Biological Assessment
for Threatened, Endangered, and Proposed Species

Revised Forest Plan for the Flathead National Forest

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List of Terms and Abbreviations

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

Abbreviation	Description
BA	biological assessment
BO	biological opinion
CFR	Code of Federal Regulations
d.b.h.	diameter at breast height
DC	desired condition (forest plan component)
DCA	demographic connectivity area
EIS	environmental impact statement
ESA	Endangered Species Act
FW	forestwide (forest plan component)
GA	geographic area
GBCS	Grizzly Bear Conservation Strategy
GDL	Guideline (forest plan component)
GIS	geographic information system
INFISH	Inland Native Fish Strategy
MA	management area
mi	mile
mmbf	million board feet
mmcf	million cubic feet
MFWP	Montana Fish Wildlife and Parks
NCDE	Northern Continental Divide Ecosystem
NEPA	National Environmental Policy Act
NFS	National Forest System
NRLMD	Northern Rockies Lynx Management Direction
PACFISH	Pacific Fish Strategy
PCA	primary conservation area
PIBO	PACFISH/INFISH Biological Opinion
STD	standard (forest plan component)
TMDL	total maximum daily load
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

Federally Designated Species and Designated Critical Habitat

In accordance with section 7(c) of the Act, the U.S. Fish and Wildlife Service has determined that the following federally designated species may be present on the Flathead National Forest (table 1) (08/04/2017):

Table 1. 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, 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 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*	Proposed	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.

Summary of Findings

Section 7 consultation does not include candidate species. The determinations for proposed species, threatened species, and designated critical habitat are summarized below.

Terrestrial Wildlife Species

The proposed framework programmatic action *may affect, is likely to adversely affect* Canada lynx and designated Canada lynx critical habitat. The proposed framework programmatic action *may affect, is likely to adversely affect* grizzly bear. The proposed framework programmatic action *may affect, is not likely to jeopardize* the wolverine.

Aquatic Species

The proposed framework programmatic action *may affect, is likely to adversely affect* bull trout and designated bull trout critical habitat. The proposed framework programmatic action will have *no effect* on meltwater stonefly.

Plant Species

The proposed framework programmatic action *may affect, is not likely to adversely affect* water howellia. The proposed framework programmatic action will have *no effect* on Spalding's catchfly.

Introduction

This programmatic biological assessment addresses the effects of implementing the revised Land and Resource Management Plan (hereinafter referred to as the "revised forest plan") on all threatened, endangered, and proposed species known or suspected to occur on the Flathead National Forest. For ease of discussion throughout this document, the Flathead National Forest will be referred to as "the Forest" when referencing the single administrative unit, the staff that administers the unit, or the National Forest System (NFS) lands within the unit.

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

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

Purpose and Need

The purpose of the proposed federal action (preferred alternative B-modified) is to revise the Flathead National Forest Land and Resource Management Plan (1986, as amended; hereinafter referred to as the "1986 forest plan"). The revised forest plan provides direction for the management of the Forest by guiding programs, practices, uses, and projects.

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

The revised forest plan provides guidance for project and activity-level decision making on the Forest for the next 15 years, approximately. This guidance includes:

1. Forestwide 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).

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

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

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

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

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

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

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

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

The revised forest plan would guide natural resource management activities on the Forest 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. For example, site-specific analysis in compliance with the National Environmental Policy Act would need to be conducted in order for prohibitions or activities to take place on the ground that are in compliance with the broader direction of the forest plan. The revised forest plan is expected to provide guidance for project- and activity-level decision making on the Forest for approximately the next 15 years.

In addition, there is a need to incorporate habitat-related direction from the Northern Continental Divide Ecosystem (NCDE) Grizzly Bear Conservation Strategy into multiple forest plans so that the USFS will be able to demonstrate to the U.S. Fish and Wildlife Service (hereinafter referred to as "the Service" or USFWS) that adequate regulatory mechanisms exist in the forest plans to support a delisted grizzly bear population. In 2013, the Service announced the availability of a draft Grizzly Bear Conservation Strategy (hereinafter referred to as the GBCS) for the NCDE grizzly bear population for public review and input. The NCDE conservation strategy 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 national forests will implement direction related to habitat management on National Forest System (hereinafter referred to as NFS) lands in the NCDE to contribute to sustaining the recovery of the NCDE grizzly bear population. When finalized, the GBCS would become the post-delisting management plan for the NCDE grizzly bears and their habitat.

Forest Plan Direction

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

Within the requirements set forth in the 2012 planning rule, land management plans provide a programmatic framework and the sideboards to guide decisions for all natural resource management activities on their respective NFS units. Plans include plan components (desired conditions, objectives, standards, guidelines, and suitability of areas) that influence the design and choice of future proposals for projects and activities in a plan area, and 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.

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

The purpose of the 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; usually it would contribute to one or a subset.

Plan components

Plan components guide future projects and activities and the plan monitoring program. Plan components are not commitments or final decisions approving projects or activities. Some plan components have also been designed to address drivers and stressors of ecosystems.

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

- the level of direction (e.g., forestwide = 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 forestwide direction), e.g., WTR = watersheds and TE&V = terrestrial ecosystems and vegetation; and
- a unique number (i.e., numerical order starting with "01").

Thus, forestwide 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).

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

Management, geographic, and designated areas

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

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).

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 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.

This plan presents three types of desired conditions, as follows:

- Forestwide desired conditions apply across the landscape but may be applicable to specific areas as designated on a map.
- 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 help us clarify what outcomes might be expected in land areas with different general suitability descriptions.
- 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 forestwide desired conditions. These desired conditions allow us to focus on specific circumstances in specific geographic locations. The Forest is divided into six geographic areas (see Figure B-1).

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 219.7(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 forestwide or specific to management areas or geographic areas. Refer also to appendix C: Potential Management Approaches and Possible Actions 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 forestwide 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 forestwide or specific to a management area or a geographic area.

Suitability of lands

Specific lands within the Forest are identified as suitable for various multiple uses or activities based on the desired conditions applicable to those lands. The plan identifies lands within the Forest 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, the lands on the Forest 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.

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 of the revised forest plan 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.

Proposed Action

The Flathead National Forest proposes to revise its Land and Resource Management Plan. The revised forest plan proposes to designate seven different management area categories across the Forest (see table 2 and table 3). In general, the areas can be described as: areas with wilderness characteristics (management area 1); wild and scenic rivers (management area 2); special areas, e.g., areas with botanical interest (management area 3); research natural areas and experimental forests (management area 4); backcountry areas (management area 5); general forest areas (management area 6); and focused recreation areas (management area 7). Allocation to any specific management area is not intended to mandate or direct the agency to propose or implement any site-specific action and but allows for an array of different uses.

The revised forest plan was also developed to supplement or replace parts of the existing forest plan that were determined to be outdated, ineffective, or absent. Many components of the existing plan are effective at directing management and providing protection for natural resources and were subsequently retained through the revision process, in part or in whole. See the "plan element summary" section of this document for more details.

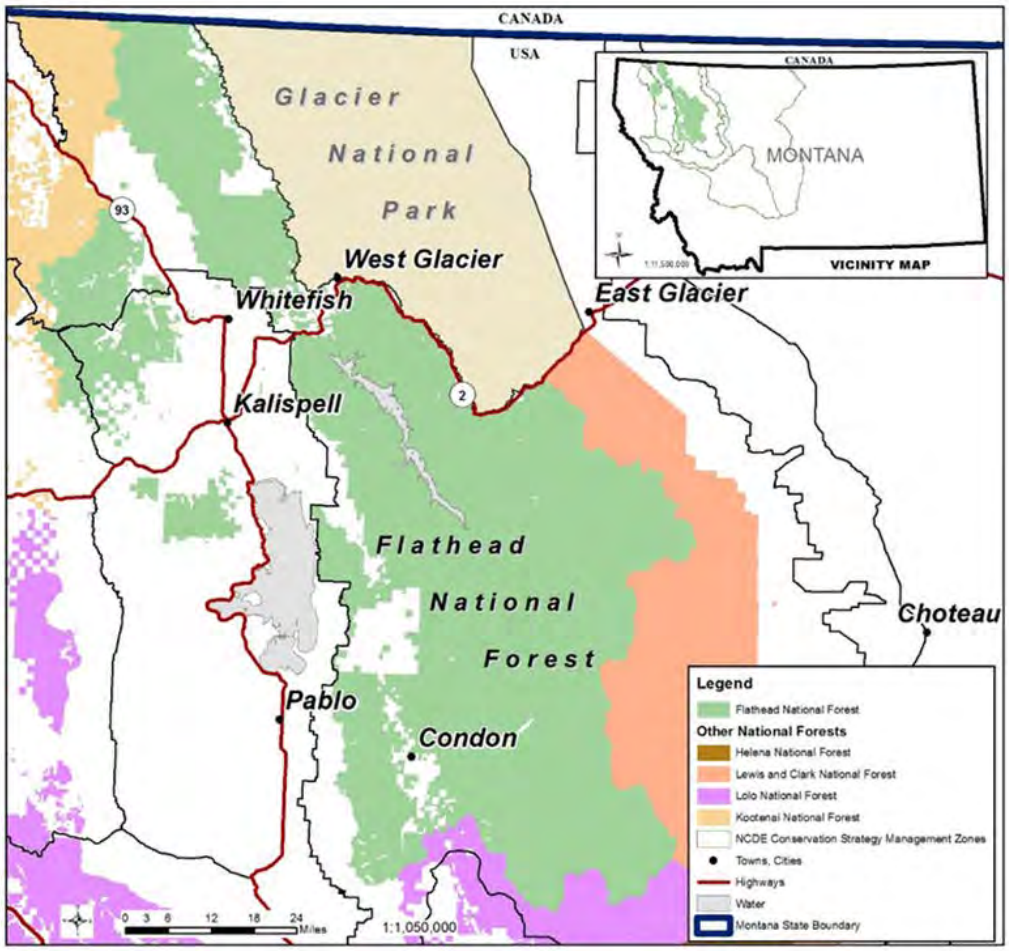


Figure 1. Flathead National Forest and vicinity

Action Area

The Flathead National Forest (figure 1) is at the heart of the northern Rocky Mountain ecosystem and is encircled by the Kootenai, Helena-Lewis and Clark, and Lolo National Forests; Glacier National Park; and Canada. 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.

Programmatic Decision

The revised forest plan is programmatic in scope. It provides the framework for future site-specific actions that are subject to section 7 consultation but does not authorize, fund, or carry out future site-specific actions. Future project-level activities must be consistent with the direction in the revised forest plan and must undergo their own National Environmental Policy Act (NEPA) planning and decision-making procedures, including the appropriate Endangered Species Act (ESA) section 7 consultation. 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.

Consultation History

Because the scope of the revised forest plan is much broader than that for the forest plan amendments, two separate biological assessments are being prepared concurrently, one for the Flathead National Forest's revised forest plan and one for the amendments of the other NCDE national forests. The record of consultation for the revised forest plan is found in appendix A. The following is a synopsis of key ESA Section 7 consultations completed on the current forest plan, as amended.

The Flathead National Forest Plan was approved in 1986, after receiving a May 15, 1985, biological opinion (BO) that implementation of the Forest Plan would not be likely to jeopardize the continued existence of threatened and endangered species, including the NCDE grizzly bear population. In 1989, the Service amended the BO to include an incidental take statement, in conformance with changes to 50 CFR part 402. On February 17, 1995, the Service issued a final BO on Amendment 19 of the forest plan with an incidental take statement regarding access management and grizzly bears. Subsequently, an access management strategy was developed specifically for intermingled lands in the Swan Valley managed by the Flathead National Forest, Montana Department of Natural Resources and Conservation, and Plum Creek Timber Company (Plum Creek et al., 1997). The Service issued a BO and incidental take statement for this strategy, known as the Swan Valley Grizzly Bear Conservation Agreement, on December 4, 1995 (USFWS, 1995c).

The Forest reinitiated consultation on the A19 implementation schedule in 2004 (S. Anderson, 2005; USDA, 2004b). On October 25, 2005, the Service issued a biological opinion (BO) on the effects of the revised implementation schedule for Flathead National Forest Plan amendment 19 on grizzly bears (hereafter "A19") (USDA, 1994, 1995a, 1995b; USFWS, 1995b, 1995d). The 2005 consultation examined projections of the period through the end of 2009 and the access improvements to be accomplished during that period, as well as additional access changes per recent project decisions through 2011, and analyzed the effects on grizzly bears (USFWS, 2005a). The Service anticipated that additional formal consultation would be required at that time to address the outstanding access changes required by A19.

In March of 2006, the Service issued a BO on Amendment 24 of the Forest Plan with an incidental take statement regarding winter (over-snow) motorized access management (USDA, 2004a; USDC-Missoula, 2010; USFWS, 2006b). On May 28, 2008, the District Court issued an order (CV 06-73-M-DWM) setting aside the biological opinion on A24. In December 2008, the Service issued a final biological opinion on the proposed Winter Motorized Recreation Forest Plan Amendment for the Flathead National Forest (hereafter "A24").

On June 2, 2006, the Service issued a BO and incidental take statement regarding the effects of the continued implementation of the Flathead National forest plan on federally listed species, including grizzly bears. The 2006 BO focused on the effects of forest plan direction related to access management, sanitation/food storage and livestock grazing on grizzly bears occurring on the Forest outside the recovery zone, as well as the effects of forest plan direction related to sanitation/food storage and livestock grazing on grizzly bears occurring on the Forest within the recovery zone.

The Forest reinitiated consultation on the A19 implementation schedule in 2009 (S. Anderson, 2009). On May 15, 2012, the Service issued an updated amended incidental take statement for grizzly bears based on updated information on the environmental baseline provided by the Flathead National Forest. The Service concluded that continued implementation of the forest plan is not likely to jeopardize the continued

existence of the grizzly bear. The Service based this conclusion on the information presented in the 2005 BA (A. Jacobs, 2005), the 2006 BO (USFWS, 2006a), the new information on the status of the species, and the new information received from the Forest in 2011 updating the environmental baseline (USDA, 2011b).

On January 31, 2014, the Service issued a BO on the effects of the revised implementation schedule for Flathead National Forest Plan Amendment 19 on grizzly bears (USFWS, 2014c). In this most recent biological opinion, the Service acknowledged that by 2018, all access changes required by A19 would not likely be met. The Service anticipated that additional Section 7 consultation would occur by 2018 to address a proposed action for revision of the Forest Plan, and their biological opinion provided for incidental take until the Forest consulted on a revised forest plan or until 2018, whichever came first. A revised forest plan would replace the current plan (as amended) and guide all access management on the Forest for as long as the new plan is in effect. All consultations received non-jeopardy opinions from the Service.

With respect to Canada lynx, the Service issued three programmatic BOs following listing: one on the existing national forest land and resource management plans (October 25, 2000), one on Montana ski areas (February 9, 2001), and one on the Northern Rockies lynx amendment of 18 national forest land and resource management plans (March 19, 2007). The Northern Rockies Lynx Management Decision (NRLMD) incorporated management direction that conserves and promotes recovery of Canada lynx, by reducing or eliminating adverse effects from land management activities. The BO and incidental take statement addressing effects to the contiguous U.S. distinct population segment of Canada lynx was issued by the Service on March 19, 2007. All consultations received non-jeopardy opinions from the Service. USFS Region 1 is in the process of consulting on the NRLMD for effects to critical habitat.

With respect to *Howellia aquatilis,* the Service issued a biological opinion on Amendment 20 to the forest plan on February 22, 1996. Amendment 20 ("A20") added objectives and standards to guide management of this plant's habitat, including adoption of the conservation strategy for water howellia (USDA, 1996). The Service concurred with the Forest's determination that the forest plan, as amended by A20, was not likely to adversely affect and was not likely to jeopardize the continued existence of water howellia on the Flathead National Forest and would promote the conservation of the species.

With respect to bull trout, the 1986 forest plan was amended by INFISH in 1995 and a biological opinion received by the Service in 1998 for all forests within the range of bull trout. On November 20, 2003, the Forest completed a BA and biological evaluation (BA/BE) for aquatic species associated with the A19 Revised Implementation Schedule. The forest determined the Revised Implementation Schedule would have "no effect" on Endangered Species Act-listed aquatic species or their habitats. The BA and "no effect" determination were challenged in Federal Court by environmental organizations claiming a violation of provisions of the Endangered Species Act. The Forest requested a remand of its November 20, 2003, BA/BE to reconsider the rationale that led to the 2003 "no effect" determination.

In May 2008, the Forest submitted a BA that re-evaluated the 2003 "no effect" determination for bull trout and further considered results of road and culvert surveys that revealed culvert failures on the existing road network. The Forest stated that although it is difficult to ascertain whether compliance with the original A19 schedule would have prevented such failures, in part because the site-specific roads were not identified in the original schedule, in theory fewer roads and road crossings result in reduced risks and threats to bull trout. In addition, the Forest acknowledged that leaving roads that remain on the landscape without appropriate maintenance can adversely affect bull trout. The 2008 BA had a "May Affect, Likely to Adversely Affect" determination for bull trout. Due to staffing shortages and other priorities, the Service could not complete the formal consultation process within the allotted time frame (due November 9, 2008). The Service informally requested a 90-day extension in an October 30, 2008, letter from the

Service's Montana Field Office Supervisor to the Flathead National Forest Supervisor. The Forest concurred in a letter dated November 13, 2008.

The forest re-evaluated the 2008 BA and re-submitted a BA for the revised implementation schedule of A19 in June 2010 with a "May Affect, Likely to Adversely Affect" determination for bull trout. A BO was received from the Service on November 22, 2010. In the BO, the Service determined that this level of anticipated take is not likely to result in jeopardy to bull trout or destruction or adverse modification of critical habitat.

On October 18, 2010, the Service posted the "Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for Bull Trout in the Coterminous United States: Final Rule" in the *Federal Register* ("Final Rule"). 75 Fed. Reg. 63898 (October 18, 2010). The final rule designated bull trout critical habitat in certain portions of rivers across Montana, Idaho, Nevada, Oregon, and Washington. The forest consulted on and received concurrence for effects of ongoing projects in bull trout critical habitat in 2015.

Description of the Preferred Alternative—B Modified

Alternative B modified has been identified as the preferred alternative for the FEIS. Alternative B modified is the result of public engagement efforts since 2013 and responds to the identified purpose of and need for the revised forest plan. This alternative emphasizes moving towards desired future conditions and contributing to ecological, social, and economic sustainability.

Vegetation management, timber production, and fire and fuels management

Desired conditions for vegetation are based on maintaining and promoting forest conditions that are resilient in the face of potential future disturbances and climate change and that contribute to social and economic sustainability. Under alternative B modified, 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 and shrublands, whitebark pine.. Fens and other unique botanical or geological areas are given special emphasis by designation as special areas (management area 3b).

Timber harvest is conducted to provide for societal goods and to move the vegetation towards desired conditions. Approximately 465,200 acres (about 20 percent of the Forest) are suitable for timber production. Under alternative B modified, with the budget constrained 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. The intensity of management of lands suitable for timber production varies by management area (see description of timber management in the forest plan for each management area). Management areas 4b and 6c emphasize a higher intensity of management while management area 6b is more moderate. The intensity of timber management in management area 7 varies, depending on the site. Alternatives B Modified has approximately 52 percent of lands suitable for timber production allowing for a moderate level of intensity of management while 48 percent allows for more intense management.

In addition to lands suitable for timber production, timber harvest is allowable on some lands not suitable for timber production, for such purposes as salvage, fuels management, insect and disease mitigation, protection or enhancement of wildlife habitat, to perform research or administrative studies, or recreation and scenic-resource management. Acres where timber harvest is allowed on land *not* suitable for timber production are about 429,300 (about 18 percent of the Forest). Under alternatives B modified, approximately one-half of these acres are comprised of inventoried roadless areas. Timber harvest on all NFS lands would have to be consistent with other plan management direction.

Wildlife and fish habitat

Alternative B modified has forestwide desired conditions, objectives, suitability, standards, and/or guidelines to support long-term persistence of species listed as threatened, endangered, or species of conservation concern and to support key ecosystem characteristics for other species, such as those that are of interest for hunting, trapping, observing, and subsistence. Diversity is addressed by coarse-filter plan desired conditions and management direction as well as species-specific desired conditions and management direction. This alternative includes 1,072,040 acres (45 percent of the Forest) in designated wilderness (management area 1a), 190,403 acres (8 percent of the Forest) in recommended wilderness (management area 1b), and 317,770 acres (13 percent of the Forest) in backcountry (management areas 5a through 5d), contributing 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. 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 as described throughout the Vegetation section of the revised plan.

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. Alternative B modified 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 percent of the Forest, and mechanized transport (e.g., mountain bikes) would be suitable on about 52 percent of the Forest. 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 net increase of less than 0.1 percent of the Forest acreage. Areas open to motorized over-snow vehicle use during the den emergence time period would be limited to about 3 percent of modeled grizzly bear denning habitat. To reduce the risk of grizzly bear-human conflicts on NFS lands in light of increasing human use of 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. 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

With the proposed action, alternative B modified, there are 8 areas totaling about 190,418 acres recommended for wilderness designation (MA1b)(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.

