permittee convenience, resource protection or development, or range research (Forest Service Manual 2231.7).

grazing permit in inactive status all permitted uses have expired, been cancelled, or been waived.

grizzly bear–human conflict an interaction between a grizzly bear and human in which bears either do, or attempt to, injure people, damage property, kill or injure livestock, damage beehives, obtain anthropogenic foods or attractants or agricultural crops.

livestock a type of domestic animal raised for commercial production purposes, e.g., cattle. Small livestock includes animals smaller than a cow, such as sheep, goats, and llamas.

motorized route a National Forest System road or trail that is designated for motorized use on a motor vehicle use map pursuant to 36 CFR 212.51.

motorized use the designation of roads, trails, and areas that are open to motor vehicle use as specified in Federal Register / Vol. 70, No. 216 / Wednesday, November 9, 2005 /36 CFR Parts 212, 251, 261, Travel Management; Designated Routes and Areas for Motor Vehicle Use; Final Rule.

moving window analysis a geographic information system procedure that quantifies the density of roads and trails by incrementally moving a template across a digital map.

net change the difference in a measurement (such as road density) after on-the-ground changes are accounted for pre- and post-project; allows for temporary changes during a project.

no surface occupancy (NSO) a fluid mineral leasing stipulation that prohibits use or occupancy of the land surface in order to protect identified resource values. Lessees may develop the oil and gas or geothermal resources under the area restricted by this stipulation through use of directional drilling from sites outside the no surface occupancy area.

Northern Continental Divide Ecosystem a region identified in the Grizzly Bear Conservation Strategy encompassing about 27.3 million acres of land in western and central Montana that is one of five areas in the lower 48 states where grizzly bear populations occur.

NCDE Coordinating Committee an interagency group that evaluates implementation of the NCDE grizzly bear conservation strategy, promotes the exchange of data and information about the NCDE grizzly bear population among agencies and the public, and makes recommendations to the management agencies regarding implementation of the NCDE grizzly bear conservation strategy. Members of the interagency group may include Montana Fish, Wildlife and Parks; U.S. Fish and Wildlife Service; U.S. Park Service; U.S. Forest Service; APHIS-Wildlife Services; U.S. Geological Survey; U.S. Bureau of Land Management; Blackfeet Tribe, and the Confederated Salish and Kootenai Tribes.

non-denning season the time period when grizzly bears typically are not hibernating:

- west side of the Continental Divide: from 1 April through 30 November.
- east side of the Continental Divide: from 16 April through 30 November.

open motorized route density a moving window analysis calculation that applies to the primary conservation area portion of the NCDE and includes Federal, State, and Tribal roads and motorized trails that are open to wheeled motor vehicle use by the public for any part of the non-denning season. *Note*: Motorized routes closed only by sign or order are considered to be open for purposes of this calculation. See also **moving window analysis**.

primary conservation area an area identified in the NCDE Grizzly Bear Conservation Strategy to be managed as a source area for the grizzly bear population, where continuous occupancy by grizzly bears would be maintained. Habitat within the primary conservation area would receive the most stringent protection. The primary conservation area is the same area as the NCDE grizzly bear recovery zone identified in the Recovery Plan (http://www.fws.gov/mountain-prairie/species/mammals/grizzly/ [U.S. Fish and Wildlife Service 1993]).

project an organized effort to achieve an outcome on National Forest System lands identified by location, tasks, outputs, effects, times, and responsibilities for execution (36 CFR 219.19).

project (in grizzly bear habitat in the NCDE) a project in grizzly bear habitat in the NCDE, for purposes of the motorized access standards and guidelines in the primary conservation area of the NCDE, refers to any temporary activity requiring construction of new roads, temporary roads, reconstruction or opening of restricted roads during the non-denning season, if such use exceeds administrative use levels (see **administrative use**). Activities involving recurring helicopter use (see **recurring helicopter use**) are also considered to be a project.

recreation site a defined, public recreation area. The Forest Service uses two categories for recreation sites: dispersed and developed. Both types may have improvements needed to protect resources such as signs, road closure devices, bear resistant food storage devices, and/or sanitation facilities. Some developed recreation sites are designed and managed for overnight use and some are designed and managed for day-use only (e.g., interpretive signs at roadside pull-outs; trailheads at roadside pull-outs or at road closures; day-use picnic areas or boat launches; ski areas that do not have overnight lodging).