- 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).

Plan Element Summary

For more details on plan elements, see the following sections of the revised forest 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.

Plan Management Areas

The 1986 Flathead forest plan provided a suite of overarching Forestwide management direction goals, objectives, research needs, desired future conditions, and standards to guide implementation of future land management decisions. To facilitate this, management areas (MAs) were designated across the Forest Please refer to the 1986 forest plan for specific details (USDA, 1986).

Because the 1986 forest plan had a different suite of management areas than the proposed plan, the Forest created a cross-reference to link the 1986 plan management areas to those used in the proposed revised forest plan (table 2).

Allocation to a specific management area does not mandate or direct the Forest Service to propose or implement any action. The management areas provide additional direction that is specific to individual parcels of land within the Flathead National Forest that represent a management emphasis for that parcel of land. The management area direction includes desired conditions, standards and guidelines and suitability of certain uses within that MA.

The proposed revised forest plan would designate seven management area categories across the Forest. Management area prescriptions have been grouped into categories that have similar management characteristics. For example, MA1 is broken down into subcategories that represent designated wilderness (MA1a) and recommended wilderness (MA1b). Management areas range from little human-caused alteration to the Forest (MA1, wilderness) and focus on passive management to more human-caused change (MA7, focused recreation areas) and focus on active management. For a more complete description of categories and management areas prescriptions, see the revised forest plan.

Table 2. Proposed Flathead National Forest management areas matched with their equivalent current management areas

Proposed MAs	Category	Description	Current MAs (1986 forest plan)
1a	Wilderness Designated	The Forest manages three Congressionally designated wilderness areas—the Bob Marshall, Great Bear, and Mission Mountains—as part of the National Wilderness Preservation System. If, over the life of this plan, Congress designates any additional wilderness areas on the Forest, those areas would be allocated to this MA.	21, 22
1b	Recommended Wilderness	These areas are recommended as additions to the National Wilderness Preservation System. 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.	Not an MA[1]
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. If, over the life of this plan, Congress designates any additional wild and scenic rivers on the Forest, those areas would be allocated to this MA.	18
2b	Eligible Wild and Scenic Rivers	The river segments and adjacent lands have been identified as eligible for inclusion in the Wild and Scenic Rivers System under the authority granted by the Wild and Scenic Rivers Act of 1968, as amended.	Not an MA[2]
3a	Administrative Areas	These areas are mapped Forest administrative sites.	10

Proposed MAs	Category	Description	Current MAs (1986 forest plan)
3b	Special Areas	These are administratively designated areas that are managed to protect and conserve the values for which they were identified. The Forest currently has one special area, the Condon Creek Botanical Area.	3A
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.	3A
4b	Experimental and Demonstration Forests	Coram Experimental Forest was established in 1933, and its management is the responsibility of the Rocky Mountain Research Station. The Miller Creek Demonstration Forest was set aside in 1989, and its management is the responsibility of the Forest. The 1986 forest plan did not designate the demonstration forest as a management area.	14
5a, 5b, 5c, 5d	Backcountry	These areas provide a variety of backcountry recreational experience, ranging from nonmotorized 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).	1, 2, 2A, 2B, 2C, 3, 11, 11A
6a	General Forest—Low	Timber management is expected to be at a low level of intensity due to other resource conditions, and this area is not suitable for timber production. Most of this area has roads, trails, structures, and other signs of forest management activities, and it provides a variety of recreation opportunities, both motorized and nonmotorized.	13A, 13D, 12
6b and 6c	General Forest—Moderate to High	Timber management is expected to be at a moderate to high level of intensity. This area is suitable for timber production, with timber harvest contributing to regulated timber harvest estimates. This area has roads, trails, structures, and other signs of forest management activities, and it provides a variety of recreation opportunities, both motorized and nonmotorized.	5, 7, 8, 9, 11C, 13, 15, 15A, 15C, 15D, 15E, 16, 16A, 16B, 16C, 17
7	Focused Recreation Areas	These are areas where certain types of recreational uses are featured and receive special attention.	4, 15B, 20

1. The 1986 plan identified areas for recommended wilderness, but they were not designated as a management area. A variety of management areas from the old forest plan occur within recommended wilderness in the revised forest plan.

Table 3 shows the approximate acres in each management area for the 1986 forest plan compared to the revised forest plan preferred alternative. Refer to Figure B-2 for a map of the management areas for the preferred alternative (B modified).

Table 3. Summary of existing management area allocations and proposed action management area allocations (single designation based upon established hierarchy), updated June 5, 2017.

Management Area	Existing plan [b] acres (percent)	Alternative B modified acres (percent)
1a Designated wilderness	1,072,040 (45%)	1,072,040 (45%)
1b Recommended wilderness	98,388 (4%)	190,403 (8%)

Management Area	Existing plan [b] acres (percent)	Alternative B modified acres (percent)
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 nonmotorized 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%)
5a-d Backcountry **Total**	381,685[e] (16%)	316,770 (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 (28%)
7 Focused recreation areas	7,305 (< 1%)[f]	60,888 (3%)
Total **Forest acres**	2,392,807 acres (100%)	2,392,807(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 its own 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.

Management area allocations are consistent with inventoried roadless areas designated under the Roadless Area Conservation Rule (USDA, 2001a). The Roadless Area Conservation Rule prohibits road construction or reconstruction and cutting, selling, or removing timber in inventoried roadless areas unless a listed exemption applies. For example, one exemption allows the cutting, sale, or removal of generally small-diameter timber when it is needed to improve threatened, endangered, proposed, or sensitive species habitat or to maintain or restore the characteristics of ecosystem composition and structure that would be expected to occur under natural disturbance regimes. The forest plan cannot modify Roadless Area Conservation Rule direction.

Inventoried roadless areas of the Forest total about 478,757 acres, which is about 20 percent of the Forest (see Figure B-3). The purpose of changing the management direction for the inventoried roadless areas from the 1986 forest plan is to remove inventoried roadless areas from the lands suitable for timber production, to determine the recreation opportunity spectrum classification, and to delineate the desired management area.

The sections below summarize plan elements specific to the grizzly bear, Canada lynx, bull trout, water howellia, and Spalding's catchfly.

Summary of plan elements for 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).

Habitat conditions and management actions on the Forest have contributed importantly to the improved the status of the grizzly bear across the NCDE (Costello, Mace, & Roberts, 2016; Mikle, Graves, Kovach, Kendall, & Macleod, 2016). The population size of the NCDE grizzly bear population is estimated to be greater than 765 bears, more than double the existing estimate based on sightings of females with young (Kendall et al. 2009); the recovery criteria for occupancy of BMU subunits have been met; and mortality is at an acceptable level because ongoing research and monitoring of the NCDE grizzly bear population indicates that it has been stable to increasing (Costello et al. 2016) and is expanding in distribution. Supporting continued recovery of the grizzly population will depend on the Forest Service's continued effective management of the NCDE grizzly bear habitat.

In 2013, the USFWS 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 USFWS to demonstrate the adequacy of regulatory mechanisms in order to delist this grizzly population. Incorporating this strategy in the Flathead National Forest plan would likewise demonstrate the adequacy of regulatory mechanisms on the Flathead National Forest to support delisting. Thus, the Flathead National Forest 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 Forest has completed consultation and issued a Record of Decision, the plan components included in the revised forest plan would replace the 1986 Flathead National Forest plan in its entirety, including but not limited to A19, 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, discussed in detail in the grizzly bear section of this document.

The Flathead National Forest 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 (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 B-5).

The Flathead National Forest 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 Forest is as follows:

- Within the primary conservation area, 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 nonmotorized 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 D of this document 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 Flathead's plan contains some additional plan components whose effects are discussed in this document.

Summary of plan elements for Canada lynx and its 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) (USDA, 2007a). 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), and scientific research results relevant to Canada lynx in northwest Montana (see literature cited section).

Based upon new information, the Forest has also updated its map of modeled lynx habitat (see appendix C of this BA and the Canada lynx section of this BA for more details).

The Forest would carry forward the lynx management direction from the current forest plan, as amended (appendix A of the revised forest plan, and replicated in this document in appendix D), except for two Forest-specific changes:

- A modification to NRLMD vegetation standard VEG S6 to add an exception to allownoncommercial 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(see FW-STD-TE&V-02). Standard VEG S5 already has an exception that allows precommercial thinning to restore whitebark pine, but VEG S6 does not provide a comparable exception.

- Changing some areas identified as suitable for over-snow motorized recreational vehicle use, which was addressed by NRLMD human use guideline HU G11 (see FW-GDL-REC-03).

Summary of plan elements for bull trout and its critical habitat

INFISH Standards and Guidelines

The Inland Native Fish Strategy (USDA, 1995c), 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 (USDA, 1995d, pp. 1-2). 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. 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 1995 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.

Summary of plan elements for water howellia

The conservation strategy for *Howellia aquatilis* would be retained. The conservation strategy for *Howellia aquatilis*, signed in 1994, requires a 300'-minimum management buffer width around all occupied and unoccupied but suitable ponds that support or could support *Howellia*. In the revised forest plan, *Howellia aquatilis* pond sites are included in riparian management zones (RMZs), see Figure B-4. RMZs are identified in the revised forest plan as areas where riparian-dependent resources receive primary emphasis and management activities are subject to specific standards and guidelines.

The riparian management zone adjacent to ponds, lakes, reservoirs, and wetlands is defined as follows (FW-STD-RMZ-01):

> Category 4a Ponds, lakes, reservoirs, and wetlands greater than one half 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.

See Figure B-6 for the occupied and unoccupied but suitable *Howellia aquatilis* sites included in category 4 riparian management zones. There are four unoccupied but suitable *Howellia aquatilis* sites in the Middle Fork of the Flathead River watershed in the vicinity of Lake Five that are not shown.

Summary of plan elements for Spalding's catchfly

There are no known populations of Spalding's catchfly on the Forest. The dry grassland habitats where this species might occur would have low likelihood of substantial impact from human activities. Risk of invasive plant species poses the greatest threat to integrity of the dry grassland communities. Plan components that emphasize protection of high-priority areas (including native grasslands) and treatments that focus on these areas provide protection to these rare plant communities that serve as potential habitat for Spalding's catchfly (see appendix D).

Terrestrial Wildlife Species

Canada Lynx

Affected Environment – Canada Lynx

Canada lynx population ecology, biology, habitat descriptions, and relationships identified by research are described in detail in the literature cited. The following description of the affected environment provides a summary in the context of the northern Rocky Mountains, focusing on the Flathead National Forest and information that is necessary to understand the consequences of the proposed federal action. Canada lynx critical habitat is discussed in a separate section below.

Canada lynx population, distribution, and status

The range of Canada lynx extends from Alaska across much of Canada (except for the coastal forests), with southern extensions into parts of the western United States, the Great Lakes region, and the northeast. Lynx distribution is closely aligned with the distribution of snowshoe hares and boreal forests (McKelvey, Aubry, & Ortega, 1999).

Snowshoe hares are the primary winter prey of lynx in Montana (J. R. Squires & Ruggiero, 2007) and throughout the range of lynx (Aubry, Koehler, & Squires, 1999). Lynx are highly specialized predators of snowshoe hares, with unique adaptations that include a lightweight body frame and proportionately large paws that enable them to travel on top of deep snow. In their study of lynx winter diets in northwest Montana, Squires and others (2013) described 86 lynx kills that included 7 prey species. Snowshoe hares contributed about 96 percent of prey biomass whereas red squirrels, the second most common prey, provided only about 2 percent of prey biomass (J. R. Squires, Ruggiero, Kolbe, & DeCesare, 2006).

Lynx do not occur everywhere within the range of snowshoe hares in the contiguous United States as discussed in both Bittner and Rongstad (1982) and McCord and Cardoza (1982) (USFWS, 2014d). This may be due to inadequate abundance, density, the spatial distribution of hares in some places, the absence of snow conditions that would allow lynx to express a competitive advantage over other hare predators, or a combination of these factors (USFWS, 2014d). In the southern part of its range, the low densities of lynx populations are likely a result of naturally patchy habitat and lower densities of their snowshoe hare prey (Adams, 1959; Paul Carlo Griffin, 2004; Koehler, Hornocker, & Hash, 1979; Mills et al., 2005).

The lynx recovery outline (USFWS, 2005b) 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, and the quality and quantity of habitat 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 Flathead National Forest 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., 1999). 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" (J. R. Squires et al., 2013). The study area delineated by Squires and others encompasses most of the Flathead National Forest, 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 Flathead National Forest included in the study area delineated by Squires and others in 2013. During 2010–2015, 15 individual adult or sub-adult lynx were captured and fitted with radio-telemetry collars on the Flathead National Forest, confirming that the North Fork, Middle Fork, and South Fork of the Flathead River watersheds were occupied by lynx (Holmquist, 2015; Olson, 2015).

Noninvasive sampling techniques have also been used to detect lynx. 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, which spans the area from north of Condon on the Swan Lake Ranger District of the Flathead National Forest, 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 with noninvasive DNA collection from bait stations as well as motion-sensor cameras. In order to standardize the approach across the SW Crown, eighty 5 x 5-mile grid cells were targeted for sampling; each grid cell represents an area slightly smaller than an average female lynx home range. Genetic samples were sent to the Forest Service's Rocky Mountain Research Station in Missoula to determine species and individual. Sampling in the SW Crown has now identified a total of 26 unique lynx across 41 grid cells across all years, including both males and females. All but five of these individuals were new to the Rocky Mountain Research Station genetic database (SWCC, 2015).

The Flathead National Forest also conducted carnivore monitoring from 2013–2016 using same-sized 5 x 5-mile grid cells in portions of the Forest that are outside the SW Crown area, in cooperation with Swan Valley Connections. In this portion of the Forest, about 64 grid cells were surveyed, resulting in 40 detections by either tracks, camera, or genetic verification. In addition to areas where Squires had previously trapped lynx, 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. Lynx have been detected in all geographic areas of the Forest (Curry et al., 2016; SWCC, 2015).

Based upon telemetry locations of lynx to date, Squires' 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. The Flathead National Forest lies in the heart of this area, highlighting its importance to lynx conservation.

The Service convened an expert workshop in October 2015 to improve understanding of the status of the contiguous U.S. distinct population segment (DPS) of Canada lynx (*Lynx canadensis*) (Bell et al., 2016). The workshop was organized by a lynx Species Status Assessment (SSA) Team consisting of Service and U.S. Geological Service staff who developed and piloted implementation of the SSA framework, as well as other biologists who are working on lynx throughout the range of the DPS. The results of the workshop contributed to the SSA report, which compiled and summarized the best available scientific and commercial data, including empirical data, published literature, and expert input. This information will then be used by the Service to develop a Final Species Status Review, and inform recovery planning direction, classification decisions, and other determinations required by the Endangered Species Act (Bell et al., 2016).

An important consideration for the long-term persistence of lynx in the northern Rockies is maintaining connectivity with lynx populations in Canada (ILBT, 2013). Squires et al. (2013) combined resource

selection, step selection, and least-cost path models to predict movement corridors for lynx in the northern Rocky Mountains. The models identified a few corridors that extend south from the international border with Canada. Currently, there is no evidence that there are significant impediments to lynx movements or that genetic isolation is occurring in western Montana (J. R. Squires et al., 2013). Lynx are managed provincially in Canada, with each province responsible for its own management program, harvest (trapping) policies, and conservation strategies. Lynx are considered secure in all provinces except New Brunswick and Nova Scotia) (Bell et al., 2016).

In the Geographic Unit identified in the SSA Workshop Final Report that encompasses northwestern Montana/northeastern Idaho, experts concluded there would be an initially high and subsequently decreasing probability of Canada lynx persistence due to projected climate change, with increasing uncertainty over time but a higher probability of persistence in all time frames than other units occupied by lynx. For the Geographic Unit unit encompassing northwestern Montana/northeastern Idaho, all experts predicted near-term (year 2025) persistence probability >= 95 percent and mid-century persistence = 70 percent to 100 percent (median = 90 percent)) (Bell et al., 2016).

Canada lynx reproduction, survival, and mortality

According to Quinn and Parker in 1987, breeding by Canada lynx occurs during March and April in the northern part of the range of lynx (ILBT, 2013). As reported in 2011 by Olson et al., in Montana, female lynx stayed in natal dens on average for 21 ± 17 days, and subsequently used an average of 3 ± 2 maternal dens in a given year (ILBT, 2013). Nine female lynx exhibited roughly equal levels of activity from dawn to dusk when they had newborn to 2-month-old kittens. Kittens are left alone at den sites while the female lynx hunts, as noted by Slough in 1999, Moen et al. in 2008, and Olson et al. in 2011(ILBT, 2013). In northwest Montana, litter sizes vary from one to five kittens per litter, with two or three kittens being the most frequently observed (Kosterman, 2014).

The most commonly reported causes of Canada lynx mortality are starvation, especially of kittens, as reported by Quinn and Parker in 1987, Koehler in 1990a, and Vashon et al. in 2012 (ILBT, 2013), and human-caused mortality, including trapping and shooting, is addressed in Ward and Krebs in 1985, Bailey et al. in 1986, and Moen in 2008 (ILBT, 2013). Predation on lynx by mountain lion, coyote, wolverine, gray wolf, fisher, and other lynx has been confirmed by Berrie in 1974, Koehler et al. in 1979, Poole in 1994, Slough and Mowat in 1996, O'Donoghue et al. in 1997, Apps in 2000, Squires and Laurion in 2000, O'Donoghue et al. in 2001, and Vashon et al. in 2012 (ILBT, 2013). Squires and Laurion (2000) reported that two of six mortalities of radio-collared lynx in Montana were due to mountain lion predation.

At southern latitudes, where lynx population density and productivity are lower than in the northern part of its range, harvest may be an additive source of mortality and lynx may be highly vulnerable to overexploitation (Koehler, 1990). Aubry et al. (1999) hypothesized that human-caused mortality such as illegal or incidental harvest could significantly reduce lynx population numbers in southern regions. The state wildlife agencies have taken actions to reduce incidental or illegal trapping and shooting, which has reduced the potential for adverse cumulative impacts.

Trapping and snaring of lynx is currently prohibited across the contiguous United States. Incidental trapping or snaring of lynx is possible in areas where regulated trapping for other species, such as wolverine, coyote, fox, fisher, marten, bobcat, and wolf, overlaps with lynx habitats (J. R. Squires & Laurion, 2000). A trapped lynx can be released, but there is potential for accidental injury or mortality (Kolbe, Squires, & Parker, 2003).

State wildlife management agencies regulate the trapping of furbearers. Trapper outreach is used as a tool to avoid or minimize incidental take of lynx. Montana Fish, Wildlife and Parks (MFWP) has implemented

special regulations to reduce the likelihood of incidental capture of lynx. A recent court settlement with MFWP established a lynx protection zone (which includes the Flathead National Forest) that restricts the size and the placement of traps and snares that can inadvertently catch lynx and requires bobcat trappers to check their traps at least once every 48 hours. The use of fresh meat or feathers as bait is now prohibited in the lynx protection zone. MFWP also provides education and outreach programs aimed at preventing illegal shooting of lynx. The magnitude of illegal shooting of lynx is unknown. Incidents have been reported throughout the range of the species. State wildlife agencies work to reduce lynx mortality by disseminating information to the public and providing guides to identifying characteristics to hunters.

Since implementation of changes to the trapping regulation in 2008, the amount of accidental trapping of lynx has decreased. A total of three lynx were captured during the eight license years 2008-2015, and all were released uninjured. Overall, lynx "take" during 2000-2007 averaged 1.6/year, and during 2008-2015, when more protective regulations were in place, they averaged 0.4/year, a fourfold decrease (MFWP, 2016).

Canada Lynx Habitat

Action Area and Relationship of the Project Area to Canada Lynx Habitat

The action area lies within the Northern Rocky Mountain region of the contiguous distinct population segment (DPS) of Canada lynx. Lynx habitat within the Northern Rockies geographic area was delineated into lynx analysis units (LAUs) for analysis and management purposes. An 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). Lynx analysis units (LAUs) were delineated for the Flathead National Forest 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 B-7). The area covered by the lynx analysis units on the Forest is the primary area used for analysis of effects on lynx. For analysis of cumulative effects 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. Lynx Habitat Mapping

Under guidance provided by the Interagency Lynx and Wolverine Steering Committee, Canada lynx habitat was initially mapped on the Flathead National Forest in 2000 (USDA, 2000) using geographical information system (GIS) modeling, based on direction and recommendations from the Lynx Science Team (Ruggiero et al., 1999), and the Lynx Biology Team (Ruediger et al., 2000). In 2007, 18 national forest plans (including the Flathead National Forest's forest plan) were amended to incorporate the Northern Rockies Lynx Management Direction (NRLMD). Appendix B in the NRLMD FEIS (USDA, 2007b) includes a letter from the Lynx Biology Team to the Lynx Steering Committee that summarizes criteria for lynx habitat mapping and a 2000 review of mapping methods used by Forests within the Northern Rockies Geographic Area. The Lynx Biology Team determined that habitat mapped in 2000 within the Northern Rockies Geographic Area (including the Forest) was consistent with established criteria and process. The area of lynx habitat modeled and mapped by the Forest in 2000 was 1,730,000 acres (USDA, 2007b, p. appendix C), and is spatially displayed in figure 1-1 in the NRLMD FEIS. The NRLMD FEIS (p. 99) states that during site-specific project analysis, maps of lynx habitat would be reviewed and updated based on local information and that future plan amendments or revisions may also consider lynx and information about local lynx presence as appropriate. The Service, in their 2007 NRLMD BO (USFWS, 2007b), also recognized and expected that lynx habitat maps would be refined and improved as new information and refined GIS mapping techniques became available (p. 4). The

Canada Lynx Conservation and Strategy (ILBT, 2013) encourages updating maps where new information and vegetation databases will improve identification of lynx habitat (p. 87). Thus, guidance for updating lynx habitat maps on lands managed by the Forest Service is well documented and encouraged when new information is available to inform improved and more accurate mapping of lynx habitat.