- Developed recreation sites have agency improvements made out of manmade materials that are intended to provide for public recreation and user comfort/convenience. Examples on National Forest Service lands include, but are not limited to: ski areas, campgrounds, sites with cabins, huts, lodges, recreation residences, visitor centers, and trailheads.
- Dispersed recreation sites have minimal to no agency improvements made out of manmade materials. Dispersed sites may include outfitter camps or other primitive camping spots along a road, trail, water body, or at a road closure.

recurring helicopter use a type of helicopter flight that involves multiple trips/passes each day consisting of low-altitude (< 500 m above-ground-level) flights that continues for a duration longer than 48 consecutive hours.

road a motor vehicle route more than 50 inches wide, unless identified and managed as a trail. (36 CFR 212.1, FSM 7705):

1. decommissioned: The stabilization and restoration of an unneeded road to a more natural state (36 CFR 212.1). Decommissioned roads do not count towards Total Motorized Route Density as long as they meet the definition of impassable.
2. forest road or trail: A route wholly or partly within or adjacent to and serving the National Forest Service (NFS) that is necessary for the protection, administration, and utilization of the NFS and the use and development of its resources (36 CFR 212.1 – Definitions)
3. impassable: A road that has been treated in such a manner that the road is blocked and there is little resource risk if road maintenance is not performed on a regular basis (self-maintaining).These roads are not counted in the total motorized route density as long as the road (generally the first 50 to 300 feet) has been treated to make it inaccessible to wheeled motorized vehicles during the non-denning season. Roads may become impassable as a result of a variety of means, including but not limited to one or more of the following: natural vegetation growth, road entrance obliteration, scarified ground, fallen trees, boulders, culvert or bridge removal, etc. Impassable roads may remain on the inventoried road system if use of the road is anticipated at some point in the future. Some, but not all, roads placed in intermittent stored service may be impassable. [GBCS]
4. intermittent stored service/intermittent service road, closed to traffic: The road is in a condition that there is little resource risk if maintenance is not performed.
5. maintenance level: A term for the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria (Forest Service Handbook 7709.59, 62.32)

   Level 1: These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns.

Level 2: Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations.

Level 3: Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities

Level 4: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds

Level 5: Assigned to roads that provide a high degree of user comfort and convenience.

6. National Forest System: A forest road other than a road which has been authorized by a legally documented right-of-way held by a State, county, or other local public road authority (36 CFR 212.1)
7. temporary: A road necessary for emergency operations or authorized by contract, permit, lease, or other written authorization that is not a forest road and that is not included in a forest transportation atlas (36 CFR 212.1). In the NCDE primary conservation area, temporary roads will meet the definition of impassable when no longer needed. [GBCS]

running average a method for computing the average of a stream of numbers for a specified period. A 10-year running average computes the mean for the values in the current year plus the previous 9 years. A running average is commonly used with time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles.

secure core (grizzly bear) an area of the NCDE primary conservation area 500 meters or more from (1) a route open to public wheeled motorized use during the grizzly bear non-denning season, (2) a gated route, or (3) a route closed only with a sign that is greater than or equal to 2,500 acres in size. Roads restricted with physical barriers (not gates), decommissioned roads, impassable roads, temporary roads, over-the-snow motorized routes/areas, and non-motorized trails are allowed within secure core, unless otherwise restricted (e.g., by other national forest plan direction). Note: for suitability for over-the-snow motorized routes/areas during the non-denning season, see Flathead National Forest revised plan figures B-11 and B-12.

total motorized route density a moving window analysis calculation that applies to the primary conservation area portion of the NCDE and includes Federal, State, and Tribal roads and motorized trails that do not meet the definition of an impassable road. See also **moving window analysis**.

zone 1 an area surrounding the grizzly bear primary conservation area in the NCDE, where the intent is to maintain occupancy by grizzly bears, but at expected lower densities than inside the primary conservation area. Zone 1 also includes two demographic connectivity areas.

zone 2 an area adjacent to the grizzly bear zone 1 and/or zone 3 in the NCDE, where grizzly bears, particularly males, would have the opportunity to move between the NCDE and adjacent ecosystems. The intent of the zone 2 area is to allow for resource management and recreational opportunities while responding to grizzly bear-human conflicts with appropriate management actions.

zone 3 the area that primarily consists of areas where grizzly bears do not have enough suitable habitat to support population growth. The intent is that grizzly bear occupancy is not actively discouraged in zone 3 and the management emphasis is on conflict response.

Appendix 5: Flathead National Forest Revised Forest Plan Key Components: Canada Lynx

Introduction

The habitat direction from the Northern Rockies Lynx Management Direction (NRLMD) is retained in this forest plan through standard FW-STD-WL-04. The forest plan will carry forward the objectives, standards, and guidelines that were developed to conserve lynx. The use of the terms “goals,” “standards,” and “guidelines” in the NRLMD is consistent with the definitions of these terms found on pages 4 and 5 of the forest plan. The definition of “objectives” in the NRLMD is consistent with the definition of “desired conditions” in the forest plan. The forest plan thus defines the NRLMD “objectives” as “desired conditions.” The NRLMD plan components are being incorporated by reference throughout the forest plan (e.g., in the terrestrial ecosystems and vegetation, wildlife species, recreation, and infrastructure sections).

Forest-specific modifications to VEG S6 (to add an exception category aimed at protecting mature rust-resistant whitebark pine trees) and HU G11 (for areas identified as suitable for over-snow motorized recreational vehicle use) are indicated in bold type in VEG S6 and HU G11 in this appendix. These plan components are also replicated in the plan as FW-STD-TE&V-02 and FW-GDL-REC-03 because they were modified.

The NRLMD record of decision applies to lynx habitat on National Forest System lands presently occupied by Canada lynx, as defined by the Amended Lynx Conservation Agreement between the Forest Service (FS) and the U.S. Fish and Wildlife Service (FWS) (USDA FS and USDI FWS 2006a). The Flathead National Forest is listed as occupied lynx habitat.

Background

The FWS listed Canada lynx as a threatened species in March 2000, saying the main threat was “the lack of guidance for conservation of lynx and snowshoe hare habitat in National Forest Land and Resource Plans and BLM Land Use Plans” (USDI FWS 2000a). Following the listing, the FS signed a Lynx Conservation Agreement with the FWS in 2001. The FS agreed to consider the Lynx Conservation Assessment and Strategy during project analysis and to not proceed with projects that would be “likely to adversely affect” lynx until the forest plans were amended to conserve the lynx. The Lynx Conservation Agreement was renewed in 2005 and again in 2006, when it was extended for 5 years (until 2011) or until all relevant forest plans had been updated (USDA FS and USDI FWS 2000, 2005, 2006a, 2006b).

In 2007, the Northern Rockies Lynx Management Direction amended the existing forest plans of 18 national forests in Montana, Idaho, Wyoming, and Utah, including the Flathead National Forest. The record of decision was signed by the regional foresters of the Northern Region, Intermountain Region, and Rocky Mountain Region on March 23, 2007.[7]

The purpose of the NRLMD was to incorporate management direction in forest plans that conserves and promotes recovery of Canada lynx by reducing or eliminating adverse effects from land management activities on National Forest System lands while preserving the overall multiple use direction in existing forest plans.

The NRLMD relied upon the scientific information and recommendations in:

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[7] The NRLMD final environmental impact statement and record of decision are available at https://www.fs.usda.gov/detail/r1/landmanagement/resourcemanagement/?cid=stelprdb5160650.

- Ecology and Conservation of Lynx in the United States (Ruggiero et al. 2000), which summarized lynx ecology;
- Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000), which recommended conservation measures for activities that could place lynx at risk by altering their habitat or reducing their prey;
- The Canada Lynx Recovery Outline issued by the FWS on Sept. 12, 2005 (USDI Fish and Wildlife Service 2005); and
- Numerous publications cited in the NRLMD final environmental impact statement and record of decision.

Subsequent to adoption of the NRLMD, several key pieces of new information have become available. These include

1. a final rule designating lynx critical habitat prepared by the FWS in 2014[8];
2. an update to the Lynx Conservation Assessment and Strategy prepared by the Interagency Lynx Biology Team in 2013[9]; and
3. additional published scientific information about lynx and lynx habitat.

Monitoring information from the 10 years of implementation of the NRLMD has also been compiled. We considered and addressed this new information in the following ways.

- The revised forest plan includes additional plan components that affect Canada lynx and their critical habitat, consistent with the 2012 planning rule.
- The final environmental impact statement and the biological assessment for the revised forest plan describe critical habitat, which is the primary constituent element identified in the FWS's final rule for critical habitat, and analyze the effects of the alternatives on critical habitat unit #3, including the Flathead National Forest.
- A full revision of the LCAS was completed in 2013. The 2013 LCAS states the intent to provide updated information that may serve to inform updates or refinements of existing land management plans (p. 89). The revised forest plan final environmental impact statement and biological assessment referenced the 2013 LCAS and carefully considered conservation measures that are applicable to core areas.
- New scientific information about lynx and lynx habitat was extensively reviewed and cited in the final environmental impact statement and biological assessment.
- Monitoring information regarding fuels treatment and vegetation management conducted based upon exemptions and exceptions to the standards has been compiled each year since approval of the NRLMD and has been reported to the FWS. Monitoring indicates that the Forest has remained well within the limits required under the terms and conditions of the incidental take statement since the NRLMD was implemented.

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[8] USFWS (2014), Final environmental assessment: Revised designation of critical habitat for the contiguous United States distince population segment of the Canada lynx, retrieved from https://www.fws.gov/mountain-prairie/es/canadaLynx.php.

[9] Interagency Lynx Biology Team (2013), Canada lynx conservation assessment and strategy (3rd ed.), USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service, Forest Service Publication R1-13-19, Missoula, MT, retrieved from https://www.fs.fed.us/biology/resources/pubs/wildlife/index.html.

- For the Forest's final environmental impact statement and biological assessment, the estimated acres of vegetation management treatments that may occur in lynx habitat were updated to reflect a 15-year time period following implementation of the revised forest plan. The FWS considered this information in preparing its biological opinion.

The following NRLMD is being incorporated into the Flathead National Forest plan. Changed language in VEG S6 and HU G11 is indicated in bold.

Northern Rockies Lynx Management Direction

This management direction includes a goal, objectives, standards, and guidelines related to all activities (ALL), vegetation management (VEG), grazing management (GRAZ), human uses (HU), and linkage (LINK).

GOAL[14][10]

Conserve the Canada lynx.

All Management Practices and Activities (ALL)

The following objectives, standards, and guidelines apply to all management projects in lynx habitat in lynx analysis units (LAUs) in occupied habitat and in linkage areas, subject to valid existing rights. They do not apply to wildfire suppression, or to wildland fire use.