In 2013-14, the Flathead National Forest initiated the planning process to revise its forest plan and conducted a review of lynx habitat originally mapped on the Forest in 2000. The review indicated a need to update and refine mapped lynx habitat based on: (1) new information from research concerning lynx populations, distribution, habitat use, and prey species on the Forest; (2) improved vegetation classification data; and (3) improved geographical information system (GIS) mapping. The updated modeling and mapping process is described in detail in a February 2014 process paper (Hanvey, 2016), which is included as appendix C of this biological assessment). Modeling and mapping is consistent with the definition of lynx habitat and is verified at project level. The Flathead National Forest's updated estimate of lynx habitat is about 1,795,000 acres (Figure B-9), and this is the area used for analysis of effects of the proposed action on Canada lynx.

At the forestwide scale, biophysical attributes that can be derived from remote sensing data are used to model and map potential lynx habitat. This information is also used to classify non-forest areas (e.g., rock, water) and exclude them from lynx habitat. The resulting map provides an estimate of the overall area that is capable of providing habitat for lynx. Modeling parameters included areas within the elevation range used by lynx on the Flathead National Forest (to predict areas that likely provide deep, fluffy snow conditions for extended periods of time). The Forest's updated mapping process also used potential vegetation types (J. Jones, 2004) having boreal forest habitat types (Pfister, Kovalchik, Amo, & Presby, 1977) that are capable of growing subalpine fir and spruce trees as well as habitat types that are able to grow grand fir if they are in close juxtaposition. The process used by the Forest (appendix C) is consistent with mapping direction provided by the Interagency Lynx Biology Team (Hanvey, 2016; ILBT, 2013). The Interagency Lynx Biology Team direction stated that subalpine fir habitat types that are dominated by cover types of spruce and subalpine fir, as well as Douglas-fir and seral lodgepole pine, should be mapped as primary vegetation whereas other cool, moist habitat types (e.g., grand fir) that may contribute to lynx habitat (especially where intermingled with and immediately adjacent to primary vegetation) should be mapped as secondary vegetation. Mapping direction provided by the Lynx Biology Team and the Forest's updated lynx habitat map are both based on biophysical conditions capable of supporting coniferous vegetation at the ground level that is sufficiently dense to support snowshoe hares during winter. Such conditions may occur during various time periods of stand development.

At any given point in time in a forest stand's development, it may provide habitat in a suitable condition or it may provide lynx habitat in a temporarily unsuitable condition, depending upon existing structural condition. Structural condition is in turn dependent upon time since disturbance (e.g., fire, timber harvest) and the rate of forest succession. Satellite imagery and forest databases can accurately classify recently harvested and burned areas, which helps to identify areas that are temporarily in an unsuitable condition (see NRLMD glossary). However, satellite imagery is poor at detecting dense horizontal cover that provides snowshoe hare habitat in a multistory forest structure, which is an important feature of lynx foraging habitat, nor coarse woody debris for denning habitat. Therefore, no forestwide estimates are made for these components of lynx habitat. During site-specific planning, the forestwide map of lynx habitat is field verified, habitat types are refined, and lynx habitat is further characterized to estimate the amount and distribution of foraging and denning habitat components.

Lynx Habitat Characteristics

Habitats across the Flathead National Forest have been grouped into broad potential vegetation types (Broad PVTs) based on broad climatic and site conditions, for purposes of analysis at the forestwide scale.

Some Forest plan components are also linked to these broad potential vegetation types. Broad PVTs serve as a basis for description of certain ecological conditions across the Forest and are useful in understanding the various ecosystems and their potential productivity, natural biodiversity, and the kinds of processes that sustain these conditions. In contrast, forest dominance types refer to the existing vegetation types that are dominant across the Forest's landscape at any one point in time.

Across their range, lynx typically occur in boreal and subalpine coniferous forests dominated by subalpine fir and spruce in landscapes with gentle topography (J. R. Squires et al., 2013). On the Flathead National Forest, subalpine fir and Engelmann spruce are found within portions of the Cool Moist and Cold Broad PVTs, also described as biophysical settings in the revised forest plan (see appendix D of the revised forest plan for more details). Portions of the Warm Moist Broad PVT in close juxtaposition to the Cool Moist Broad PVT are capable of growing grand fir.

Forests with a subalpine fir/spruce dominance type currently occur on an estimated 43 percent (90 percent C.I. = 39-47 percent) of all Flathead NFS lands (R1 Summary Data Base, Forest Inventory and Analysis (USDA)). Both tree species are very shade tolerant and commonly are most abundant in mid- and understory tree canopy layers, often found in mixed forest with western larch, lodgepole pine, and/or Douglas-fir in the overstory.

Squires and others (2010) compared lynx resource selection in summer versus winter, including lynx success in capturing snowshoe hares. During winter, lynx foraged primarily in mid- to high-elevation forests (4,134–7,726 feet) composed of mature, large diameter (greater than about 11 inches d.b.h.) trees and in and selected forests with relatively denser horizontal cover, more abundant hares, and deeper snow than was available within a home range. The preferred forests had a multistory structure with dense horizontal cover provided by the young trees in the understory and conifer boughs touching the snow surface, which could support snowshoe hare populations at varying snow depths throughout the winter. Engelmann spruce and subalpine fir were the dominant tree species in forests used by lynx, but these forests contained a mix of other conifer species including lodgepole pine, western larch, and Douglas-fir. Squires stated that the primary limiting factor for Canada lynx in northwest Montana appears to be suitable winter foraging habitat.

During the summer months, lynx in Montana broaden their preferred habitat use to include more of the early successional forest with dense horizontal cover provided by abundant shrubs, spruce and fir saplings, and small diameter trees (J. R. Squires et al., 2010). These conditions can occur in forests burned by wildfire, regenerated by insects or disease, or regenerated by timber harvest. Squires and others found that lynx used slightly higher elevations during the summer but, as in winter, were located below the alpine zone and above the low-elevation, dry forests dominated by ponderosa pine. Low-elevation, ponderosa pine forests were not modeled as potential lynx habitat on the Flathead National Forest.

In Montana, Squires and others (2010) reported that horizontal cover was denser at lynx kill sites than along travel paths. They further reported that lynx kill sites were associated with a higher proportion of spruce-fir overstory than lodgepole pine overstory and that neither snow depth nor snow penetrability influenced lynx kill sites. Snowshoe hare abundance is also positively associated with dense horizontal cover (Hodges, 2000). In western Montana, Griffin and Mills (2007) found the highest snowshoe hare densities in regenerating conifer stands that had a high density of saplings (defined as more than 2,267 stems/acre) and in mature multistory conifer stands that had abundant saplings. Hare abundance was negatively affected in stands treated with traditional precommercial thinning prescriptions that reduced stem densities to about 263-526 stems/acre (Paul C. Griffin & Mills, 2007). Snowshoe hare abundance in control stands was comparable to thinned stands if 20 percent of the precommercially thinned stand was retained in uncut 0.6-acre patches (Paul C. Griffin & Mills, 2007). Young regenerating stands (20-40 years old) can support high densities of snowshoe hares before growing into a structure that no longer

provides the needed dense horizontal cover. A regular influx of this "early stand initiation stage" of forest succession (created by processes such as fire or vegetation management) can help to enhance snowshoe hare production.

Cheng and others (2015) studied snowshoe hare densities in areas of Glacier National Park adjacent to the Forest that were burned by wildfire in 1988 and 1994. Regenerating forests with a lodgepole pine tree dominance type made up 50 percent of the 1988 burn area. Hare pellet densities in lodgepole pine stands regenerating after the 1988 fire (i.e., 17 years post-fire at the time of their study) were far greater than in other canopy types within the 1988 burns and also exceeded pellet densities in lodgepole forests burned in 1994, or other mature forests, by a factor of at least 10. Their "best" model for habitat predicted that mean pellet density for lodgepole forests in the1988 burns equates to hare densities nearly three times the threshold believed necessary to support lynx populations.

Among the continuous habitat parameters measured in the Cheng et al. study, only understory cover (at a height of 0 to 20 inches above the ground surface) and percent canopy cover were identified as predictors of hare density. Canopy cover had the next largest effect, with mean pellet densities increasing from 10percent canopy closure to 70percent canopy closure when other variables were held at typical values. The next most important predictor of hare pellet density was understory cover. Mean pellet density increased slowly with understory cover up to 80 percent, above which pellet densities declined (Cheng et al., 2015). Cheng and others (2015) stated that snowshoe hares' association with regenerating lodgepole pine forests is transient because these forests will eventually grow tall enough and dense enough to no longer provide the habitat conditions selected by snowshoe hares.

At the landscape scale, a mosaic of forest structure, from young regenerating to mature multistory stands, is recommended to provide for the habitat needs of lynx (ILBT, 2013). Kosterman collected field data on denning and offspring survival in northwestern Montana from 1998–2012, studying the relationship between female lynx reproductive success and habitat composition/arrangement at the scale of a lynx home range on two national forests adjacent to the Flathead (Kootenai and Lolo). Connectivity of mature forest, percent composition of young regenerating forest, low perimeter-area ratio of young regenerating forest patches, and adjacency of mature to young regenerating forest types were the most important predictors for overall lynx reproductive success in her study areas (Kosterman, 2014).

Although Kosterman's 2014 thesis provides valuable new information with potential to inform changes in Forest Service management of lynx and lynx habitat, the relationships between vegetation composition and lynx reproductive success described in the thesis are not well enough understood to determine whether specific changes in management direction are warranted and, if so, what they should be. By design, Kosterman classified vegetation in a way that was deliberately imprecise in order to allow her to correlate lynx demography to habitat in a simple and rough sense. For this purpose, the classification was a success. However, the parameters and metrics that Kosterman used do not directly correlate to Forest Service vegetation inventory data or the management direction established by the NRLMD. Kosterman and Rocky Mountain Research Station scientists are working to refine her lynx habitat classification and publish the results of her study in a peer-reviewed scientific journal. Some of the analysis or findings in the original thesis may change through that process. Forest Service staff will continue to work in partnership with the USFWS, the Rocky Mountain Research Station, and Kosterman to determine the appropriate application of her information to the management of Canada lynx habitat (Marten, 2016).

During the winter and early spring, availability of den sites is also important to lynx. Boutros and others in 2007 as well as Moen et al. in 2008 found that coarse woody debris provides kittens with protection from extreme temperatures, precipitation, or predators (ILBT, 2013). Lynx dens in northwest Montana are typically found in multistory stands of spruce-fir forests with dense horizontal cover and abundant coarse woody debris. Squires and others found that 80 percent of dens were in mature forest stands and 13

percent in mid-seral, regenerating stands (J. R. Squires, DeCesare, Kolbe, & Ruggiero, 2008). Young stands that were either naturally sparse or mechanically thinned were seldom used for denning. Denning habitat is generally abundant across the coniferous forest landscape of northwest Montana and is not likely to be limiting for lynx (J. R. Squires et al., 2008, 2010; J. R. Squires & Kennedy, 2006).

Stand dynamics of snowshoe hare and lynx habitat on the Flathead National Forest

Immediately after a disturbance, the removal of live trees and shrubs means these areas are not yet able to support snowshoe hares and lynx. As vegetation regrows, the burned or harvested areas develop into summer hare habitat. During this "early stand initiation" stage, if there is sufficient horizontal cover and adjacent forest edge, lynx may forage for hares in the regenerating forests during the summer months. Then, after approximately 20 years (the typical average time for the Forest), trees and some shrubs will have grown tall enough to have branches at the snow surface and dense enough to provide winter food and cover for hares. During the next couple of decades, this later "stand initiation" phase will likely provide winter snowshoe hare habitat, depending upon the species composition and density of regenerating trees. As the trees continue to grow, stands dominated by shade intolerant species such as lodgepole pine may move into the "stem exclusion" stage, in which the crowns close, shading out understory vegetation, and the tree branches grow out of reach of the hares. The denser the regenerating forest stand, the faster trees such as lodgepole pine lose their lower live branches and grow out of reach of hares. Given enough time (several to many decades) and absent another stand-replacing disturbance, within-stand competition and disturbances such as windthrow and forest pathogens usually will create canopy gaps that enable the stand to develop into the "understory reinitiation" stage, which is one type of older multistoried forest structure described by Oliver and Larson (1996). However, in the boreal forests of the northern Rocky Mountains where stand-replacing wildfire is a dominant landscape process, not all forest stands will reach the understory reinitiation stage. Instead, they may burn or may stagnate in the stem exclusion stage.

Snowshoe hare and lynx habitat and natural ecosystem processes

Both subalpine fir and Engelmann spruce are intolerant of drought and fire due to their shallow roots, thin bark, and tree crowns that extend to the ground, making them susceptible to being killed by even low-severity fires. Though they may regenerate into the opening created by a fire, they have comparably slow growth rates and are soon overtopped by other early successional species such as lodgepole pine or western larch. However, their shade tolerance allows them to persist indefinitely, and eventually, over many decades to centuries, they will dominate the site unless there is a fire event or other stand-replacing disturbance that re-initiates succession with early successional species. Subalpine fir is the indicated climax species across most of the Flathead National Forest.

The prevalence of subalpine fir and spruce-dominated forests is tied to the frequency of fire. More frequent fires will reduce the presence and dominance of these species; long fire-free intervals and/or the lack of a seed source of other species will favor their dominance. Forests dominated by subalpine fir and Engelmann spruce tend to support higher severity fires due to the lower fire frequency, higher tree densities, multiple canopy layers, and greater litter depths and fuel loads typical in these stands. These stand-replacing fires make lynx habitat temporarily unsuitable. The multistory forest conditions that typically develop in subalpine fir and Engelmann spruce-dominated forests are also highly susceptible to damage from western spruce budworm. In contrast with stand-replacing wildfires, beetles may only kill some of the overstory trees, allowing the understory to respond.

Past disturbances and the natural range of variation for Canada lynx habitat

Historically, fire, insects, and disease were the primary processes that affected forest vegetation in lynx habitat, reverting them to an early stage of succession or creating openings within the forest canopy

(USDA). The NRLMD (USDA, 2007a) defines lynx habitat in an unsuitable condition as lynx habitat in the stand initiation structural stage where trees are generally less than 10 to 30 years old (e.g., current burned forest less than 20 years old) and have not grown tall enough to protrude above the snow in winter. As a result, trees in this structural stage are too short or too open to provide dense, seedling-sapling forage for snowshoe hares during winter, but the trees will become taller and denser as the forests go through vegetative succession.

The USFS SIMPPLLE model (SIMulating Patterns and Processes at Landscape scaLEs) was used to model the natural range of variation (NRV) for lynx habitat in a temporarily unsuitable condition. Ecosystem Research Group provided the Forest with an assessment using the USFS SIMPPLLE model (see appendix 3 of the revised forest plan). The SIMPPLLE model is a spatially explicit model that uses logic pathways to predict how forests respond over time to succession, wildfires, and insect/disease risks based on cover types, size classes, crown closure, aspect, and slope (Chew, Moeller, & Stalling, 2012). Figure 2 shows the NRV going back about a thousand years, for maximum, minimum, and average levels of lynx habitat in an unsuitable condition within the Forest's LAUs, and compares that to the current level (projected back in time for comparison, with decade 101 on the x-axis representing the decade beginning with 2010).

To provide context for NRLMD standard VEGS1, NRV was modeled to display the number of LAUs with more than 30 percent of lynx habitat in a temporarily unsuitable condition for the Flathead National Forest. The model estimated that at a maximum level, 13.8 percent of Forest LAUs would have had more than 30 percent of the lynx habitat in an LAU in an unsuitable condition. At a minimum level, 4.0 percent of LAUs would have had more than 30% of lynx habitat in an unsuitable condition, with a mean level of 8.6 percent.

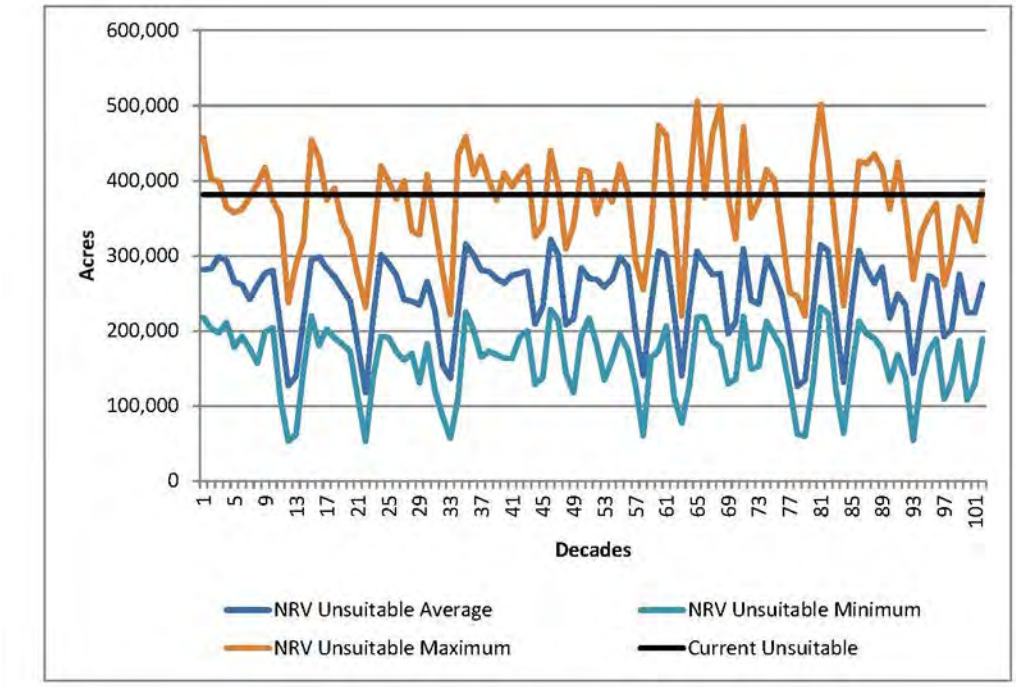


Figure 2. Lynx habitat in a temporarily unsuitable condition modeled for the past 102 decades: natural range of variation (NRV) and current levels

Historically, the acreage burned by wildfires has fluctuated substantially from decade to decade on the Flathead National Forest. Many factors (including weather, climate, ignition sources, available fuels, and fire suppression efforts) interact to influence the amount of acreage burned by wildfire in a given year. As shown in Figure 2, we are above maximum NRV for some decades and below maximum NRV for others, and the current condition is above the long-term average.

The SIMPPLLE model was also used to estimate the maximum and minimum amounts of the stand initiation structural stage on the Forest that would have occurred historically due to naturally occurring fires. Modeling indicates the stand initiation phase would have been a maximum of about 13 percent of all lynx habitat at a forestwide scale. There is a wide range of variation of about 180,000 acres between maximum and minimum NRV. This is because the stand initiation phase occurs for a relatively short period of time following major disturbances (e.g., stand-replacing fire), which typically begins once small trees and shrubs have regenerated, but may only last another decade or two until the stand moves into stem exclusion condition (depending upon factors such as elevation and stem density).

Figure 3 displays all Forest acres burned from 1889-2015. The number of acres burned on the Flathead National Forest in 2016 totaled less than 500 acres. During the largest fire years about a century ago, the actual area burned on the Flathead National Forest was about 140,000 acres in 1890, 432,500 acres in 1910, 150,000 acres in 1919, and 90,000 acres in 1929. From 1939 to 1987, very few acres were burned. Starting in 1988, there has been an increase in acres burned; the three largest recent fire years burned about 235,000 acres in 2003, 120,000 acres in 2008, and about 100,000 acres in 2014.