Objective[30] ALL O1

Maintain[26] or restore[40] lynx habitat[23] connectivity[16] in and between LAUs[21], and in linkage areas[22].

Standard[44] ALL S1

New or expanded permanent development[33] and vegetation management[49] projects[36] must maintain[26] habitat connectivity[16] in an LAU[21] and/or linkage area[22].

Guideline[15] ALL G1

Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways[18] or forest highways[12] across federal land. Methods could include fencing, underpasses, or overpasses.

Standard[44] LAU S1

Changes in LAU[21] boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.

Vegetation Management Activities and Practices (VEG)

The following objectives, standards, and guidelines apply to vegetation management projects[36] in lynx habitat within lynx analysis units (LAUs) in occupied habitat. With the exception of Objective VEG O3 that specifically concerns wildland fire use, the objectives, standards, and guidelines do not apply to wildfire suppression, wildland fire use, or removal of vegetation for

[10] Note: In this section, superscript numbers refer to numbered definitions in the glossary.

permanent developments such as mineral operations, ski runs, roads, and the like. None of the objectives, standards, or guidelines apply to linkage areas.

Objective[30] VEG O1

Manage vegetation[49] to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.

Objective VEG O2

Provide a mosaic of habitat conditions through time that support dense horizontal cover[19], and high densities of snowshoe hare. Provide winter snowshoe hare habitat[51] in both the stand initiation structural stage and in mature, multi-story conifer vegetation.

Objective VEG O3

Conduct fire use[11] activities to restore[40] ecological processes and maintain or improve lynx habitat.

Objective VEG O4

Focus vegetation management[49] in areas that have potential to improve winter snowshoe hare habitat[51] but presently have poorly developed understories that lack dense horizontal cover.

Standard[44] VEG S1

Where and to what this applies: Standard VEG S1 applies to all vegetation management[49] projects[36] that regenerate[38] forests, except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). *In addition, fuel treatment projects may not result in more than three adjacent LAUs exceeding the standard.*

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The standard: Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages[45] limit disturbance in each LAU as follows:

If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects[36].

Standard VEG S2

Where and to what this applies: Standard VEG S2 applies to all timber management[47] projects[36] that regenerate[38] forests, except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The standard: Timber management[47] projects[36] shall not regenerate[38] more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period.

Standard VEG S5

Where and to what this applies: Standard VEG S5 applies to all precommercial thinning[35] projects[36], except for fuel treatment[13] projects36 that use precommercial thinning as a tool within the wildland urban interface50 (WUI) as defined by HFRA17, subject to the following limitation:

Fuel treatment projects[36] within the WUI50 that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The Standard: Precommercial thinning projects[36] that reduce snowshoe hare habitat may occur from the stand initiation structural stage[45] until the stands no longer provide winter snowshoe hare habitat only:

1. Within 200 feet of administrative sites, dwellings, or outbuildings; or
2. For research studies[39] or genetic tree tests evaluating genetically improved reforestation stock; or
3. Based on new information that is peer reviewed and accepted by the regional level of the Forest Service, and state level of FWS, where a written determination states:
   a. that a project[36] is not likely to adversely affect lynx; or
   b. that a project[36] is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or
4. For conifer removal in aspen, or daylight thinning[5] around individual aspen trees, where aspen is in decline; or
5. For daylight thinning of planted rust-resistant white pine where 80 % of the winter snowshoe hare habitat[51] is retained; or
6. To restore whitebark pine.

Exceptions 2 through 6 shall only be utilized in LAUs where Standard VEG S1 is met.

Standard VEG S6

Where and to what this applies: Standard VEG S6 applies to all vegetation management[49] projects[36] except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 shall occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI50 see guideline VEG G10.

The Standard: Vegetation management projects[36] that reduce snowshoe hare habitat in multi-story mature or late successional forests[29] may occur only:

1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or
2. For research studies[39] or genetic tree tests evaluating genetically improved reforestation stock; or
3. For incidental removal during salvage harvest[42] (e.g. removal due to location of skid trails).
4. **For noncommercial felling of trees larger than sapling size within 200 feet of whitebark pine trees (in stands that contain trees identified for cone/scion/pollen collection) to make whitebark pine more likely to survive wildfires, more resistant to mountain pine beetle attack, and more likely to persist in future environments.**

Exceptions 2, 3, and 4 shall only be utilized in lynx analysis units where standard VEG S1 is met.

Note: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover (e.g., uneven-aged or even-aged management systems could be used to create openings in coniferous forests in the stem exclusion structural stage where there is little understory so that new forage can grow).

Guideline VEG G1

Vegetation management[49] projects[36] should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available.

Priority for treatment should be given to stem-exclusion, closed-canopy structural stage[46] stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat[51] should be near denning habitat[6].

Guideline VEG G4

Prescribed fire[34] activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.

Guideline VEG G5

Habitat for alternate prey species, primarily red squirrel[37], should be provided in each LAU.