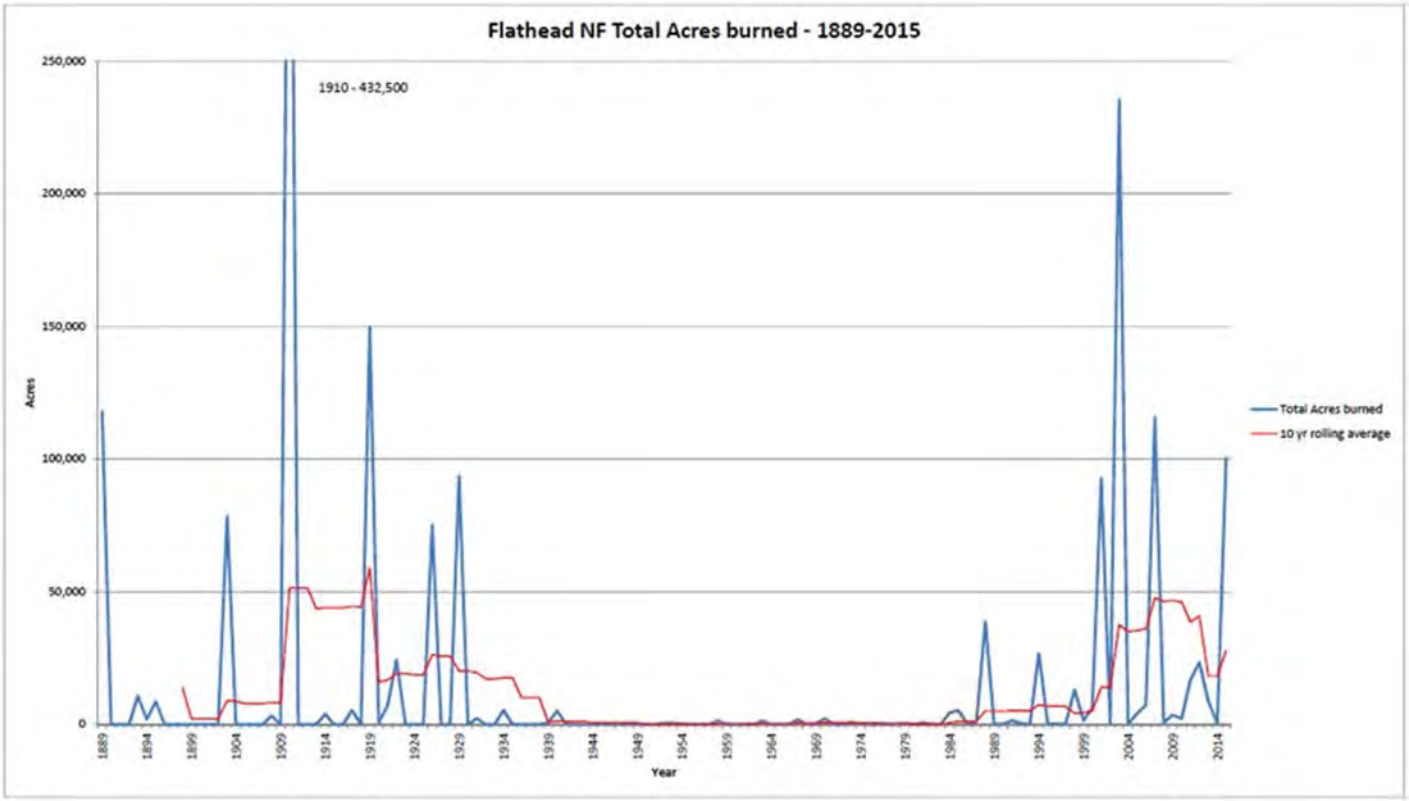


Figure 3. Forest total acres burned 1889-2015

Associated with the recent increase in the prevalence and extent of wildfires, about 381,336 acres (approximately 21 percent) of lynx habitat in LAUs on national forest system lands of the Forest were burned by wildfire within the last two decades. In the subalpine zone that supports lynx habitat, wildfires

are typically stand-replacing events. For purposes of forestwide modeling, areas burned in the past 20 years are not yet providing snowshoe hare habitat in all seasons.

On the Forest, western larch, lodgepole pine, Douglas-fir, and white pine generally are the dominant tree species on boreal forest habitat types during the early and late stand initiation stage. Some areas that experience intense stand-replacing wildfire and/or repeated burns may regrow as monotypic forests of lodgepole pine. If these lodgepole pine stands are extremely dense (e.g., 20,000-50,000 stems per acre), the trees will move quickly into stem exclusion, losing their lower live branches and eliminating seedlings and shrubs in the understory due to competition and lack of light. If lodgepole pine stands are less dense, they move into a stem exclusion condition more slowly. Much of the forest that burned in the 1988 fires in the North Fork Flathead River geographic area have developed sufficient height and density of trees and shrubs to produce winter snowshoe hare and lynx habitat; however, some stands that regenerated with extremely dense lodgepole pine have already moved into the stem exclusion stage and no longer have live branches at the snow surface or shrubs in the understory to provide hare foraging habitat.

Some of the extremely dense lodgepole pine forests that regenerated after wildfires in 1910, 1919, and 1929 have stagnated in the stem exclusion stage. These forests are composed of very dense lodgepole pine with an average diameter of 4-5 inches d.b.h. and generally will not progress into a condition where they provide multistoried hare and lynx habitat. These forests are known to remain "stagnated" in the stem exclusion structural stage until they are replaced by a stand-replacing wildfire or by human intervention. In lodgepole pine stands with a more moderate tree density, shade-tolerant trees such as subalpine fir or Engelmann spruce are able to grow and eventually dominate the stand. These stands are able to develop into a multistory structure that provides snowshoe hare and lynx habitat. Examples of both scenarios exist on the Flathead National Forest.

Since about 1950, the early stand initiation stage has also been created in lynx habitat by vegetation management activities, including timber harvest. About 30,926 acres (approximately 2 percent) of lynx habitat in LAUs was treated by regeneration harvest on national forest system lands of the Flathead National Forest from 1994-2013 and are less than 20 years old. Observations suggest that, similar to wildfire, regeneration harvest units do not develop into stand initiation snowshoe hare habitat until 20 or more years post-harvest. Telemetry locations of lynx on the Forest indicate that lynx begin to use the harvested stands for foraging once sufficient tree and shrub growth has occurred and continue to frequent harvested stands if they develop a multistoried structure. In past harvest units in the Cool-Moist Broad PVTs (biophysical setting) of the Forest, tree density and composition often supports lynx use. Tree density and composition are affected by natural factors as well as by post-harvest treatments (depending upon factors such as aspect, elevation, type of harvest, and whether the stand was precommercially thinned and/or planted with small trees after harvest).

Squires and others are conducting research evaluating how lynx and hares respond to fire across a continuum of fire age and post-fire silvicultural treatment. Retrospective analysis of stand history (harvest prescription, fuels disposal, tree planting, precommercial thinning) is also underway to gain a better understanding of how silvicultural practices influence lynx habitat use, as determined using previously collected telemetry locations of lynx (J. Squires, pers. comm. to R. Kuennen, June 2016).

Existing conditions in lynx analysis units on the Flathead National Forest

There are 109 lynx analysis units that are wholly or partially within the Flathead National Forest (see table 4). These lynx analysis units encompass a total of about 2.4 million acres on the Forest. Under the NRLMD standard LAU S1, changes to lynx analysis units may only be made if site-specific habitat information demonstrates it is needed and after review by the Regional Office. Changes have not been

made to lynx analysis unit boundaries on the Flathead National Forest subsequent to their delineation in 2000.

Within the lynx analysis units, an estimated 1.8 million acres provide potential lynx habitat (Figure B-9) where NRLMD management direction applies. The remainder of Forest lands occur at low elevations lacking in deep, fluffy snow or are inclusions that are not capable of producing boreal forest habitat (e.g., dry forest types, non-forest). Under NRLMD standard VEGS1, if the early stand initiation stage (not yet winter snowshoe hare habitat) exceeds 30 percent of an LAU, no additional habitat may be regenerated by vegetation management projects unless:

- it meets criteria applicable to the wildland-urban interface (as discussed in the WUI section)
- a broad scale assessment has been completed that substantiate different historic levels of stand initiation structural stages.

As of 2015, there were about 25 of 109 (23%) of lynx analysis units on the Flathead National Forest (see table 4) that have more than 30 percent of lynx habitat modeled as being in an early stand initiation condition as a result of stand-replacing wildfires. As shown in table 4, wildfire was clearly the driver in creating substantial acreages on the Forest in a condition where they do not yet provide winter hare and lynx habitat. Although a large percentage of some LAUs is in the WUI, as shown in table 4, 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 lynx analysis unit in a ten-year period, unless it meets criteria applicable to the wildland-urban interface. Table 4 displays the condition of lynx analysis units based on forestwide modeling. On the Flathead National Forest, only 10 of the 109 lynx analysis units have had more than 5 percent of the lynx habitat acres regenerated by vegetation management activities over the time period from 1994-2016. Since the forest plan was amended to include the NRLMD in 2007, none of the LAUs has had more than 15% regenerated by timber harvest (two LAUs exceed 15 percent due to regeneration harvest that occurred prior to 2007).

Table 4. Existing conditions of lynx analysis units (LAU) on the Flathead National Forest with regard to acres of lynx habitat on NFS land.

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1996-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1994-2016[b]	Approximate percentage of lynx habitat on NFS lands in wildland-urban interface
Canyon	96%	23,578	45%	3%	16%
Hay	90%	22,318	None	None	11%
Lakalaho	100%	21,148	< 0.5%	None	18%
Lower Big	99%	18,543	93%	< 0.5%	9%
Lower Coal	53%	13,968	58%	None	17%
Lower Whale	94%	18,341	27%	3%	22%
Moose	82%	11,102	None	1%	48%
North Trail	85%	26,722	1%	< 0.5%	25%
Red Meadow	87%	21,956	None	None	27%
South Trail Tepee	93%	20,236	76%	3%	40%

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1996-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1994-2016[b]	Approximate percentage of lynx habitat on NFS lands in wildland-urban interface
Teakettle	59%	6,868	1%	None	70%
Upper Big	98%	18,039	24%	None	None
Upper Coal	93%	23,894	7%	<0.5%	None
Upper Trail	100%	15,404	None	None	None
Upper Whale	100%	21,775	< 0.5%	None	None
Bear Creek	96%	21,039	28%	< 0.5%	52%
Challenge Granite	100%	17,419	18%	< 0.5%	None
Clayton Anna	100%	16,183	66%	4%	None
Coram Abbot	84%	6,653	none	None	37%
Dirtyface Spruce	100%	13,023	5%	None	6%
Doris Creek	100%	24,118	24%	3%	9%
Emery Creek	100%	12,844	None	1%	2%
Essex Java	99%	14,052	15%	< 0.5%	29%
Felix Logan	100%	17,471	13%	None	None
Graves Forest	100%	21,221	8%	None	< 0.5%
Hungry Horse Creek	100%	11,537	None	None	None
Lake Five	58%	2,745	None	None	99%
Long Cy	100%	21,494	23%	None	none
Moccasin Nyack	92%	13,427	2%	< 0.5%	64%
Murray Canyon	100%	12,625	None	0.5%	None
Paola Ridge	92%	9,534	<0.5%	2%	48%
Slippery Bill	100%	12,587	14%	< 0.5%	None
South Firefighter	100%	10,726	None	5%	None
Stanton Grant	95%	16,800	None	1%	51%
Vinegar Moose	100%	21,481	10%	None	4%
West Columbia	87%	7,851	None	None	86%
Wheeler Creek	100%	15,087	None	None	14%
Wildcat Mountain	100%	15,831	20%	2%	None
Albino Necklace	99%	14,269	13%	None	None
Babcock Creek	100%	11,665	8%	None	None
Bent Whitcomb	100%	21,268	63%	1%	4%
Big Prairie Cayuse	100%	11,042	49%	None	None
Big Salmon Lake	97%	22,216	46%	None	None
Black Bear Helen	100%	14,766	79%	None	None
Bunker Creek	100%	23,273	45%	< 0.5%	None
Cox Creek	100%	19,936	4%	None	None

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1996-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1994-2016[b]	Approximate percentage of lynx habitat on NFS lands in wildland-urban interface
Dolly Varden Creek	100%	24,864	14%	None	None
Dryad Miner	99%	16,882	< 0.5%	None	None
Foolhen Danaher	100%	25,440	10%	None	None
Holbrook Bartlett	100%	29,119	47%	None	None
Hungry Picture	100%	18,561	30%	None	None
Kah Soldier	100%	15,288	9%	2%	8%
Little Salmon Creek	100%	27,766	11%	None	None
Lodgepole Creek	100%	21,319	4%	None	None
Lost Jack Mid	100%	13,182	91%	None	None
Lower Gordon Creek	100%	15,795	42%	None	None
Lower White River	100%	17,902	38%	None	None
Lower Youngs Creek	100%	18,885	50%	None	None
Mud Lake	100%	10,488	62%	None	None
Pale Clack	100%	13,956	3%	None	None
Peters Crossover	100%	17,925	None	None	None
Quintonkon Creek	100%	15,888	7%	< 0.5%	2%
Rapid Basin	100%	29,821	25%	None	None
Shadow Dean	100%	27,399	24%	None	None
Silvertip Creek	100%	12,540	35%	None	None
Spotted Bear Mountain	100%	20,943	53%	< 0.5%	1%
Stadium Gorge	100%	25,091	13%	None	None
Stony Jungle	100%	17,700	61%	1%	3%
Strawberry Creek	100%	16,688	27%	None	None
Sullivan Creek	100%	27,743	16%	1%	None
Three Sisters Bungalow	100%	27,654	18%	None	None
Trail Bowl	100%	24,727	78%	None	None
Twin Creek	100%	18,890	5%	< 0.5%	< 0.5%
Upper Gordon Creek	99%	12,638	5%	None	None
Upper White River	100%	12,521	24%	None	None
Upper Youngs Creek	100%	26,021	59%	None	None

Lynx Analysis Unit	Percent of NFS lands in the LAU	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1996-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1994-2016[b]	Approximate percentage of lynx habitat on NFS lands in wildland-urban interface
Blacktail	79%	13,680	< 0.5%	7%	80%
Haskill Mount	76%	7,885	None	5%	37%
Bond	82%	10,903	None	None	37%
Buck	68%	9,854	16%	None	61%
Elk	77%	18,879	7%	7%	29%
Glacier	92%	21,066	40%	7%	20%
Holland	81%	8,294	None	3%	53%
Krause	85%	13,308	< 0.5%	None	50%
Lion	98%	10,950	< 0.5%	5%	None
Lost	78%	12,365	12%	None	< 0.5%
Lower Beaver	86%	16,661	< 0.5%	12%	39%
Meadow	87%	7,248	41%	5%	4%
North Crane	78%	10,258	None	2%	65%
Piper	91%	18,696	< 0.5%	10%	15%
Porcupine	63%	8,087	None	None	1%
Schmidt	83%	9,677	None	None	52%
Soup	18%	2,351	None	None	None
South Cold	93%	17,989	< 0.5%	2%	13%
South Crane	97%	13,938	None	3%	36%
South Woodward	94%	13,370	1%	4%	8%
Squeezer	51%	10,759	2%	1%	None
Upper Beaver	96%	10,684	< 0.5%	< 0.5%	< 0.5%
Woodward	21%	3,743	None	1%	1%
Ashley Herrig	30%	6,660	None	5%	87%
Evers Reid	73%	9,586	< 0.5%	10%	82%
Lost Tally	89%	9,590	None	6%	99%
Lower Good	84%	19,746	< 0.5%	6%	56%
Lower Griffin	93%	17,622	57%	17%	25%
Martin Stillwater	90%	15,804	None	5%	16%
Sheppard	94%	21,352	80%	17%	22%
Upper Good	98%	28,384	15%	13%	23%
Upper Griffin	81%	15,844	5%	6%	1%
Upper Logan	80%	17,893	< 0.5%	12%	15%

a. acres burned by wildfire may include areas with previous regeneration harvest, so wildfire and regeneration percentages are not additive. These percentages are based upon forest scale data, modeled as a time period of 20 years, and are verified at the project level.

b. based on USFS FACTS database, which does not include decisions not yet implemented. For inclusion of decisions not yet implemented, Table 5.

* shaded LAUs are estimated to have 30 percent or more of lynx habitat in a temporarily unsuitable condition. This is verified at the project level.

Fuels treatments and precommercial thinning in lynx habitat

Standards VEG S1, VEG S2, VEG S5, and VEG S6 include an exemption for fuels treatments to protect communities at risk in lynx habitat within the wildland-urban interface. Such fuels treatments may not occur on more than 6 percent of lynx habitat on each national forest considered "occupied" as defined in the NRLMD, which is a limit of about 103,800 acres on the Flathead National Forest (USDA, 2007b). (For additional discussion of the wildland-urban interface, see the Canada lynx critical habitat section below.)

Standard VEG S5 also contains six listed exceptions that allow for precommercial thinning in lynx habitat to meet other specific resource objectives. VEGS6 contains several listed exceptions for vegetation management projects that reduce snowshoe hare habitat in multistory mature or late successional forests. The estimated acres that would possibly be treated through precommercial thinning exceptions are shown in appendix K of the FEIS for the Northern Rockies Lynx Management Direction. For the Flathead National Forest, the estimated acres to be thinned under the exceptions to the vegetation standards was 1,460 acres over a 10-year period (less than 0.1 percent of the lynx habitat on the Forest). The estimates were distributed as 500 acres for defensible space, 220 acres for research studies and genetic tree testing, and 740 acres for daylight thinning of western white pine. It was noted throughout appendix K that the acreages for precommercial thinning exceptions were only estimates and might change due to changing needs. Since these estimates were the basis of incidental take, this biological assessment and consultation updates the estimates for purposes of determining incidental take.

In its biological opinion on the Northern Rockies Lynx Management Direction, the Service concluded that there was potential for incidental take to occur in lynx habitat, mostly due to the exemptions and exceptions to the vegetation standards, which could diminish the value of lynx habitat and thereby impair feeding and reproduction by adult female lynx and survival of kittens. Because of the difficulty of detecting incidental take of lynx, the Service used the total estimated acreage of the exemptions and exceptions as a surrogate measure. The amount of incidental take thus was anticipated to be represented by fuels treatments on up to 6 percent of lynx habitat across the entire Northern Rockies analysis area over 10 years (729,000 acres) and precommercial thinning for other resource benefits on up to 64,320 acres (less than 0.5 percent) of snowshoe hare habitat (lynx foraging habitat) over a 10-year period. The Service provided reasonable and prudent measures and terms and conditions in order to minimize incidental take.

Annual monitoring and reporting is a requirement of the NRLMD biological opinion in order to ensure that the level of incidental take is not exceeded. The actual acres with decisions for treatments using wildland-urban interface exemptions on the Forest was a little over 10,000 acres as of January 2017 (table 5). During the same period, the Flathead National Forest had decisions for 940 acres (including 939 acres treated under the VEGS5 exceptions and 1 acre treated under VEGS6 exceptions (table 5). The vast majority of thinning completed under the exceptions was for western white pine, in which 80 percent of the winter snowshoe hare habitat was retained as required by the standard. The allowable level of incidental take has not been exceeded for the Northern Rockies analysis area (MFWP, 2016) nor for the Flathead National Forest (table 5, Figure B-11).

Table 5. 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) (source: (USDA, 2016e).

Habitat	Estimated acres in the 2007 FEIS	Sum of acres with decisions for treatment
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.

Existing conditions in relation to winter recreation

Ski Resorts on the Flathead National Forest

Effects to lynx from Montana's ski resorts were assessed in 2000 and 2001 after the Canada lynx was listed (USDA-USDI, 2000; USFWS, 2001b). In 2007, when consultation on the NRLMD occurred, the effects of ski areas and other types of winter recreation on lynx were further analyzed. The Flathead National Forest has two ski resorts; Whitefish Mountain Resort (formerly known as Big Mountain) and Blacktail Mountain Resort. Both of these resorts were addressed in the BOs (USFWS, 2001b, 2007b). In its 2001 BO, 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 BO, 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.

About 3,100 acres of the Lakalaho lynx analysis unit 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 Canada lynx critical habitat (USDA-USFWS, 2016; USFWS, 2007a, 2011b, 2013b, 2015a).

The Blacktail Mountain Resort is located in the Blacktail lynx analysis unit (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. This ski area 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, 2001b).

Over-snow vehicle use

In November 2006, the Flathead National Forest 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 Flathead National Forest. The specific areas and routes that are suitable for motorized over-snow vehicle use are identified on maps that were incorporated into the forest plan. Under this decision, about 32 percent of lynx habitat on the Forest is open to motorized over-snow use or is in cross-country ski areas where trails are groomed. Across the Forest, there are about 1,098 miles of routes in lynx habitat open to motorized over-snow use at various times throughout the year, snow conditions permitting.

In their March 3, 2006, biological opinion on A24 (USFWS, 2006b), the Service concurred with the Flathead National Forest's determination that the proposed federal action was not likely to adversely affect the Canada 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.

Subsequently, Squires and others (2010) reported on the effects of snowmobiling on Canada lynx in their Seeley Lake study area, south of the Forest. 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/day. They reported that they found no evidence that lynx selected areas away from forest roads or groomed snowmobile trails during winter.

In the past, some researchers have speculated that packed trails could indirectly affect Canada lynx by serving as travel routes that might enable competing predators (e.g., coyotes) to access snowshoe hare prey in lynx habitat (Murray & Boutin, 1991; Murray, Boutin, & O'Donoghue, 1994; Ruggiero et al., 1999). However, in its remanded determination (Federal Register vol. 68, no. 128, pp. 40076-40101, July 3, 2003), the Service found no evidence for 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. Additionally, Kolbe, Squires, Pletscher, and Ruggiero (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 (Kolbe et al., 2007). John Squires confirmed that Kolbe's findings are the best available science for the Flathead National Forest (J. Squires, 2015; Warren, 2016b). However, because snow compaction results varied across the 18 national forests encompassed by the NRLMD, Guideline HU G11 specified that designated over-the-snow routes or designated play areas should not be expanded outside baseline areas of consistent snow compaction unless designation serves to consolidate use and improve lynx habitat.

Habitat Connectivity or Linkage

Lynx linkage areas were identified in the NRLMD. Lynx linkage areas are intended to maintain connectivity and allow for movement of animals between blocks of habitat that are otherwise separated by intervening non-habitat areas such as basins, valleys, and agricultural lands or places where habitat naturally narrows due to topographic features. These linkage areas were initially identified on the basis of expert opinion and were coarsely mapped at a broad scale. The group anticipated that linkage areas would be further refined as more information became available. Subsequently, Squires and others (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 (M. K. Schwartz et al., 2009), for wolves (Oakleaf et al., 2006), and for grizzly bears (R. D. Mace, Waller, Manley, Ake, & Wittinger, 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 and crossed the U.S. Highway 2 transportation 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 in the Red Meadow LAU in the North Fork Flathead River watershed as it approached the Canadian border. The Forest used the updated information published by Squires and others in 2013 in developing its plan components for habitat connectivity.

Citing a 2002 article by Hansen et al., Squires and others (2013) stated, "Given that increased traffic and urbanization are projected for the Northern Rockies, mitigation such as land purchases and conservation easements may be necessary to preserve connectivity among lynx populations" (p. 194). Private land development, especially along highway corridors in mountain valleys, may also fragment habitat and impede the movement of lynx.

Effects of the framework programmatic action

Introduction

In this section, "effects of the action" refers to the effects of an action on the Canada lynx and its habitat, together with the effects of other activities that are interrelated or interdependent with that action. The environmental baseline includes the past and present impacts of actions and human activities in the action area, considering the anticipated impacts of proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the cumulative impact of State or private actions that are contemporaneous with the consultation in process.

This section considers the effects from implementation of the revised forest plan as guided by the plan components (objectives, desired conditions, suitability, standards, and guidelines applied forestwide or to management areas). This analysis addresses how the specific components targeted for Canada lynx (biological assessment appendix D), as well as key plan components not targeted for the Canada lynx, have the potential to affect its persistence and recovery.

As is typical of Forest Service land and resource management plans, the revised forest plan does not prescribe site-specific actions, and 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 Canada lynx, its habitat, the Flathead National Forest is responsible for section 7 consultation on future projects (conducted under the revised forest plan).The forest plan was amended in 2007 to add objectives, standards, and guidelines that addressed the major threats to lynx and remedied the inadequacy of existing regulatory mechanisms. The NRLMD addressed vegetation management, livestock management, human use projects (e.g., special uses, recreation management, roads, highways, and mineral/energy development), linkage areas, and some general direction that applies to all management practices and activities. The BO for the NRLMD stated, "We conclude, based on our entire analysis, that the proposed action would support lynx populations in core areas, and would not appreciably reduce the reproduction, numbers or distribution of lynx in the NRLA. The recovery outline for lynx (USWS 2005) presents our current understanding of historical and current lynx distribution, ecology, population dynamics, and the relative importance of different areas to the persistence of lynx in the contiguous United States. We have determined that the proposed action is compatible with our understanding of recovery needs for lynx in the contiguous United States DPS." (USFWS, 2007b). The effects to lynx that were described in the 2007 FEIS (volumes 1 and 2), biological assessment, biological opinion, and record of decision for the Northern Rockies Lynx Management Direction (NRLMD) are incorporated by reference.

Alternative B modified is based on the detailed proposed action that was published with the notice of intent in March 2015 and alternatives displayed in the May 2016 draft revised forest plan, with

clarifications and modifications in response to comments. Alternative B modified emphasizes moving towards desired future conditions that contribute to ecological, social, and economic sustainability. The forestwide NRLMD management direction is carried forward as appendix A of the proposed action, with two forest-specific modifications:

- an additional Forest-specific exception under VEG S6 for the felling of trees within 200 feet of selected mature whitebark pine trees that are genetically resistant to disease;
- amended wording of NRLMD guideline HU G11 to shift areas suitable for motorized over-snow use provided there is no net increase in suitable areas on a forestwide basis.

The previous section presented risk factors and activities that can affect Canada lynx in the action area, some of which may also result from future actions undertaken as allowed by the proposed action (alternative B modified). First, the effects section assesses allowable activities that can pose a risk to Canada lynx (the key stressors or anthropogenic influences identified in the 2013 Lynx Conservation Assessment and Strategy, discussed above in the affected environment section). Effects are also put in context based upon the extent to which they are allowed under the existing forest plan versus the proposed action. Lastly, the cumulative effects are examined.

The anticipated effects of the proposed programmatic action (B modified) are based upon:

- updates to the environmental baseline and best available science,
- plan components in the revised forest plan,
- updated estimates of the acres that would be treated with existing exceptions or exemptions to NRLMD standards to reflect the expected 15-year life of the revised forest plan and an updated assessment of treatments needs,
- an estimate of the acres that would be treated with the new, proposed exception to VEGS6,
- areas and routes suitable for motorized over-snow use.

Effects of forestwide plan components:

Key indicators for analysis

To assess key habitat features and conditions, key indicators for analysis of effects of the revised forest plan for the Flathead National Forest related to risk factors and habitat effectiveness are displayed in table 6.

Table 6. Key indicators for assessing effects to Canada lynx

Resource Element	Indicator
Effects of wildland fire on Canada lynx habitat diversity	Forestwide plan components that are adaptive to the effects of wildland fire. Management areas and the role of wildland fire.
Canada lynx habitat diversity and climate change	Forestwide plan components for terrestrial ecosystems that promote boreal forest vegetation diversity in snowshoe hare and lynx habitat. Management areas and the role of vegetation management. Forestwide components that minimize potential adverse effects of vegetation management.
Canada lynx habitat connectivity, fragmentation of habitat, linkage areas, and travel corridors	Forestwide plan components that support habitat connectivity and reduce fragmentation

Resource Element	Indicator
Recreation	Forestwide plan components that minimize potential adverse effects of snowmobiling and mortality risk due to incidental trapping/shooting
Mineral and energy activities	Forestwide plan components that minimize potential adverse effects of mineral and energy activities.
Forest/backcountry roads	Forestwide plan components that minimize potential adverse effects of forest/backcountry roads and indirect effects of trapping/shooting
Livestock grazing	Forestwide plan components that minimize potential adverse effects of livestock grazing

The Lynx Conservation Assessment and Strategy (ILBT, 2013) identified anthropogenic influences that may affect lynx and lynx habitat, sorted into either the "upper tier" or the "lower tier." The upper tier includes the anthropogenic influences that are of greatest concern to the conservation of the lynx: climate change, vegetation management, wildland fire management, and fragmentation of habitat. The "lower tier" of anthropogenic influences includes recreation (primarily snowmobiling), minerals and energy management, forest/backcountry roads and trails, grazing by domestic livestock, and mortality due to incidental trapping or illegal shooting. It is thought that the lower-tier activities could affect individual lynx but are not likely to have a substantial effect on lynx populations and are of less concern for conservation of the species (Warren, 2016b). These influences are also discussed below. The effects analysis considers the previous analysis and decision under the Northern Rockies Lynx Management Direction FEIS (USDA, 2007b) and assesses the effects of changed conditions or proposed modifications to the forest plan components under the proposed action, alternative B modified.

Wildland fire management

Objectives, standards, and guidelines carried forward from the 2007 NRLMD in proposed alternative B modified are aligned with the following conservation measures for wildland fire management in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (p. 91) at a forestwide scale, considering exemptions allowed by the incidental take statement. Wildland fire management direction 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.

- Maintain fire as an ecological process in lynx habitat, where small populations are not at risk of extirpation due to habitat loss. Evaluate whether fire suppression, forest type conversions, and other management practices have altered fire regimes and the functioning of ecosystems. (FW-DC-TE&V-23 and 24)
- Consider the use of mechanical pre-treatment and management ignitions if needed to restore fire as an ecological process or to maintain specific lynx and/or prey species habitat components. (FW-DC-TE&V-23 and 24)
- Design burn prescriptions to promote response by shrub and tree species that are favored by snowshoe hare. (objective VEG O3)

Objective VEG O3 encourages fire use activities that restore ecological processes and maintain or improve lynx habitat. Fire use is a combination of wildland fire and use of prescribed fire to meet resource objectives. Under guideline VEG G4, prescribed fire activities should not create permanent travel routes that facilitate snow compaction and permanent firebreaks should not be constructed on ridges or saddles.

As explained in the affected environment, Canada Lynx Habitat section above, historically, fire has played a significant role in creating forested landscape patterns on the Flathead National Forest and continues to be a dominant ecological process, as expected. Most of the boreal forest zone where lynx habitat occurs has not been strongly influenced by past fire suppression efforts since these areas naturally burn infrequently. Since the late 1980s, the Forest has experienced an increase in the number of large, stand-replacing wildfires. Fire has already been restored as an ecological process and we know of no science indicating that fire regimes in lynx habitat on the Forest have been altered by fire suppression. The Forest is currently experiencing a spike in the amount of lynx habitat that is currently in a temporarily unsuitable condition, similar to the spike that occurred in the time period around 1910. By the expected end of the life of the revised forest plan (about 15 years after adoption), a substantial portion of burned habitat is expected to have developed sufficient height and density to provide dense horizontal cover of branches at the snow surface for snowshoe hare and lynx habitat.

Alternative B-modified includes fire management direction that would support Canada lynx by emphasizing actions that move the Forest towards desired conditions for lynx habitat. Standard FW-STD-FIRE-01 states that when wildland fires occur, appropriate response strategies should be developed based on the risk considerations of life, safety and potential resource impacts and with the participation of other responsible agencies, authorities, and jurisdictions as appropriate. Guideline FW-GDL-FIRE-02 states that the Forest should use wildfires forestwide to meet multiple resource management objectives where and when conditions permit, keeping risk within acceptable limits. Meeting resource objectives generally means progress toward or maintaining desired conditions. Standard VEGS1 ensures that habitat conditions in each LAU will be considered as wildfire, insect, and disease conditions change over time.

Vegetation management

Desired conditions for lynx habitat and vegetation standards VEGS1, VEGS2, VEGS5, and VEGS6 support conservation of Canada lynx and their habitat. Exceptions and exemptions to the standards allow for activities to occur to meet social, economic, and multiple-use objectives of the Forest while promoting recovery of the Canada lynx population on the Forest, as discussed below.

The Forest's habitat components for Canada lynx and are aligned with the following conservation measures for vegetation management in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (p. 91) at the forestwide scale, considering exceptions allowed by the incidental take statement.

- Design vegetation management to develop and retain dense horizontal cover. Focus treatments in areas that have the potential to improve snowshoe hare habitat by developing dense horizontal cover in areas where it is presently lacking. In areas of young, dense conifers resulting from fire, timber harvest, or other disturbance, do not reduce stem density through thinning until the stand no longer provides low, live limbs within the reach of hares during winter (e.g., self-pruning processes in the stem exclusion structural stage have eliminated snowshoe hare cover and forage availability during winter conditions with average snowpack). If studies are completed that demonstrate that thinning can be used to extend the duration of time that snowshoe hare habitat is available (e.g., by maintaining low limbs), then earlier thinning could be considered. (VEGS5, note: exemptions and exception #3 addresses potential for thinning).
- Retain mature multistory conifer stands that have the capability to provide dense horizontal cover. If portions of these stands currently lack dense horizontal cover, focus vegetation management practices (such as group selection harvest) in those areas to increase understory density and improve snowshoe hare habitat. (VEGS6, note: some conifer stands called "multistory" by a silviculturist do not have the capability to provide dense horizontal cover)To maintain the amount and distribution of lynx foraging habitat over time, manage so that no more than 30 percent of the

lynx habitat in an LAU is in an early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (i.e., does not provide winter snowshoe hare habitat). Emphasize sustaining snowshoe hare habitat in an LAU. If more than 30 percent of the lynx habitat in an LAU is in early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (e.g., clearcuts, seed tree harvest, precommercial thinning, or understory removal), no further increase as a result of vegetation management projects should occur on federal lands. (VEGS1, exemptions address precommercial thinning and understory removal in the WUI).Recognizing that natural disturbances and forest management of private lands also will occur, management-induced change of lynx habitat on federal lands that creates the early stand initiation structural stage or silvicultural treatments to remove horizontal cover should not exceed 15 percent of lynx habitat on federal lands within a LAU over a 10-year period. (VEGS2, exemptions address management-induced changes in the WUI).

- Design harvest units to mimic the pattern and scale of natural disturbances and retain natural connectivity across the landscape. (VEG O1).
- Provide for continuing availability of lynx foraging habitat in proximity to denning habitat. (VEG G1)
- When designing fuels reduction projects, where possible retain patches of untreated areas of dense horizontal cover within treated areas. (VEG G10).

The following discussion summarizes and paraphrases the effects of the Forest's plan components for Canada lynx, which carry forward objectives, standards, and guidelines from the NRLMD, with two site-specific modifications. As part of the previous consultation on the NRLMD, the Forest Service estimated acres to be treated, using numbered exceptions to the vegetation standards, anticipated to occur over one decade. In their BO, the Service used these estimated acres in determining incidental take. The Forest is now providing an estimate of acres to be treated using exceptions and exemptions to vegetation standards anticipated to occur over the 15-year time period of the revised forest plan.

Objectives VEG O1, VEG O2, and VEG O4 encourage management of vegetation to mimic or approximate natural succession and disturbance processes while maintaining lynx habitat components. Plan components provide for a mosaic of habitat conditions through time that support dense horizontal cover and high densities of snowshoe hare, with winter snowshoe hare habitat provided by the stand initiation stage and by mature multistory conifer vegetation. Under alternative B-modified, these objectives would be met at the forestwide scale, which would benefit lynx by creating or sustaining desired habitat conditions. At the project level, vegetation management is focused on areas that have the potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover, except to protect communities at risk in the wildland urban interface.

Guideline G1 encourages development of projects that are designed to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Guideline VEG G5 is to provide habitat for alternative prey species, particularly red squirrel, in each lynx analysis unit. Guideline VEG G10 states that all the vegetation standards should be considered when designing fuel treatment projects within the wildland-urban interface to promote lynx conservation and should be explained in the project NEPA. Guideline VEG G11 describes how denning habitat should be retained and distributed in each lynx analysis unit. These guidelines benefit lynx by encouraging management that creates or maintains lynx habitat components, and they would continue to be considered in the site-specific design of projects under this alternative.

Vegetation treatments in the WUI (wildland urban interface)

The wildland-urban interface (see glossary) is defined by the Healthy Forests Restoration Act. The wildland-urban interface is an area within or adjacent to an at-risk community that is identified in a community wildfire protection plan or that is a certain distance around the community if a community protection plan is not available. For analysis purposes, the wildland-urban interface was modeled in 2007 as a 1-mile buffer surrounding communities with more than 28 people/mi^2.

In recognition of the escalating monetary and societal costs associated with fires in the wildland-urban interface, fuels treatment projects in the wildland-urban interface would be exempted from compliance with VEG S1, VEG S2, VEG S5, and VEG S6 under certain conditions designed to protect communities at risk. Over the entire Northern Rockies analysis area, about 6 percent of lynx habitat was found to be within 1 mile of communities. The 2007 incidental take statement constrains WUI exemption treatments to no more than 6 percent (cumulatively) of lynx habitat on an individual national forest. The Forest is proposing to carry forward the 6 percent exemption for vegetation treatments within the wildland-urban interface (which is 103,800 acres for the Flathead National Forest) for the life of the revised forest plan, which is anticipated to be 15 years.

During the period 2007-2016, the Flathead National Forest used the exemption to treat fuels on 10,079 acres of lynx habitat within the wildland-urban interface, or about 9 percent of the limit allowed under the NRLMD consultation incidental take statement. Fuels treatments in the wildland-urban interface are expected to have some adverse effects on lynx and their snowshoe hare prey, because the intent would be to maintain lower tree density in these areas, resulting in less area of dense horizontal cover. The limitations on the extent and distribution of these projects would, however, limit the impacts on the Canada lynx population. Additionally, on the Flathead National Forest, 48 of the 109 lynx analysis units (44 percent) do not contain any identified wildland-urban interface; these are mostly located within the Bob Marshall Wilderness Complex.

The wildland urban interface on the Forest is defined by community protection plans. An analysis of these WUI boundaries on the Forest shows that much of the WUI is at lower elevation and is relatively poor quality habitat for lynx (J. R. Squires et al., 2013), reducing the potential for adverse effects. The Salish Mountains geographic area has the highest percentage of lynx habitat in the wildland-urban interface (ranging from 1 to 99 percent of individual lynx analysis units), followed by the North Fork of the Flathead River (ranging from 9 to 70 percent) and the Swan Valley geographic area (ranging from 0 to 61 percent). In its previous biological opinion on the NRLMD, the USFWS assumed that fuel treatments within the wildland-urban interface would not be excessively concentrated in adjacent lynx analysis units because fuel treatment projects may not result in more than three adjacent lynx analysis units exceeding standard VEG S1. These limitations would continue to limit the concentration of impacts to Canada lynx in the future.

Vegetation Standards

In summary, standard VEG S1 allows no additional regeneration harvest by vegetation management projects if more than 30 percent of the lynx habitat in lynx analysis unit is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, with certain exceptions or exemptions allowed under the 2007 incidental take statement. As a result of recent large wildfires, currently 25 of the 109 lynx analysis units on the Forest exceed the 30 percent VEGS1 threshold (table 4). Limiting further regeneration harvest in lynx analysis units that do not meet all of the VEGS1 exemption requirements until vegetation regrows into snowshoe hare habitat would help to support lynx by maintaining a mosaic of habitat, as called for under VEG O2, so that a lynx is more likely to be able to access sufficient prey resources within its home range.

In summary, standard VEG S2 does not allow timber management projects to regenerate more than 15 percent of lynx habitat on National Forest System lands within a lynx analysis unit in a 10-year period, with certain exceptions or exemptions allowed under the 2007 incidental take statement. By limiting the rate of regeneration harvest in each LAU, this standard would help to maintain a mosaic of habitat over time, as called for under VEG O2, which would benefit lynx by providing distribution of prey resources across the landscape.

In summary, standard VEG S5 limits precommercial thinning projects during the stand initiation structural stage until the stand no longer provides winter snowshoe hare habitat, with certain exceptions or exemptions allowed under the 2007 incidental take statement. The intent is to maintain the habitat conditions that are expected to produce high densities of snowshoe hares, which would contribute to sustaining the lynx population. There are six exceptions to the standard VEG S5 that could be used to meet other resource objectives.

The six exceptions to standard VEG S5 are as follows: (1) within 200 feet of administrative sites, dwellings, or outbuildings; (2) for research studies or genetic tree tests; (3) based on new, peer-reviewed information demonstrating that a project is not likely to affect lynx or would have short-term adverse effects but long-term beneficial effects; (4) for conifer removal or daylight thinning where aspen is in decline; (5) for daylight thinning of planted rust-resistant western white pine where 80% of the winter snowshoe hare habitat is retained;; or (6) to restore whitebark pine. Exceptions 2 through 6 may only be utilized in lynx analysis units where standard VEG S1 is met. The overall effects of the VEG S5 exceptions on lynx across the Northern Rockies analysis area, as summarized in the 2007 record of decision, are as follows. Few acres would be precommercially thinned at administrative sites and for research and genetic tests, and these would generally be benign with little or no adverse effect on lynx. Thinning to enhance whitebark pine and aspen would benefit other wildlife species and would occur on a limited number of acres of lynx habitat, resulting in a minor adverse effect on lynx. Daylight thinning would be allowed around individual western white pine in a manner that retains most winter snowshoe hare habitat. Daylight thinning may reduce lynx habitat effectiveness, but since this tree species has declined by 95 percent across its range, it was decided that a limited amount of thinning should be allowed to maintain western white pine on the landscape. The Forest is proposing to increase its anticipated pre-commercial thinning treatments using exceptions to VEGS5 for the life of the revised forest plan, which is anticipated to be 15 years, as outlined below. The exceptions to VEG S5 were anticipated to result in the loss of lynx foraging habitat in some treated stands, which could have an adverse effect on lynx survival and reproduction by reducing prey resources. However, the Forest now has an abundance of acres which have burned since 2000, creating an abundance of forests that are, or soon will be providing stand initiation hare habitat, so adverse effects of proposed pre-commercial thinning are expected to be minor.