Guideline VEG G10

Fuel treatment projects[36] within the WUI[50] as defined by HFRA[17] should be designed considering Standards VEG S1, S2, S5, and S6 to promote lynx conservation.

Guideline VEG G11

Denning habitat[6] should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects[36] should be designed to retain some coarse woody debris[4], piles, or residual trees to provide denning habitat[6] in the future.

Livestock Management (GRAZ)

The following objectives and guidelines apply to grazing projects in lynx habitat in lynx analysis units (LAUs) in occupied habitat. They do not apply to linkage areas.

Objective[30] GRAZ O1

Manage livestock grazing to be compatible with improving or maintaining[26] lynx habitat[23].

Guideline[15] GRAZ G1

In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.

Guideline GRAZ G2

In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.

Guideline GRAZ G3

In riparian areas[41] and willow carrs[3], livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.

Guideline GRAZ G4

In shrub-steppe habitats[43], livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs[21], to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

Human Use Projects (HU)

The following objectives and guidelines apply to human use projects, such as special uses (other than grazing), recreation management, roads, highways, and mineral and energy development, in lynx habitat in lynx analysis units (LAUs) in occupied habitat, subject to valid existing rights. They do not apply to vegetation management projects or grazing projects directly. They do not apply to linkage areas.

Objective[30] HU O1

Maintain[26] the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat[23].

Objective HU O2

Manage recreational activities to maintain lynx habitat and connectivity[16].

Objective HU O3

Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.

Objective HU O4

Provide for lynx habitat needs and connectivity when developing new or expanding existing developed recreation[9] sites or ski areas.

Objective HU O5

Manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat.

Objective HU O6

Reduce adverse highway[18] effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity[16], and to reduce the potential of lynx mortality.

Guideline[15] HU G1

When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris[4], so winter snowshoe hare habitat[51] is maintained.

Guideline HU G2

When developing or expanding ski areas, lynx foraging habitat should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.

Guideline HU G3

Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat[23].

Guideline HU G4

For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.

Guideline HU G5

For mineral and energy development sites and facilities that are closed, a reclamation plan that restores[40] lynx habitat should be developed.

Guideline HU G6

Methods to avoid or reduce effects on lynx should be used in lynx habitat[23] when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.

Guideline HU G7

New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity[16]. New permanent roads and trails should be situated away from forested stringers.

Guideline HU G8

Cutting brush along low-speed[25], low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.

Guideline HU G9

On new roads built for projects[36], public motorized use should be restricted. Effective closures should be provided in road designs. When the project[36] is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.

Guideline HU G10

When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat[10], if it has been identified as a need.

Guideline HU G11

To provide ecological conditions to support Canada lynx on NFS lands at a forestwide scale, there should be no net increase in miles of designated routes for motorized over-snow vehicle use, groomed routes, or areas where motorized over-snow vehicle use is identified as suitable. The "no net increase" is in comparison to the suitability displayed in forest plan figure B-11.

This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.

Guideline HU G12

Winter access for non-recreation special uses and mineral and energy exploration and development, should be limited to designated routes[8] or designated over-the- snow routes[7].

Linkage Areas (LINK)

The following objective, standard, and guidelines apply to all projects within linkage areas in occupied habitat, subject to valid existing rights.

Objective[30] LINK O1

In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat.

Standard[44] LINK S1

When highway[18] or forest highway[12] construction or reconstruction is proposed in linkage areas[22], identify potential highway crossings.

Guideline[15] LINK G1

NFS lands should be retained in public ownership.

Guideline LINK G2

Livestock grazing in shrub-steppe habitats[43] should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.

Required Monitoring

Map the location and intensity of snow compacting activities and designated and groomed routes that occurred inside LAUs during the period of 1998 to 2000. The mapping is to be completed within one year of this decision, and changes in activities and routes are to be monitored every five years after the decision.

When project decisions are signed report the following:

1. Fuel treatments:
    a) Acres of fuel treatment in lynx habitat by forest and LAU, and whether the treatment is within or outside the WUI as defined by HFRA.
    b) Whether or not the fuel treatment met the vegetation standards or guidelines. If standard(s) are not met, report which standard(s) are not met, why they were not met, and how many acres were affected.
    c) *Whether or not 2 adjacent LAUs exceed standard VEG S1 (30% in a stand initiation structural stage that is too short to provide winter snowshoe hare habitat), and what event(s) or action(s) caused the standard to be exceeded.*
2. *Application of exception in Standard VEG S5*
    a) For areas where any of the exemptions 1 through 6 listed in Standard VEG S5 were applied: Report the type of activity, the number of acres, and the location (by unit, and LAU) and whether or not Standard VEG S1 was within the allowance.
3. *Application of exceptions in Standard VEG S6*
    1. For areas where any of the exemptions 1 through 3 listed in Standard VEG S6 were applied: Report the type of activity, the number of acres, and the location (by unit, and LAU) and whether or not Standard VEG S1 was within the allowance.
    2. Application of guidelines

Document the rationale for deviations to guidelines. Summarize what guideline(s) was not followed and why.