In summary, standard VEG S6 limits vegetation management projects that would reduce winter snowshoe hare habitat in multistory forests, with certain exceptions or exemptions allowed under the 2007 incidental take statement. Fuels treatments intended to protect communities at risk within the wildland-urban interface that do not meet the vegetation standards may occur on no more than 6 percent cumulatively on each national forest. Research in northwest Montana demonstrated that mature multistory forests provide important snowshoe hare habitat and are more important to lynx than younger stands during the critical winter period (J. R. Squires et al., 2010). Timber harvest would be allowed in areas that have the potential to improve winter snowshoe hare habitat but presently have poorly developed understories. Implementation of this standard is expected to benefit lynx by retaining and developing important winter habitat. There are three exceptions to standard VEG S6: (1) to accommodate fuels reduction activities within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special-use permit improvements, including infrastructure within permitted ski area boundaries, to

provide defensible space; (2) for research studies or genetic tree tests; and (3) for incidental removal during salvage harvest (e.g., removal due to location of skid trails). Exceptions 2 and 3 can only be used in lynx analysis units where standard VEG S1 is met. The exceptions to VEG S6 were anticipated to result in the loss of lynx foraging habitat in some treated multistory stands, which could have an adverse effect on lynx survival and reproduction by reducing prey resources. However, it was expected that an insignificant number of acres would be affected under the exceptions. The Forest is proposing anticipated treatments using exceptions to VEGS6 for the life of the revised forest plan, which is anticipated to be 15 years, as outlined below. In addition, alternative B-modified includes an additional site-specific exception to standard VEG S6 to benefit whitebark pine, as discussed in detail below.

Under alternative B modified, the estimate for all of the exceptions to vegetation standards VEGS5 and VEGS6 is given as a range of acres, from about 10,900 to 15,460 acres. The high end of the range includes acres that could be treated with existing NRLMD exceptions and exemptions but that cannot be specifically identified at the present time. For planning purposes, the upper end reflects potential treatment needs, updated in 2016, 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).

As previously analyzed in the biological assessment for the NRLMD, the Forest anticipates that the overall acres for purposes of incidental take would be constrained but that there would be flexibility as to which exception categories are used in order to respond to changing budgets, conditions and needs. Additional consultation would occur at the project level to assess site-specific effects on Canada lynx and their habitat. The maximum acres outlined above is about 0.9 percent of lynx habitat on the Flathead National Forest. The Forest anticipates that effects would be minor.

VEG S5 exception 3 has not been included in the acreage estimates because use of this exception first requires peer review and acceptance by the regional level of the Forest Service and state level of the Fish and Wildlife Service, with a written determination stating that modified precommercial thinning techniques would not be likely to adversely affect lynx or would have short-term negative but long-term benefits to the Canada lynx or its habitat. Acres listed under VEGS5 exception 2 include about 1,260 acres of anticipated precommercial thinning that may occur for research studies. Some of this research may involve study of the effects of precommercial thinning in wildfire areas and/or alternative precommercial thinning treatments designed to provide long-term lynx habitat benefits.

Standards and guidelines to retain old growth, snags and down wood would contribute to denning habitat for Canada lynx.

As a result of recent wildfires, there is a large pulse of lynx habitat in the early stand initiation stage on the Flathead National Forest. It is likely that these stands will develop into good-quality winter snowshoe hare habitat within about 20 years; however, after another 20 years or so, this large cohort of forests that are dominated by shade intolerant species and not subalpine fir or spruce, is likely to move into the stem

exclusion stage, producing little hare habitat for several decades. In addition, burned areas that have regenerated into very dense monotypic stands (with densities of 20,000-50,000 trees per acre), are likely to stagnate in the stem exclusion stage. Monitoring conducted on the Forest has shown than some of the very dense forested stands that regenerated after the 1910 wildfires have remained in a stagnated condition (with lodgepole pine trees that are only 3-5 inches d.b.h. and have no live tree branches at the snow surface) for over 100 years and have not progressed to a multistory mature condition.

Recently burned areas provide an opportunity to test modified techniques for precommercial thinning with the aim of increasing tree species diversity, promoting development and retention of dense horizontal cover over longer time periods, and shortening the time it takes for burned forests with very high densities of regenerating trees (often lodgepole pine and/or western larch) to develop into multistory mature forest with a dense understory of spruce and subalpine fir. The Forest Vegetation Simulator has been used to model stand structure and growth following traditional and modified precommercial thinning techniques to predict which methods offer the most promise for providing the desired forest composition and structure to support snowshoe hares and lynx over the long term. These modeling results, as well as monitoring (and possibly research) of past treatments in areas with lynx telemetry data, could inform project planning and design. The Forest is actively working with research scientists to design and conduct studies that clarify the relationships between stand treatments and the effects on lynx.

New exception to standard VEG S6 for noncommercial thinning around mature whitebark pine trees

Standard VEG S5 has an exception that allows precommercial thinning to restore whitebark pine, but VEG S6 does not provide a comparable exception to accommodate vegetation treatments to protect whitebark pine in multistory mature stands. Under Alternative B modified, standard VEG S6 would have an additional exception that would allow noncommercial 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. Removal of these trees would be aimed at reducing the risk of mortality of the whitebark pine trees due to wildfire, within-stand competition, and other stressors and making the trees more resilient and adaptable to changing future environments.

Whitebark pine historically was widespread on the Flathead National Forest and resilient to losses due to wildfire, drought, insects, or pathogens. However, an introduced disease, white pine blister rust, has caused extensive mortality and severe decline of the whitebark pine across its distribution on the Forest. In addition, some whitebark pine trees on the Forest are surrounded by dense forests dominated by larger subalpine fir, making whitebark pine very susceptible to being killed by wildfires. The Forest has already lost some of its remaining live whitebark pine trees of all sizes to high-severity wildfire. The Flathead National Forest is an important source of whitebark pine seeds that are used for restoration of the species throughout the region.

Under the Forest's new VEG S6 exception, along with the existing exception to VEG S5 for whitebark pine, it is estimated that a total of about 2,500 acres over the next 15 years would be treated with precommercial thinning and about 4,400 acres would be treated with noncommercial thinning to protect and restore whitebark pine. The acreage estimate is for the entire stand, although not all of the acres within a stand would be affected since only trees located within 200 feet of the selected whitebark pine trees would be felled. Preliminary analysis, subject to further site-specific analysis, suggests that 18 out of the 109 lynx analysis units distributed in all but the Salish Mountains geographic area may have treatments using this new exception, with no more than 6 percent of the lynx habitat in any one LAU that is identified for possible treatment (for estimated exception acres in lynx analysis units on the Forest see Figure B-8)

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 down 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 Salish geographic area, treatments would not be adjacent to areas currently in the wildland-urban interface. 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 this new exception category. Exceptions #2-6 to VEG S5 shall only be utilized in LAUs where standard VEG S1 is met. Exceptions 2, 3, and 4 to VEG S6 shall 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.

Habitat connectivity, travel corridors, and linkage areas

Additional plan components in alterative B modified address habitat connectivity, travel corridors, and linkage areas on a Forest-specific basis (see examples of key plan components listed below). Management direction 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.

As explained in the affected environment, Canada lynx habitat section, maintaining Canada lynx habitat connectivity and minimizing fragmentation is important to conservation and recovery. Objectives, standards, and guidelines carried forward from the 2007 NRLMD in the proposed alternative B modified are aligned with the following conservation measures to minimize habitat fragmentation in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (p. 93) at a forestwide scale.

- 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-13).

In summary, under alternative B modified there are multiple objectives, standards, and guidelines that apply in lynx habitat in lynx analysis units in occupied habitat (except for wildfire suppression or wildland fire use). 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-13 specifies: Within areas specifically identified as being important for wildlife connectivity across highways (see table 7) the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety.

Table 7. 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 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, for example, 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 (see Figure B-10) 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 (note: this incorporates the highest value putative travel corridor identified in Squires and others (2013).

- GA-MF-DC-04 specifies that the Nyack, Essex, and Pinnacle connectivity areas (see Figure B-10) 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 (note: this incorporates a putative travel corridor identified in Squires and others (2013).

- GA-NF-DC-06 specifies that the Haskill Basin connectivity area (see Figure B-10) 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 (note: this incorporates a putative travel corridor identified in Squires and others (2013).

- GA-NF-DC-07 specifies that the North Fork and North Whitefish Range connectivity areas (see Figure B-10) provides habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, wolverine) moving between Glacier National Park and the Whitefish Range (note: this incorporates a putative travel corridor identified in Squires and others (2013).

- GA-SM-DC-04 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 (note: this incorporates a putative travel corridor identified in Squires and others (2013).

- GA-SV-DC-08 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 (note: this incorporates a putative travel corridor identified in Squires and others (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 (see glossary) 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.

Recreation

Developed ski areas

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. 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 says 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. Guideline HU G3 says that recreation development and operations should be planned to provide for lynx movement and maintain the effectiveness of lynx habitat.

Downhill ski resorts typically occur at high elevations in areas with coniferous forests and deep snow, which coincides with lynx habitat. On the Flathead National Forest, two ski resorts, Whitefish Mountain Resort (formerly known as Big Mountain Resort) and Blacktail Mountain Resort contain lynx habitat, each located within one lynx analysis unit. In a 2000 consultation for 12 ski resorts in Montana, including Big Mountain and Blacktail Mountain Resorts, existing conditions, proposed expansions, and ongoing operations were determined to be likely to adversely affect lynx. However, given the limited proportions of the lynx analysis units affected and other factors, USFWS concluded that ongoing and proposed actions were not likely to jeopardize the species nor to result in incidental take of individual lynx. The 2007 biological opinion on the Northern Rockies Lynx Management Direction (USFWS, 2007b) 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. Under this alternative, the two ski resorts will continue to operate within their existing permit area boundaries, so effects are anticipated to be the same as in previous consultations.

Motorized over-snow use and winter routes

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, under forest plan amendment 24 (USDA, 2006) the Flathead National Forest designated specific routes and areas, as well as seasons, for motorized over-snow vehicle use in accordance with §212.81 of the Travel Management Rule. About 68 percent of the lynx habitat on the Flathead National Forest is closed to motorized over-snow vehicle use (see Figure B-12, mapped lynx habitat with over-snow vehicle use).

Under alternative B modified, the wording of HU G11 would be replaced with a Forest-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 Canada lynx, as shown in table 8.

Table 8. NRLMD guideline HU G11

Northern Rockies Lynx Management Direction, guideline HU G11	Flathead National Forest-specific modification of HU G11 under Alternative B modified
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.

In summary, the effects of this change in the guideline would be that additional areas would be suitable for motorized over-snow use in seven lynx analysis units. 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 about 7,660 acres in the Canyon LAU (see Figure B-12). 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.

At a forestwide scale, the above increases would be offset by changing some areas in five different lynx analysis units to make them unsuitable for motorized over-snow vehicle use. These changes would total about 48 acres in the Bunker Creek LAU, about 2,646 acres in the Kah Soldier LAU, about 94 acres in the Stony Jungle LAU, about 8,812 acres in Sullivan LAU, and about 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 about 30 LAUs in order to clean up boundaries previously mapped in a raster format or to assist in enforcement of closed areas. Thus, for the Forest as a whole there would be a very small net increase in the percentage of lynx habitat designated as suitable for over-snow vehicle use, totaling less than 0.1%.

In the lynx analysis units 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 as shown on Figure B-12, there are adjacent areas which 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, based upon findings by Squires and others (Kuennen, 2017a; J. R. Squires et al., 2010; J. R. Squires et al., 2013) and Kolbe and others (2007). 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 because terrain and vegetation also influence where over-snow vehicles can physically go. Vegetation conditions are dynamic over time and change in response to disturbance and succession. Wildfire may initially open up dense forest for over-snow use, but as high densities of dead trees fall or as succession occurs, areas previously open to over-snow use become unavailable because machines cannot physically maneuver between or over the trees.

This guideline 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 Forest as a whole under alternative B modified. 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.

Lynx are distributed across the Forest, with telemetry data documenting lynx use of areas such as Big Creek and Skyland Creek that receive use by snowmobiles. As discussed previously, Kolbe et al. (2007) found that compacted trails from over-snow motorized vehicles in their study area (western Montana) had only minimal impacts on coyote movements and foraging success and that snowshoe hares were an insignificant portion of the winter diet of coyotes, indicating that snow compaction did not promote a competitive interaction between coyotes and lynx. Mountain lions are a known source of mortality of lynx, accounting for roughly one third of documented mortalities in northwest Montana study areas, but all documented mountain lion predation on lynx occurred in the snow-free period (Warren, 2016a).

Although the Forest is closed to lynx trapping, a potential indirect effect of over-snow vehicle use is that it could facilitate access to lynx habitat and increase the vulnerability of lynx to incidental or accidental trapping or illegal shooting. Since 2008, changes in trapping regulations by MFWP have greatly reduced the number of lynx caught in traps, as explained in the affected environment section. Glacier National Park is closed to trapping and to public over-snow vehicle use, greatly reducing the risk of mortality. Wilderness areas of the Forest are closed to motorized use. Due to the large size and the remoteness of the Bob Marshall Wilderness complex, it too has a low risk of lynx mortality due to trapping. The combined area of Glacier National Park and the Flathead's portion of the Bob Marshall Wilderness Complex is over 2 million acres. In addition, some of the recommended wilderness areas included in alternative B modified are large or increase the size of the Bob Marshall Wilderness complex, further reducing the risk of accidental or incidental trapping. Shifting areas suitable for over-snow vehicle use within the Forest would not increase the risk of accidental or incidental trapping. Overall, the level and distribution of winter recreation under this alternative is not likely to negatively impact the overall lynx population, although there is some risk of injury or mortality to individual lynx.

Mineral and energy activities

At the present time, there is no leasable energy development activity occurring on the Flathead National Forest. There are existing gravel pits. Objective HU O5 says to manage human activities, including minerals and oil and gas exploration and development, to reduce impacts to lynx and lynx habitat. Guideline HU G4 encourages remote monitoring of mineral and energy development sites and facilities to reduce snow compaction; guideline HU G5 addresses development of a reclamation plan to restore lynx habitat when mineral and energy development sites and facilities are closed. 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 application of these measures is expected to minimize adverse effects on lynx.

At the present time, there is little exploration and no leasable development activity occurring on the Flathead National Forest. 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 Forest are withdrawn from mineral entry (Figure B-37). 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.

Withdrawal of these large areas reduces the risk of Canada lynx habitat loss, disturbance, displacement, and mortality. All withdrawals are subject to valid existing rights. The Forest Service 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 Forest, and the Forest has some ability to manage surface resources. FSM 2832 provides direction for administration of an outstanding mineral right (source of minerals information is Volume 2 of the Flathead National Forest assessment, 2014, as updated by the 2015 leasing withdrawal). In addition, the "no surface occupancy" stipulation proposed for new leases in the grizzly bear primary conservation area would limit the potential for future activity.

Forest/backcountry roads

Forest roads have minimal effects on lynx (ISDA, 2013). Four forest plan guidelines concern forest roads: HU G6 says to use methods that avoid or reduce effects on lynx 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 discourages building new permanent roads on ridgetops, saddles, and forested stringers or in areas identified as important for lynx habitat connectivity; HU G8 says that brush-cutting along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety; and HU G9 says that public motorized use should be restricted on new roads built for projects. These objectives and guidelines would continue to limit the potential local impacts of roads on lynx and lynx habitat.

On the Forest, implementation of amendment 19 has resulted in decreased road mileage, decreased road maintenance, and many miles of public road use restrictions in the last decade. 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 (see Grizzly Bear section for more details).

Livestock grazing

The forest plan includes one objective and four guidelines concerning livestock grazing in lynx habitat. Objective GRAZ O1 is to manage livestock grazing to be compatible with improving or maintaining lynx habitat. Guideline GRAZ G1 is to manage livestock grazing in fire- and harvest-created openings so that regeneration of shrubs and trees is not prevented; under GRAZ G2, livestock grazing in aspen stands should be managed to contribute to the long-term health and sustainability of aspen; under GRAZ G3, livestock grazing in riparian areas and willow carrs should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages; and under GRAZ G4, livestock grazing in shrub-steppe habitats that are in the elevation ranges of forested lynx habitat in LAUs should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages. With these components in place, the effect of livestock grazing on lynx and lynx habitat was judged to be minimal across the Northern Rockies analysis area. Very little livestock grazing occurs on the Flathead National Forest, and standards for the grizzly bear would limit livestock grazing in the future (see grizzly bear section for more details). There would continue to be little or no effect on lynx attributable to livestock grazing.

Summary of Effects of Forestwide Plan Components

- Silvicultural treatments (e.g., timber harvest, fuels treatment, and/or precommerical thinning) that reduce dense horizontal structure within forest stand understories can reduce an area's carrying capacity for snowshoe hares (Homyack, Harrison, & Krohn, 2007). With the proposed action, the NRLMD would be applied for vegetation management in Canada lynx habitat. This means that all vegetation management projects would meet the NRLMD, or, if they would not, then the project would need a site-specific forest plan amendment. Plan components protect and promote development of dense horizontal cover unless allowed by specific exceptions or exemptions consistent with incidental take.
- Vegetation treatments focused on reduction of snags and/or down woody material (fuel reduction or salvage of dead and dying trees) can result in the removal of coarse woody material or negatively affect its recruitment into the stand. This may reduce the area's potential use as denning habitat for lynx, but denning is not considered a limiting factor across the landscape. Analysis of FIA data on snags and large down woody material for the Flathead National Forest revised forest plan shows that their availability has increased due to an increase in wildfires. Plan components for snags and down woody material promote their retention.
- The proposed action limits the area where new leasable mineral activities may occur (subject to valid existing rights) within 97 lynx LAUs because there would be a standard for "no surface occupancy" for new leases in the grizzly bear primary conservation area. The primary conservation area covers 90% of the Forest. Additional direction in the NRLMD regarding mineral activities would apply with site-specific project implementation.
- 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. The proposed action plan components identify key connectivity areas across highways for multiple wildlife species. This includes the key 6-mile stretch of Highway 2 near Hungry Horse identified by Squires et al. (2013).
- Vehicle speeds on forest roads 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 thought to be low on forest roads. There would be no net increase in roads open to motorized public use in potential lynx habitat under the proposed action. 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. Guideline HU G6 in the NRLMD mentions methods to avoid or reduce the effects on lynx in lynx habitat that 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. The proposed action does not make site-specific decisions about travel routes. Travel is managed according to the Motor Vehicle Use Map, which restricts non-winter travel to designated routes. Changes to motorized public use would go through site-specific consultation at the project level.
- Although lynx are believed to be tolerant of many types of human activities, there is a potential for negative effects to lynx due to disturbance, displacement, and/or mortality risk (from non-target trapping) in winter. The proposed action plan components specify no net increase in the percentage of Forest area or miles of routes suitable for motorized over-snow use.
- The proposed action limits the amount of grazing allowed within the lynx LAUs because grizzly bear standard FW-STD-GR-05 specifies that there will be no net increase in the number of active cattle grazing allotments above the baseline in the grizzly bear primary conservation area, and a

guideline for the Swan Valley geographic area (GA-SV-GDL-05) addresses closing open and active grazing allotments if the opportunity arises with a willing permittee. Additional direction in the NRLMD regarding grazing would apply with site-specific project implementation.

Effects of plan components for broad potential vegetation types

Although standards and guidelines carried forward from the 2007 NRLMD provide direction for many aspects of land management, the proposed action has additional plan components that integrate Canada lynx habitat with desired conditions for vegetation that are tied to broad potential vegetation types, within the context of the natural range of variation. The following section discusses the effects of these plan components on Canada lynx.

Desired conditions in proposed alternative B modified are aligned with the following conservation measures for vegetation management in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (p. 91) at the forestwide scale, considering exceptions allowed by the incidental take statement.

- Provide a mosaic that includes dense early-successional coniferous and mixed-coniferous-deciduous stands, along with a component of mature multistory coniferous stands to produce the desired snowshoe hare density within each LAU. (FW-DC-TE&V-19)

- Recruit a high density of stems, generally greater than 4,600/ha (1,862/ac), of conifers, hardwoods, and shrubs, including species that are preferred by hares. (FW-DC-TE&V-19)

- In aspen stands, maintain native plant species diversity, including conifers. (FW-DC-TE&V-09)

Under alternative B modified, desired conditions for vegetation pattern are tied to broad potential vegetation groups. The majority of modeled Canada lynx habitat is in the cool-moist and cold groups, which corresponds to boreal forest habitat types capable of growing spruce and fir trees. 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 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.