Directions in italics were terms and conditions that were incorporated from the FWS Biological Opinion (USDI FWS 2007).

NRLMD Glossary

[1] *Area of consistent snow compaction* – An area of consistent snow compaction is an area of land or water that during winter is generally covered with snow and gets enough human use that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after (within 48 hours) snowfall.

These can be areas or linear routes, and are generally found in or near snowmobile or cross-country ski routes, in adjacent openings, parks and meadows, near ski huts or plowed roads, or in winter parking areas. Areas of consistent snow compaction will be determined based on the acreage or miles used during the period 1998 to 2000.

[2] *Broad scale assessment* – A broad scale assessment is a synthesis of current scientific knowledge, including a description of uncertainties and assumptions, to provide an understanding of past and present conditions and future trends, and a characterization of the ecological, social, and economic components of an area. (LCAS)

[3] *Carr* – Deciduous woodland or shrub land occurring on permanently wet, organic soil. (LCAS)

[4] *Course woody debris* – Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses on the ground or in streams. (LCAS)

[5] *Daylight thinning* – Daylight thinning is a form of precommercial thinning that removes the trees and brush inside a given radius around a tree.

[6] *Denning habitat (lynx)* – Denning habitat is the environment lynx use when giving birth and rearing kittens until they are mobile. The most common component is large amounts of coarse woody debris to provide escape and thermal cover for kittens.

Denning habitat must be within daily travel distance of winter snowshoe hare habitat – the typical maximum daily distance for females is about three to six miles. Denning habitat includes mature and old growth forests with plenty of coarse woody debris. It can also include young regenerating forests with piles of coarse woody debris, or areas where down trees are jack-strawed.

[7] *Designated over-the-snow routes* – Designated over-the-snow routes are routes managed under permit or agreement or by the agency, where use is encouraged, either by on-the- ground marking or by publication in brochures, recreation opportunity guides or maps (other than travel maps), or in electronic media produced or approved by the agency.

The routes identified in outfitter and guide permits are designated by definition; groomed routes also are designated by definition. The determination of baseline snow compaction will be based on the miles of designated over-the-snow routes authorized, promoted or encouraged during the period 1998 to 2000.

[8] *Designated route* – A designated route is a road or trail that has been identified as open for specified travel use.

[9] *Developed recreation* – Developed recreation requires facilities that result in concentrated use. For example, skiing requires lifts, parking lots, buildings, and roads; campgrounds require roads, picnic tables, and toilet facilities.

[10] *Security habitat (lynx)* – Security habitat amounts to places in lynx habitat that provide secure winter bedding sites for lynx in highly disturbed landscapes like ski areas.

Security habitat gives lynx the ability to retreat from human disturbance. Forest structures that make human access difficult generally discourage human activity in security habitats. Security habitats are most effective if big enough to provide visual and acoustic insulation and to let lynx easily move away from any intrusion. They must be close to winter snowshoe hare habitat. (LCAS)

[11] *Fire use* – Fire use is the combination of wildland fire use and using prescribed fire to meet resource objectives. (NIFC) Wildland fire use is the management of naturally ignited wildland fires to accomplish resource management objectives in areas that have a fire management plan. The use of the term wildland fire use replaces the term prescribed natural fire. (Wildland and Prescribed Fire Management Policy, August 1998)

[12] *Forest highway* – A forest highway is a forest road under the jurisdiction of, and maintained by, a public authority and open to public travel (USC: Title 23, Section 101(a)), designated by an agreement with the FS, state transportation agency, and Federal Highway Administration.

[13] *Fuel treatment* – A fuel treatment is a type of vegetation management action that reduces the threat of ignition, fire intensity, or rate of spread, or is used to restore fire- adapted ecosystems.

[14] *Goal* – A goal is a broad description of what an agency is trying to achieve, found in a land management plan. (LCAS)

[15] *Guideline* – A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations may be documented, but amending the plan is not required. (LCAS modified)

[16] *Habitat connectivity (lynx)* – Habitat connectivity consists of an adequate amount of vegetation cover arranged in a way that allows lynx to move around. Narrow forested mountain ridges or shrub-steppe plateaus may serve as a link between more extensive areas of lynx habitat; wooded riparian areas may provide travel cover across open valley floors. (LCAS)

[17] *HFRA (Healthy Forests Restoration Act)* – Public Law 108-148, passed in December 2003. The HFRA provides statutory processes for hazardous fuel reduction projects on certain types of at-risk National Forest System and Bureau of Land Management lands. It also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships. (Modified from Forest Service HFRA web site.)

[18] *Highway* – The word highway includes all roads that are part of the National Highway System. (23 CFR 470.107(b))

[19] *Horizontal cover* – Horizontal cover is the visual obscurity or cover provided by habitat structures that extend to the ground or snow surface primarily provided by tree stems and tree boughs, but also includes herbaceous vegetation, snow, and landscape topography.

[20] *Isolated mountain range* – Isolated mountain ranges are small mountains cut off from other mountains and surrounded by flatlands. On the east side of the Rockies, they are used for analysis instead of sub-basins. Examples are the Little Belts in Montana and the Bighorns in Wyoming.