Forestwide desired condition FW-DC-TE&V-19 promotes ecological conditions to support Canada lynx habitat and its connectivity because it is consistent with the desired vegetation conditions described in the section of the affected environment for Canada lynx habitat. Desired condition FW-DC-TE&V-19 states:

> 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 conditions related to forest patterns across the landscape and within potential vegetation types are described below. . . .
>
> **Cool-Moist type:** Natural disturbance processes (such as insects, disease, fires, avalanches) as well as vegetation management create patches of different tree sizes, species, and stand structures within the larger patch matrix. Forest patterns generally reflect the natural variation that might occur where moderate- and high-severity fire are prevalent, although very large high-severity fires are relatively infrequent. A mosaic pattern composed of relatively large patches of different forest size classes tends to occur across the landscape. Early successional openings (< 5 inches d.b.h.) across this landscape range from less than 100 to several thousand acres in size. Even-aged, single canopy forest patches of shade-intolerant species (e.g., lodgepole pine, western larch, and Douglas-fir) are common, particularly in the early (seedling/sapling) and mid-successional

stages of forest development. Over time, large patches of even-aged forest trend towards more diversity in size and structure, as dense understory canopy layers of shade-tolerant trees (subalpine fir and spruce) develop. Larger-sized, usually fire-tolerant species (e.g., western larch and Douglas-fir) occur in a discontinuous pattern across the landscape, sometimes in large patches and sometimes as scattered individual trees in younger stands, having survived one or more fire events.

Forests in the cool-moist broad potential vegetation type provide habitat for a variety of wildlife species over long time frames as climate, forest, and landscape conditions change (see FEIS appendix 6 for a full list of species). Processes (e.g., fire, wind, insect infestation, and disease) that create diverse patches and patch sizes also create forest groundcover consisting of a wide variety of plant species that produce berries for grizzly bears as well as willow, alder, or yew that provide cover and forage for species such as snowshoe hares and moose).

Other than in areas of recent natural disturbance (such as stand-replacing wildfire or epidemic insect infestation), patches of shrubs and coniferous trees in the small to very large size classes (> 5 inches average d.b.h.) trend towards larger, more interconnected patches, allowing animals such as lynx, fisher, and marten to move within and between home ranges. The width and distribution of patches are highly variable due to environmental conditions that change over time (e.g., disturbance, forest succession), so their location changes over time.

In Canada lynx habitat and critical habitat (see Figure B-9), a mosaic of successional stages promotes the conservation of the Canada lynx at the lynx analysis unit scale as well as at larger scales. Except in portions of the wildland-urban interface, patches of dense, young, seedling/sapling forests with branches touching the snow surface are interspersed with contiguous and interconnected areas of mature multistory hare and lynx habitat. Young forests with extremely high densities (greater than 14,000 stems per acre) occur following fires but are interspersed in a mosaic with stands of much lower densities that are developing a multistoried stand structure. Large, stand-replacing wildfires may make large areas of lynx habitat temporarily unsuitable, but over time forest conditions within post-fire landscapes promote development of snowshoe hare and lynx habitat to support long-term persistence of lynx populations.

Cold type: Forest patterns across the area generally reflect the variation that might occur in a mixed-severity fire regime, where low-, moderate-, and high-severity fires would occur. A very diverse mosaic pattern of vegetation conditions occur, reflecting both the influence of natural disturbances and the complex arrangement of site and environmental conditions that prevent or delay the establishment and growth of trees. Variable size patches of small, medium, or large trees are intermingled with small and large grass/forb/shrub openings and other non-forest types, such as avalanche chutes or high-elevation rocklands. Forest characteristics within patches are variable, usually composed of multiple canopy layers, tree ages, and size classes. The size of early successional seedling/sapling forest patches, originating mainly from fire, ranges from small (e.g., 20 acres) to large (e.g., several thousand acres).

Forests in the cold type provide habitat for a variety of wildlife species over long time frames as climate, forest, and landscape conditions change. Processes (e.g., fire, wind, insect infestation, and disease) that create diverse patches and patch sizes also create openings in moister or more protected sites that support grass, forb, and shrub species that provide forage for a variety of wildlife. Harsh climate and fires create conditions suitable for regeneration and maturation of white-bark pine trees, particularly on dry and exposed ridges and slopes, resulting in seed-producing trees that provide forage for wildlife species such as Clark's nutcrackers. The more gently sloped, moist basin areas are more densely stocked (e.g., 40 to 60 percent canopy cover),

> providing cover interspersed with more open areas for species such as grizzly bears, elk, and mule deer.
>
> In Canada lynx habitat and critical habitat (Figure B-9), a mosaic of successional stages promotes the conservation of the Canada lynx at the lynx analysis unit scale as well as at larger scales. Some patches of high-density young forest (seedlings/saplings) are present, interspersed with patches of older forests with dense understories to provide food and cover for snowshoe hares and Canada lynx. Large, stand-replacing wildfires may make large areas of lynx habitat temporarily unsuitable, but over time forest conditions within post-fire landscapes promote the development of snowshoe hare and lynx habitat to support long-term persistence of lynx populations.
>
> Other than in areas where harsh conditions limit tree growth or in areas of recent stand-replacing wildfire, patches of shrubs and coniferous trees in the small to large size classes (> 5 inches average d.b.h.) are interconnected, allowing animals such as lynx to move within and between home ranges. The width and distribution of patches are highly variable due to environmental conditions that change over time (due to disturbance, forest succession, etc.), so their locations change over time.

Desired condition FW-DC-T&V-09 provides direction to maintain native plant species diversity, including conifers, in aspen stands:

> Transitional hardwood communities occur most commonly in the early successional stage of succession, such as after a fire or harvest, where hardwood trees comprise 40 percent or greater of the tree canopy cover. These communities are most abundant on warm moist types and in riparian areas. Through natural succession, conifer species become more dominant, but hardwood species (especially aspen and birch) are present within these stands for several decades, providing habitat for a wide variety of wildlife species, including decayed hardwood trees for cavity nesters. Canopy gaps and small openings are periodically created over time within the coniferous forest landscape by disturbances (such as fire or harvest) to provide sites where hardwoods continue to successfully regenerate and/or grow into larger-sized trees. Refer also to desired conditions related to early successional and recently burned coniferous forest types (FW-DC-TE&V-11, 12, and 24).

Effects of vegetation management plan components in the context of the reference conditions and future climate scenarios

As stated in the 2013 Lynx Conservation and Assessment Strategy, "There is some uncertainty about the rate and magnitude of impacts from climate change, and federal agencies may be limited in actions that can be taken to ameliorate those impacts. Nevertheless, those impacts will interact with and perhaps magnify the effects of vegetation management, wildland fire, and fragmentation of habitat" (p. 68). In the Lynx Conservation and Assessment Strategy, no conservation measures are identified for climate change due to the limited ability of the federal land management agencies to alter the current trajectory, but the conservation measures for vegetation includes the following measure: "Conduct a landscape evaluation to identify needs or opportunities for adaptation to climate change. Consider potential changes in forest vegetation that could occur as a result of climate change (e.g., Gärtner et al. 2008). Identify reference conditions relative to the landscape's ecological setting and the range of future climate scenarios. For example, the historical range of variability could be derived from landscape reconstructions (e.g., Hessburg et al. 1999, Blackwell et al. 2003, Gray and Daniels 2006)" (p. 91).

Plan alternatives were analyzed using a landscape evaluation that considered reference conditions relative to the landscape's ecological settings and the range of future climate scenarios, considering the interaction

of vegetation management, wildland fire, and possible effects on fragmentation of habitat. Effects of vegetation management associated with each alternative set of management areas, combined with modeling of natural processes such as wildfires, insects/disease, and forest succession, were modeled by Ecosystem Research Group (ERG) in 2015. ERG modeled the effects of several future scenarios for comparison purposes, including a warmer/drier climate over the next five decades that resulted in more acres burned (due to expected climate change), as well as continuing the current level of fire suppression into the future. Effects were modeled using the SIMPPLLE model (which simulates future pathways of natural vegetation change across the Forest) and the Spectrum model (which simulates future vegetation management associated with an alternative and its mix of management areas across the Forest). The SIMPPLLE and Spectrum models provide a probalistic assessment of the subset of federal actions that provide a programmatic framework for vegetation management activities across the forest over a 50-year future time period. However, since the exact location, extent, and timing of future fires, timber harvest, thinning, and planting are unknown, future site-specific actions would be subject to the requirements of section 7 of the Endangered Species Act at a future time.

ERG's modeling used the GIS layer of modeled and mapped lynx habitat for the Flathead National Forest. ERG conducted two analyses for lynx to assess their habitat requirements: (1) a stand initiation habitat analysis and (2) a potential multistoried habitat analysis. Stand initiation hare habitat was modeled as any cover types within grand fir or subalpine fir/spruce habitat types (often mixed with other species). On the Forest, grand fir (although not abundant) was included because it occurs in close juxtaposition to subalpine fir/spruce lynx habitat and is known to produce snowshoe hares. Stand initiation hare habitat was modeled as the seedling/sapling size class with a canopy cover class of 40–100 percent and 20 or more years since the previous stand-replacing disturbance (high-severity fire or regeneration harvest). VMap canopy cover classes greater than or equal to 40 percent accounted for eighty-five percent (5,515 of 6,505) of Squires's lynx telemetry locations on the Forest, and forest that is at least 20 years old generally has trees

Modeled multistoried habitat is limited to cover types that contain subalpine fir or Engelmann spruce (which may be mixed with other species) within subalpine fir/spruce habitat groups. Multistoried lynx habitat is provided by forests with a high proportion of trees in the 7-11" and 11"+ diameter classes (J. R. Squires et al., 2010; J. R. Squires et al., 2006), so all diameter classes with an average above 10" and at least 40 percent VMap canopy cover were included. VMap canopy cover classes greater than or equal to 40 percent accounted for 85 percent (5,515 of 6,505) of lynx telemetry locations on the Flathead National Forest. In addition, the following assumptions were made. Although snowshoe hares require a dense understory, the SIMPPLLE model is dependent on R1-VMap classes and did not allow the incorporation of understory density.

Additionally, all cover types with presence of subalpine fir/Engelmann spruce (which may be mixed with other species) were identified as potential habitat to disclose how much of that potential habitat currently has subalpine fir or spruce and is in either a stand initiation or multistoried condition. If potential habitat is currently forested with western larch (typical seral species on warmer subalpine fir habitat types) or is in a single-storied, dense stem exclusion condition, that habitat is considered "potential" but may not provide snowshoe hare habitat in its current condition.

Over the next 50 years, the SIMPPLLE model predicts that subalpine fir presence will be maintained on the Forest. Available Forest data sets are not able to estimate horizontal cover associated with snowshoe hare and lynx habitat, but overall density can be estimated based upon FIA field measurements of canopy cover. A large portion of the forest—about 65 percent of the area in the Cool Moist Broad PVT (biophysical setting) is currently in a moderate- to high-density class. Over the first three decades, modeling estimates that this proportion remains steady but then declines but the proportion of low-density

forest increases. In the model, lower forest densities are largely driven by natural disturbances (fire, insect, disease) which converts large areas to early successional forest in the latter modeled decades, with temporarily less canopy cover. The increasing proportion of forest with low canopy cover may temporarily reduce the quality and connectivity of lynx habitat; however, it would improve over time with development of vegetation in the understory and midstory.

According to modeling of NRV, fire cycles affecting the amount of multistoried and stand initiation habitat have probably occurred in the past and are likely to occur in the future in the mid- to high-elevation subalpine fir and spruce forests of the Forest. This is a natural fluctuation over time associated with the characteristic fire regimes and disturbance processes. On the Forest, where conifer growth is rapid in the moist habitats providing lynx habitat and stand-replacing fire intervals are fairly infrequent, the acres of modeled stand initiation habitat fluctuate up and down. Modeling of vegetation management that would occur under the preferred alternative, in combination with natural processes, shows that stand initiation habitat is expected to stay within the natural range of variation.

ERG also modeled multistory forest that provides snowshoe hare and lynx habitat. The model is not able to discern whether a dense understory is present or not, so this should be interpreted as areas with a potential to provide winter snowshoe hare and lynx habitat. What the model depicts is the trend in forest stands that are most likely to have a multistoried structure, high canopy closure, and presence of subalpine fir and spruce. The range between maximum and minimum NRV is very large, almost 650,000 acres. Since the model reduces harvest based upon lynx standard VEG S6 and applies fire suppression logic as well as forest succession for all alternatives, levels of modeled multistoried lynx habitat slightly exceeds the maximum range of NRV for the first two decades. By the third decade, modeled levels of fire and/or insects and disease increase, consistent with projected changes in climate by mid-century. If insects/disease kill scattered patches of trees in the overstory of multistoried forests, it could increase the density of the understory, creating multistoried stands after a lag time of a few decades, provided the loss of canopy cover is not too great. In contrast, stand-replacing wildfires would create more stand initiation habitat after a lag time of a few decades.

Despite plan components to maintain or increase multistoried hare and lynx habitat, modeled declines below current levels are projected to occur by the end of five decades. This suggests that the current level of modeled multistoried habitat may be unsustainable based on inevitable and unavoidable natural disturbances, which were modeled as increasing with a warmer, drier summer climate. Modeling of vegetation management that would occur under the preferred alternative, in combination with natural processes, shows that although it would decline, potential multistory hare and lynx habitat is expected to stay within the natural range of variation.

Modeling results discussed above are believed to be a “worst-case scenario”. The Flathead National Forest planning team made updates to the SIMPPLLE model between the draft EIS and the final EIS based upon input from scientists that the model may have projected too much effect from spruce bark beetle and Douglas-fir beetle infestation. This resulted in differences in future projected conditions for some of the vegetation attributes. In regards to lynx habitat, outputs of the initial model run showed that multistoried habitat would increase during the first two timesteps (2 decades). This increase might be less than modeled, however, because if fewer spruce are killed, fewer canopy gaps are created, and there is less opportunity for a dense understory to grow. The decline in multistoried habitat by the fourth and fifth timesteps would likely be less as well because the extent of tree mortality from Douglas-fir beetle and spruce bark beetle would be decreased across about 150,000 acres average per decade. In the updated modeling, an increase in the combined medium, large, and very large size classes occurs as well as an increase in the amount of moderate and high canopy cover classes. There would be fewer large dead trees falling down, so higher canopy cover would be maintained. In the updated modeling, the Forest also

tested the effects of an earlier increase in stand-replacing wildfire. This resulted in stand-replacing wildfire occuring on about 80,000 more acres. This would initially create more temporarily unsuitable habitat for Canada lynx for about the first two timesteps, followed by an increase in stand initiation hare habitat for the subsequent timesteps. However, the amount of additional fire in the updated model is not enough to offset the favorable effects of reduced Douglas-fir and spruce bark beetle in creating multistoried habitat.

Effects of management area (MA) plan components in potential lynx habitat

Management area plan components and delineation provides the on-the-ground framework guiding which allowable uses may occur. Table 9 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 MAs begins on page 17 of the Introduction.

Table 9. Canada lynx habitat in each Forest management area (MA).

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**	

Wilderness (MA1a): The Forest manages approximately 771,082 acres of potential lynx habitat in existing wilderness in the Mission Mountains and Bob Marshall wilderness complex—a total of about 43 percent of the Forest's lynx habitat acreage (Table 9). Planned and natural ignitions are allowed under current and proposed action direction and contribute to desired vegetation conditions in these areas. This MA maintains large, remote, and secure habitats for lynx that are likely to have a lower amount of human presence due to the lack of wheeled or over-the-snow motorized use and limited nonmotorized access. The wilderness MA provides habitat connectivity with Glacier National Park and then to the international border with Canada, helping to provide linkage with lynx populations in British Columbia and Alberta. Periodic wildfires create a mosaic of forest conditions.

Recommended Wilderness (MA1b): Approximately 155,820 acres of potential lynx habitat, distributed across 46 of the Forest's 109 lynx analysis units, is located in this MA (Table 9). Planned and natural

ignitions are allowed under current and proposed action direction and contribute to desired vegetation conditions in these areas. Like wilderness, this MA maintains large, remote, and secure habitats for lynx that are likely to have a lower amount of human presence due to management area direction that does not allow wheeled or over-the-snow motorized use and limits management actions to those that maintain wilderness character. The wilderness MA provides habitat connectivity with Glacier National Park and then to the international border with Canada, helping to provide linkage with lynx populations in British Columbia and Alberta. The recommended additions to the Bob Marshall, Great Bear, and Scapegoat wilderness areas provide habitat for lynx in 38 LAUs. The recommended Tuchuck addition helps provide a large block of secure habitat in 7 LAUs in close proximity to lynx habitat in Canada, contributing to habitat connectivity as well as genetic connectivity. Periodic wildfires create a mosaic of forest conditions.

Designated and Eligible Wild and Scenic Rivers (MA2): Approximately 17,658 acres of potential lynx habitat is located within these MAs (Table 9). The Forest has one designated river with three forks (the North, Middle, and South Forks of the Flathead), and an additional 21 rivers are eligible. Wild and scenic river segments are free of impoundments and have shorelines that are essentially primitive, and recreation segments are accessible by road or railroad and have some shoreline development. Timber harvest is not allowed in wild river segments. Scenic and recreational river segments are not suitable for timber production, but timber harvest may be allowed to meet desired social, economic, or ecological conditions. MA2 management direction helps to maintain wide forested corridors along major waterways that may facilitate lynx movement through the landscape, providing connectivity.

Special Areas (MA3b): Approximately 1,001 acres of potential lynx habitat is located within this MA (Table 9). This MA provides protection for areas with unique botanical features such as fens, sloughs, *Howellia* sites, and groves of cedar, larch, or ponderosa pine. This MA is not suitable for timber production, nor is it suitable for commercial use of non-timber forest products. Vegetation management may be allowed to maintain desired ecological conditions and values. A variety of sites occur in this MA and in their natural state; these areas may or may not provide the kind of vegetation conditions that provide lynx foraging, denning, or habitat connectivity.

Research Natural Areas (MA4a): Approximately 4,673 acres of potential lynx habitat is located within this MA (Table 9). The Forest has six research natural areas (RNAs) in three geographic areas. RNAs are generally natural appearing, and ecological processes have limited human influence that is guided by the Rocky Mountain Research Station. This MA is not suitable for timber production. Vegetation management may be allowed for study and research purposes or if needed to protect the values for which the RNA was designated. Although very limited in their number and size, RNAs help provide a continuum of security habitat and connectivity for lynx.

Experimental Forest and Demonstration Forest (MA4b): Approximately 8,782 acres of potential lynx habitat are located within this MA (Table 9). The Forest has one experimental forest in the Hungry Horse geographic area and one demonstration forest in the Salish geographic area. In experimental forests and demonstration forests, vegetation management for research purposes is likely, wheeled motorized travel may occur on designated routes, and motorized over-snow use may occur, subject to other forestwide plan components. Periodic wildfires, prescribed fires, and other types of vegetation management, including timber harvest, precommercial thinning, commercial thinning, and planting, may create a mosaic of forest conditions.

Backcountry (MA5): Approximately 271,963 acres of potential lynx habitat is located within this MA (Table 9). In MA5a, motorized use is not allowed. Year-round motorized use is allowed in MA5b, over-snow motorized use is allowed in MA5c, and summer wheeled motorized use is allowed in MA5d. Motorized use in MA5d is generally dispersed trail use, whereas over-snow use in MA5c includes

dispersed trail use as well as larger areas. Mechanized uses (e.g., mountain bikes, game carts) are allowed in this MA. Although lynx are generally tolerant of human presence and the types of uses that occur in backcountry areas, over-the-snow disturbance may be great enough to cause disturbance or displacement of individual lynx in some circumstances. The proposed action limits areas where motorized over-snow use can occur, reducing the risk of population-level effects (see also the discussion under forestwide plan components, modification to HU G11). This MA is not suitable for timber production, but timber harvest may be allowed to meet desired ecological, social, or economic conditions. Because most of MA5a is in inventoried roadless areas where road building is not allowed, timber harvest would be likely to occur at low levels. Periodic wildfires, prescribed fires, and other types of vegetation management, including precommercial thinning, commercial thinning, and planting, may contribute to a mosaic of forest conditions.

General Forest (MA6): Approximately 528,010 acres of potential lynx habitat is located within the general forest MAs (Table 9, Figure B-13). Potential lynx habitat located within the general forest MAs provide a mosaic of successional stages in a roaded environment due to past road construction and timber harvest. In this MA, 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 MA6, riparian management zones 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 of MA6a and MA6b is located in areas along putative travel corridors identified by Squires and others (2013). MA6a is anticipated to have the lowest intensity of timber harvest, followed by MA6b, which also contributes to habitat connectivity in key areas for lynx. Much of the MA6c area is in the wildland-urban interface, where timber harvest intensity is anticipated to be higher. MA6c is where exemptions to the vegetation standards for lynx are most likely to result in short-term adverse effects but long-term benefits to hare habitat by creating a mosaic of successional stages. Grizzly bear management direction prescribes no net increase to baseline densities of roads open to public motorized use during the non-denning season, which would also reduce the potential for disturbance to lynx. In the grizzly bear recovery zone/primary conservation area, total road densities would also be subject to a standard of no net increase to baseline densities, and there would be no net decrease in secure core, providing large areas of relatively high habitat security.