[21] *LAU (Lynx Analysis Unit)* – An LAU is an area of at least the size used by an individual lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

[22] *Linkage area* – A linkage area provides connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas, where basins, valleys, or agricultural lands separate blocks of lynx habitat, or where lynx habitat naturally narrows between blocks. (LCAS updated definition approved by the Steering Committee 10/23/01)

[23] *Lynx habitat* – Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir, and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat. (LCAS)

[24] *Lynx habitat in an unsuitable condition* – Lynx habitat in an unsuitable condition consists of lynx habitat in the stand initiation structural stage where the trees are generally less than ten to 30 years old and have not grown tall enough to protrude above the snow during winter. Stand replacing fire or certain vegetation management projects can create unsuitable conditions. Vegetation management projects that can result in unsuitable habitat include clearcuts and seed tree harvest, and sometimes shelterwood cuts and commercial thinning depending on the resulting stand composition and structure. (LCAS)

[25] *Low-speed, low-traffic-volume road* – Low speed is less than 20 miles per hour; low volume is a seasonal average daily traffic load of less than 100 vehicles per day.

[26] *Maintain* – In the context of this decision, maintain means to provide enough lynx habitat to conserve lynx. It does not mean to keep the status quo.

[27] *Maintenance level* – Maintenance levels define the level of service provided by and maintenance required for a road. (FSH 7709.58, Sec 12.3) Maintenance level 4 is assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most level 4 roads have double lanes and an aggregate surface. Some may be single lane; some may be paved or have dust abated. Maintenance level 5 is assigned to roads that provide a high degree of user comfort and convenience. Normally, level 5 roads are have double lanes and are paved, but some may be aggregate surfaced with the dust abated.

[28] *Mid-seral or later* – Mid-seral is the successional stage in a plant community that is the midpoint as it moves from bare ground to climax. For riparian areas, it means willows or other shrubs have become established. For shrub-steppe areas, it means shrubs associated with climax are present and increasing in density.

[29] **Multi-story mature or late successional forest – This stage is similar to the old multistory structural stage (see below). However, trees are generally not as old, and decaying trees may be somewhat less abundant.**

[30] *Objective* – An objective is a statement in a land management plan describing desired resource conditions and intended to promote achieving programmatic goals. (LCAS)

[31] *Old multistory structural stage* – Many age classes and vegetation layers mark the old forest, multistoried stage. It usually contains large old trees. Decaying fallen trees may be present that leave a discontinuous overstory canopy. On cold or moist sites without frequent fires or other

disturbance, multi-layer stands with large trees in the uppermost layer develop. (Oliver and Larson, 1996)

[32] *Old growth* – Old growth forests generally contain trees that are large for their species and the site, and are sometimes decadent with broken tops. Old growth often contains a variety of tree sizes, large snags, and logs, and a developed and often patchy understory.

[33] *Permanent development* – A permanent development is any development that results in a loss of lynx habitat for at least 15 years. Ski trails, parking lots, new permanent roads, structures, campgrounds, and many special use developments would be considered permanent developments.

[34] *Prescribed fire* – A prescribed fire is any fire ignited as a management action to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements met, before ignition. The term prescribed fire replaces the term management ignited prescribed fire. (NWCG)

[35] *Precommercial thinning* – Precommercial thinning is mechanically removing trees to reduce stocking and concentrate growth on the remaining trees, and not resulting in immediate financial return. (Dictionary of Forestry)

[36] *Project* – All, or any part or number of the various activities analyzed in an Environmental Impact Statement, Environmental Analysis, or Decision Memo. For example, the vegetation management in some units or stands analyzed in an EIS could be for fuel reduction, and therefore those units or stands would fall within the term *fuel treatment project* even if the remainder of the activities in the EIS are being conducted for other purposes, and the remainder of those units or stands have other activities prescribed in them. All units in an analysis do not necessarily need to be for fuel reduction purposes for certain units to be considered a *fuel reduction project*.

[37] *Red squirrel habitat* – Red squirrel habitat consists of coniferous forests of seed and cone-producing age that usually contain snags and downed woody debris, generally associated with mature or older forests.

[38] *Regeneration harvest* – The cutting of trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, shelterwood, and group selective cuts. (Helms, 1998)

[39] *Research* – Research consists of studies conducted to increase scientific knowledge or technology. For the purposes of Standards VEG S5 and VEG S6, research applies to studies financed from the forest research budget (FSM 4040) and administrative studies financed from the NF budget.

[40] *Restore, restoration* – To restore is to return or re-establish ecosystems or habitats to their original structure and species composition. (Dictionary of Forestry)

[41] *Riparian area* – An area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation. (LCAS)

[42] *Salvage harvest* – Salvage harvest is a commercial timber sale of dead, damaged, or dying trees. It recovers economic value that would otherwise be lost. Collecting firewood for personal use is not considered salvage harvest.

[43] **Shrub steppe habitat – Shrub steppe habitat consists of dry sites with shrubs and grasslands intermingled.**

[44] *Standard* – A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard.

[45] *Stand initiation structural stage* – The stand initiation stage generally develops after a stand-replacing disturbance by fire or regeneration timber harvest. A new single-story layer of shrubs, tree seedlings, and saplings establish and develop, reoccupying the site. Trees that need full sun are likely to dominate these even-aged stands. (Oliver and Larson, 1996)

[46] *Stem exclusion structural stage (Closed canopy structural stage)* – In the stem exclusion stage, trees initially grow fast and quickly occupy all of the growing space, creating a closed canopy. Because the trees are tall, little light reaches the forest floor so understory plants (including smaller trees) are shaded and grow more slowly. Species that need full sunlight usually die; shrubs and herbs may become dormant. New trees are precluded by a lack of sunlight or moisture. (Oliver and Larson, 1996)

[47] *Timber management* – Timber management consists of growing, tending, commercially harvesting, and regenerating crops of trees.

[48] *Understory re-initiation structural stage* – In the understory re-initiation stage, a new age class of trees gets established after overstory trees begin to die, are removed, or no longer fully occupy their growing space after tall trees abrade each other in the wind. Understory seedlings then re-grow and the trees begin to stratify into vertical layers. Alow to moderately dense uneven-aged overstory develops, with some small shade- tolerant trees in the understory. (Oliver and Larson, 1996)

[49] *Vegetation management* – Vegetation management changes the composition and structure of vegetation to meet specific objectives, using such means as prescribed fire or timber harvest. For the purposes of this decision, the term does not include removing vegetation for permanent developments like mineral operations, ski runs, roads and the like, and does not apply to fire suppression or to wildland fire use.

[50] *Wildland urban interface (WUI)* – Use the definition of WUI found in the Healthy Forests Restoration Act. The full text can be found at HFRA § 101. Basically, the wildland urban interface is the area adjacent to an at-risk community that is identified in the community wildfire protection plan. If there is no community wildfire protection plan in place, the WUI is the area 0.5 mile from the boundary of an at-risk community; or within 1.5 miles of the boundary of an at-risk community if the terrain is steep, or there is a nearby road or ridgetop that could be incorporated into a fuel break, or the land is in condition class 3, or the area contains an emergency exit route needed for safe evacuations. (Condensed from HFRA. For full text see HFRA § 101.)

[51] *Winter snowshoe hare habitat* – Winter snowshoe hare habitat consists of places where young trees or shrubs grow densely – thousands of woody stems per acre – and tall enough to protrude above the snow during winter, so snowshoe hare can browse on the bark and small twigs (LCAS). Winter snowshoe hare habitat develops primarily in the stand initiation, understory reinitiation and old forest multistoried structural stages.

Lynx and other Meso-Carnivore Monitoring

Note that Northern Rockies Lynx Management Direction plan components are preceded by VEG and can be found above.

Monitoring Question	Plan Component(s)	Potential Indicator(s)
MON-T&E-LYNX-01: How much of lynx critical habitat does not yet provide PCE1a, but is progressing towards providing PCE1a?	**VEGS1, VEGS2**	**IND-WLD-** **17**: Percentage of lynx critical habitat on NFS lands in each lynx analysis unit that is not yet winter snowshoe hare habitat due to wildfire. **18.** Percentage of lynx critical habitat on NFS lands in each lynx analysis unit that is not yet winter snowshoe hare habitat due to vegetation management projects.
MON-T&E-LYNX-02: What is the percentage of lynx critical habitat that has vegetation treatments in stand initiation hare habitat (PCA1a)?	**VEGS5**	**IND-WLD-** **19**. Number of acres of lynx critical habitat on NFS lands in each lynx analysis unit that were precommercially thinned using exceptions to VEGS5 **20**. Number of acres of lynx habitat or critical habitat on NFS lands in each lynx analysis unit that were precommercially thinned using wildland-urban interface exemptions to VEGS5
MON-T&E-LYNX-03: If modified precommercial thinning techniques are used in lynx critical habitat do they increase PCE1a and/or its persistence?	**VEGS5**	**IND-WLD-** **21**. Number of acres of lynx critical habitat that were treated with modified thinning techniques under VEG S5 exception #2 or 3 **22**. The percentage of dense horizontal cover over time in treatment areas in comparison to untreated plots
MON-T&E-LYNX-04: What is the percentage of lynx critical habitat that has vegetation treatments in multistoried hare habitat (PCE1a)?	**VEGS6**	**IND-WLD-** **23**. Number of acres of multistory hare habitat in lynx critical habitat on NFS lands in each lynx analysis unit that were treated using exceptions to VEGS6 **24**. Number of acres of multistory hare habitat in lynx critical habitat on NFS lands in each lynx analysis unit that were treated using wildland-urban interface exemptions to VEGS6
MON-WL- 17: What is the occupancy of forest meso-carnivores (e.g., lynx, wolverine, fisher) on the Flathead National Forest?	**FW-DC-WL SCC-01** **FW-DC-WL DIV-01**	**IND-WLD-** **75.** Number of each meso-carnivore species detected on the Forest in cooperation with other partners.