Focused Recreation Area (MA7): Approximately 36,578 acres of potential lynx habitat is located within this MA (Table 9, Figure B-9). Focused recreation areas typically have recreation uses such as a large lake or reservoir, large campgrounds, or trail systems for featured recreational activities such as hiking, mountain biking, cross-country skiing, and/or off-road vehicle use. There are two developed ski areas or year-round resorts in this MA. Focused recreation areas may have a relatively high level of human activities and associated infrastructure. There will generally be roads, utilities, and trails, as well as signs of past and ongoing activities of actively manage forest vegetation in these areas. Although individual lynx may be adversely affected by recreation developments, the management direction in the NRLMD would reduce potential impacts and avoid an appreciable reduction in the reproduction, numbers, and distribution of lynx.

Summary of key differences in management areas between the existing forest plan and the proposed action

- Compared to the current plan, recommended wilderness would increase by about 91,900 acres under the proposed action, bringing the area managed for wilderness character to about 53 percent of the Forest when combined with existing wilderness. Timber harvest would not be allowed in recommended wilderness, but planned and unplanned ignitions could occur. As a result of increasing recommended wilderness, the area managed in backcountry management areas would decrease by about 83,300 acres.

- Compared to the current plan, management areas suitable for timber production (MAs 6b, 6c, 4b, and portions of MA7) would be reduced in potential lynx habitat by approximately 41,507 acres under the proposed action. Even within these management areas, riparian management zones would not be suitable for timber production. Timber harvest would only be allowed in the inner portion of RMZs to benefit aquatic and riparian-dependent resources. Timber harvest would be allowed in the outer RMZ, but there would be a guideline limiting distance to cover, which would benefit Canada lynx by contributing to habitat connectivity.

Summary and conclusion for alternative B modified

Under alternative B modified, implementation of the revised forest plan is anticipated to maintain or improve lynx habitat in the long term, although some short-term adverse effects may occur, primarily due to the reduction of snowshoe hare habitat allowed under the exemptions and exceptions to the vegetation standards. Reductions in snowshoe hare habitat due to fuels treatments and precommercial thinning could lead to lowered reproduction and survival of lynx. However, the adverse effects are limited in their extent and distribution, as discussed above. A maximum of 6 percent of the 1.8 million acres of lynx habitat on the Forest could be affected by the exemption for fuels reduction in the wildland-urban interface, and less than 1 percent of lynx habitat could be affected by the exceptions allowing precommercial or noncommercial thinning for other resource objectives. Except for defensible space, the exceptions may not be used in lynx analysis units that have more than 30 percent in stand initiation structural stage that does not yet provide winter snowshoe hare habitat, reducing the potential for cumulative effects of wildfire, prescribed fire, and vegetation management activities.

The Northern Rockies Lynx Management Direction would remain in place with two Forest-specific changes. There would be an additional exception to standard VEG S6 with some additional minor adverse effects from felling of trees within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. This effect would occur on about 4,400 acres (less than 0.01 percent) of lynx habitat and is likely to be distributed in no more than 18 lynx analysis units out of 109 lynx analysis units on the forest.

In 7 lynx analysis units, there would be an increase in the area suitable for over-snow vehicle use, which would be offset by a reduction in 5 other LAUs. The change to HU G11 would result in no net increase in the area suitable for over-snow vehicle use on the Forest, but areas would be shifted. The effects of the increased suitable areas are anticipated to be minor based upon findings by Squires et al. (2010) and Kolbe et al. (2007). There may be a small benefit to lynx because some areas that would become unsuitable provide higher quality habitat than some areas that would become suitable (see figure 1 in Squires et al. (2013) (Kuennen, 2017a).

On the whole, modified alternative B would promote conservation of the Canada lynx population because (1) the regulatory framework provided by the Northern Rockies Lynx Management Direction would remain in place, with two Forest-specific modifications that would have minor effects, (2) plan components for vegetation in the broad potential vegetation groups that include boreal forest habitat types would support lynx habitat diversity over the long term, and (3) management area designations and their effects have been modeled for lynx habitat (based on a “worst-case scenario” with respect to modeled changes in climate over 5 decades following plan implementation), and modeling has shown that anticipated combined effects would remain within the range of natural variation of the Forest’s historically fire-dominated landscape.

Landscape-scale effects on Canada lynx habitat

Vegetation Management

On national forests during the last decade, timber harvest practices have been more favorable for lynx as a result of forest plan amendments, with fewer acres impacted by temporary loss of multistory stands that provide snowshoe hare and lynx habitat. Outside the wildland-urban interface, the reduction in traditional precommercial thinning practices has also been more favorable for lynx, with fewer acres experiencing short-term reductions in snowshoe hare habitat due to excessive reductions in horizontal cover providing hare and lynx habitat. Effects of vegetation management on adjacent national forests, Glacier National Park, and the Flathead Indian Reservation within the area occupied by Canada lynx are as follows:

- On the Kootenai National Forest, the maximum acres of lynx habitat that could be affected by exemptions for fuels management in the wildland-urban interface is no more than 57,052 acres, according to the NRLMD biological opinion. Exceptions for precommercial thinning projects for resource benefits could affect another approximately 11,862 acres. Thus far, the level of effects related to vegetation management on the national forests is substantially lower than what was anticipated in the 2007 record of decision for the Northern Rockies Lynx Management Direction and the USFWS biological opinion. From 2007-2012, approximately 7,271 acres were burned by wildfires in lynx habitat within lynx analysis units on the Kootenai National Forest (J. Anderson, pers. comm., August 9, 2013).
- On the Helena National Forest, the maximum acres of lynx habitat that could be affected by the wildland-urban interface exemption is 26,400 acres, according to the NRLMD biological opinion. Exceptions for precommercial thinning projects for resource benefits are limited to 730 acres. Combined, the exemptions and exceptions could affect about 6 percent of the lynx habitat on the Forest. To date, the level of effects to lynx are substantially lower than what was anticipated in the record of decision for the Northern Rockies Lynx Management Direction as the actual amount of treatments on the Helena National Forest total only about 200 acres under the wildland-urban interface exemption (D. Pengeroth, pers. comm., March 29, 2016).
- On the Lolo National Forest as a whole, the maximum number of acres of lynx habitat that could be affected by exemptions for fuels management in the wildland-urban interface is no more than 16,900 acres, according to the NRLMD biological opinion. Exceptions for precommercial thinning projects for resource benefits could affect another approximately 2,200 acres of lynx habitat. To date, the level of effects to lynx are substantially lower than what was anticipated in the record of decision for the Northern Rockies Lynx Management Direction as the actual amount of treatments on the Lolo National Fprest total only about 300 acres under the wildland-urban interface exemption (E. Roberts, pers. comm., April 26, 2016).
- Management of Glacier National Park and the forest management plan for the Flathead Indian Reservation (CSKT) incorporate the conservation measures of the 2013 Lynx Conservation Assessment and Strategy. Glacier National Park does not conduct commercial timber sales but does use fire as a vegetation management tool. Vegetation management in lynx habitat on the Flathead Indian Reservation is similar to that on the national forests. This serves to minimize adverse effects to lynx and to promote consistency in habitat management approaches.

Future climate change

The preliminary Northern Region Adaptation Partnership risk assessment for the Canada lynx (McKelvey & Buotte, in press) states that lynx have little or no adaptive capacity to live in areas lacking snow and limited ability to shift their diet away from snowshoe hares. The authors estimate the likelihood of future climate change effects is high, with a moderate magnitude of effects by 2030 and a high magnitude of

effects by 2050. There is a potential for climate change to reduce the extent of deep snow habitats preferred by lynx. McKelvey et al. (2011) estimated that contiguous areas of spring snow cover would become smaller and more isolated throughout the Columbia River Basin, with greatest losses at the southern periphery but possible increases in snow at higher elevations in the lynx core (including the Flathead National Forest). Regardless of snow depth, the timing of snowmelt has been occurring about two weeks earlier in recent decades. Mills and Johnson (2013) used an ensemble of locally downscaled climate projections and forecasted that annual average duration of snowpack will decrease by 29–35 days by midcentury. Unless snowshoe hares show enough plasticity to adapt to earlier snowmelt, the reduced snow duration will increase the number of days that white hares will be mismatched on a snowless background. This lack of camouflage coloration may make lynx more successful in detecting their primary prey, but in the long term it may also reduce snowshoe hare numbers, especially at relatively lower elevations where snow reductions in the northern Rockies are anticipated to be greatest.

Large wildfires in lynx habitat are also believed to be strongly associated with changing climate factors. Westerling et al. (2006) compiled information on large wildfires in the western United States from 1970–2004 and found that large wildfire activity increased suddenly and markedly in the mid-1980s, with higher frequency of large wildfire, longer wildfire durations, and longer wildfire seasons. The greatest increases occurred in mesic, middle- and high-elevation forest types in the northern Rocky Mountains. Westerling stated that fire exclusion (suppression) has had little impact on natural fire regimes of these higher-elevation forest types in this area; instead, climate appears to be the primary driver of forest wildfire risk.

As discussed above, stand-replacing wildfires on the Forest have created a greater amount of early stand initiation habitat in recent decades. Increases in wildfire may initially create more habitat that is temporarily unsuitable for snowshoe hares and lynx foraging but may greatly increase suitable habitat after a few decades. The Forest modeled what is believed to be a worst-case scenario with respect to stand-replacing wildfire. Fuels reduction programs have ramped up in recent years and are expected to continue on most federal, state, tribal, and private lands within the boundaries of Forest geographic areas. Plan components for fire would allow the Forest to adapt its future management to changing conditions.

Cumulative effects analysis area

For lynx, the area selected for analysis of cumulative effects is the area identified by J. R. Squires et al. (2013) as the current distribution of lynx in northwestern Montana. The cumulative effects analysis area in northwest Montana spans about 13,900 mi^2 (8.9 million acres) of the Northern Rockies and generally encompasses forested areas with recent evidence of lynx presence on portions of the Kootenai, Helena-Lewis and Clark, and Lolo National Forests. Lynx habitat on these national forests is managed through implementation of a consistent set of forest plan objectives, standards, and guidelines (see Flathead National Forest revised forest plan, appendix A). Two national forests make up the bulk of the lands in this area, the Flathead and the Kootenai National Forests. There are 47 LAUs on the Kootenai National Forest, encompassing about 1,151,000 acres of lynx habitat (i.e., boreal forest habitat types). The Kootenai National Forest has consulted on its 2013 revised forest plan. To the south, the Seeley Lake District on the Lolo National Forest and the Lincoln District on the Helena National Forest also provide lesser amounts of lynx habitat in the area.

The cumulative effects analysis area also includes lands managed by Glacier National Park, the State of Montana, the tribes, and private lands. This area was delineated by Squires and others (2013) based upon lynx radiotelemetry location data from 1998-2007. The locations of lynx captured on the Forest from 2009-2015 and non-invasive detections of lynx on the forest also lie within this area. Consideration of the Northern Rockies Geographic Area, a region encompassing 18 national forests and an estimated 18.5

million acres of lynx habitat in Montana, Idaho, Wyoming and Utah, and adjoining areas in Canada, is also provided for context.

Cumulative effects to Canada lynx

Cumulative effects under the Endangered Species Act include state, tribal, local, or private actions that are reasonably certain to occur in the action area. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in cumulative effects analysis in this biological assessment.

As described previously, the 2013 Lynx Conservation Assessment and Strategy identified four anthropogenic influences (the upper tier) as being of greatest concern to the conservation of the lynx: climate change, vegetation management, wildland fire management, and fragmentation of habitat. These are therefore considered in some detail in this section to evaluate the potential for cumulative adverse effects. The "lower tier" of anthropogenic influences include recreation, minerals and energy management, forest/backcountry roads and trails, grazing by domestic livestock, and mortality due to incidental trapping or illegal shooting. Although the lower tier activities could affect individual lynx, they are not expected to have a substantial effect on the overall lynx population and are unlikely to cause cumulative adverse effects. Therefore, they are not discussed in detail.

Vegetation management and wildland fire management

In the past, timber harvest removed all size classes of trees, snags, and down logs in mixed species forests containing spruce-subalpine fir, resulting in loss of multistory stands as well as fragmentation of cover. On cool-moist habitat types, forests regenerated in the 1950s and 1960s, including those that had precommercial thinning following harvest, are now developing into forests with a multistory canopy structure that in some cases contain a dense understory. During the same time period, an extensive insect and disease outbreak killed large-diameter spruce. Removal of scattered mature spruce trees allowed a dense understory of subalpine fir and shrubs to grow in many of these areas.

State lands

Within the Forest analysis area, 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 their 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. 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

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 Forest geographic areas are at elevations too low to be lynx habitat, but lynx do cross through these areas. There is a potential for future management to have negative effects on lynx, although the Service (USFWS, 2007b) concluded that some of the negative effects would be moderated by federal land management within the large landscapes inhabited by an individual lynx. 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 in the Middle Fork and North Fork of the Flathead River, as well as in the Swan Valley and Stillwater Valley near Olney, 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. Formerly, Plum Creek Timber Company managed lands in lynx habitat and a large portion of their acreage was regenerated in the last few decades. Since 1996, lands in the Swan River geographic area have been acquired by the Forest Service or DNRC through the Montana Legacy Project and other acquisitions. Acquisition by the Forest Service ensures that these lands will not be subdivided for permanent human development and will be managed according to applicable standards and guidelines to conserve lynx habitat (see grizzly bear section for more details on Legacy lands and their distribution). 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 or may not decrease habitat quality for Canada lynx, depending upon the specific location, rate, and type of treatment.

Canada lynx habitat connectivity

Linkage areas are intended to allow for movement of animals between blocks of habitat that are otherwise separated by intervening non-habitat areas such as basins, valleys, and agricultural lands or to maintain habitat connectivity where habitat naturally narrows due to topographic features (Claar, Bertram, Naney, Warren, & Ruediger, 2003). Several linkage areas that intersect the Flathead National Forest were identified in the Northern Rockies Lynx Management Direction FEIS, figure 1-1 (USDA, 2007b).

Subsequently, Squires and others (2013) identified lynx travel corridors connecting Canada and northwest Montana using least-cost path modeling. A primary corridor was identified that extended from the Whitefish Range in the north, then along the western front of the Swan Range, and ended near Seeley Lake. A second modeled corridor extended along the east side of Glacier National Park southward through the Bob Marshall Wilderness Complex.

Crossing of highways by lynx has not been studied in the northern Rocky Mountains, but Baigas and others (2017) modeled behavior of Canada lynx crossing two-lane highways in the southern Rocky Mountains, based on 593 highway crossings documented with GPS telemetry. Lynx mostly crossed highways at night and early dawn when traffic volumes were low (Baigas et al., 2017). State Highway 83 bisects the Swan Valley, but radio-collared lynx have been documented to cross this highway and it does not appear to impede their movements (J. R. Squires & Laurion, 2000). Radio-collared lynx have also been documented crossing State Highway 2 between the Flathead National Forest and Glacier National Park (Squires 2013, unpublished data). Since 2000 when Canada lynx were listed, there have been three documented mortalities in the state of Montana due to collision with vehicles on paved two-lane or four-lane highways with high traffic volumes or road speeds of 70 miles per hour (Broderdorp, 2016). There are no four-lane highways in the cumulative effects analysis area, and lynx are known to cross the existing two-lane highways. Given that increased traffic and urbanization are projected for the northern

Rockies (A. J. Hansen et al., 2005), mitigation measures such as land transfers and conservation easements may be necessary to preserve connectivity among lynx populations. If traffic volume greatly increases, the construction of wildlife crossing structures could be considered (Clevenger & Waltho, 2005; J. R. Squires et al., 2013).

Continuing development of private lands to support increased human populations will likely increase habitat fragmentation and may reduce habitat connectivity between blocks of public lands. NRLMD standard ALLS1, objective LINK 01 and objective HU 05 apply. In addition, to address potential changes on private lands, the preferred alternative includes a forestwide desired condition (FW-DC-LSU-01) stating that land ownership adjustments, through purchase, donation, exchange, or other authority, will be considered to 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. Because these actions require a willing landowner, it is difficult to predict when or where effects may actually occur. Cities and towns and/or broad expanses of agricultural lands without cover may deter lynx movements. Although lynx are known to cross openings, Squires and others found that lynx generally use habitat within about 300 feet of cover (J. R. Squires et al., 2013). Most of northwest Montana is heavily forested, with the largest non-cover areas occurring in cities, towns, and agricultural valleys (such as the Flathead Valley). The preferred alternative includes desired conditions for connectivity (FW-DC-TE&V-20, FW-DC-WL DIV-02, GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06,07; GA-SM-DC-03, GA-SV-DC-09) and pathogens and actions on private lands; it is difficult to predict when or where effects would occur.

Connectivity to source populations of lynx in Canada is considered critical to persistence of populations in most parts of the range in the United States (J. R. Squires et al., 2013; USFWS, 2003). Connectivity from the Forest to Canada is currently high, with cover conditions that facilitate lynx travel and only two-lane gravel roads within the cumulative effects area. Currently there is no evidence that there are significant impediments to lynx movements or that genetic isolation is occurring in western Montana (Squires et al. 2013).

Recreational activities

Scientific evidence to date indicates that most recreational activities pose a low risk of having negative effects on lynx (ILBT, 2013).Within the cumulative effects analysis area outside of the Forest, there is one ski area on the Kootenai National Forest (Turner Mountain). This is a very small ski area with only one lift and very little development at the base. The ski area affects about 263 acres of lynx habitat, with 164 acres of cleared ski runs and 98 acres of gladed skiing. Summer activities such as hiking are also provided. The Montana Snowbowl is located on the Lolo National Forest and affects about 1,190 acres of lynx habitat in the Rattlesnake lynx analysis unit. Over 90 percent of this lynx analysis unit is within the Rattlesnake National Recreation Area and Wilderness. Although the Turner Mountain and Snowbowl ski areas may have some local adverse effects, they would not be expected to contribute to cumulative adverse effects on the lynx population.

There is a potential for snowmobile use to increase in the cumulative effects analysis area, which could indirectly increase mortality risk to lynx due to incidental trapping or shooting. However, many areas of lynx habitat have limited accessibility for off-route snowmobiling due to high tree densities and rugged topography. On the Kootenai National Forest, there are approximately 120 miles of groomed over-snow motorized routes and approximately 46 more miles of designated routes in lynx habitat within lynx analysis units. Additionally, there are approximately 5 miles of groomed cross-country ski trails in lynx habitat within lynx analysis units and another 5 miles that are designated for cross-country ski use. These mileages are less than what was analyzed in the Northern Rockies Lynx Management Direction FEIS due

to better mapping and some routes being dropped due to lack of snow (M. Laws, personal communication, September 17, 2012 (USDA, 2013)). There are no designated "play areas" on the Kootenai National Forest, although it is likely that some areas receive concentrated use.

Minerals and energy exploration and development

On the Kootenai National Forest, no leasable minerals (e.g., oil, gas, coal, geothermal resources, etc.) are being produced. As on the Flathead National Forest, all leases are currently suspended in accordance with the 1985 court decision Conner v. Burford (848 F.2d 1441 (9th Cir. 1988).

The Troy copper/silver mine was in operation for over 20 years on the Kootenai National Forest and affects approximately 50 acres on National Forest System lands and an additional 400 acres of private lands (USFS 2003). In 2006 the USFWS issued a biological opinion for the re-start of the Troy silver mine that concluded that the mine would not have adverse effects on lynx. However, the Troy Mine has now been shut down and is moving into the reclamation phase. Various analyses have also been completed for the Rock Creek Mine, which also determined the mine is not likely to adversely affect lynx or lynx habitat. There are no plans of operation or notices of intent to explore or operate any commercial mines in lynx habitat on the Lolo National Forest, The Cotter Basin Mine on the Helena National Forest produced copper and silver in the past.

In its 2007 biological opinion on the Northern Rockies Lynx Management Direction, USFWS concluded that the application of the amendment guidelines would result in no or only minor adverse effects to lynx due to minerals and energy development. No adverse cumulative effects are anticipated.

Forest roads

Much of the lynx habitat on the Kootenai, Lolo and Helena National Forests overlaps with grizzly bear habitat, where road construction and motorized use is constrained. The objectives and guidelines contained in the forest plans for lynx reduce or minimize any potential adverse effects (USFWS, 2007b), and no adverse cumulative effects are anticipated.

Livestock grazing

The effects of livestock grazing were anticipated to be minimal under the 2007 Northern Rockies Lynx Management Direction, and no new information suggests that this has changed. No adverse cumulative effects are anticipated.

Trapping

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. Poaching may also occur. As explained in the affected environment section, since more strict trapping regulations were implemented in 2008, the magnitude of this effect has been much less. Some lynx home ranges overlap the international border, making those lynx susceptible to harvest because Canada has a legal trapping season for lynx.

In summary, management actions on national forests within the area occupied by Canada lynx in Montana are expected to support conservation and recovery of the Canada lynx. Glacier National Park and the Confederated Salish and Kootenai Tribe incorporated the Lynx Conservation Assessment and Strategy into their management plans, and DNRC manages in accordance with their habitat conservation plan, all of which helps to minimize adverse effects on those lands. There is little potential for adverse cumulative impacts to lynx on private lands because only a small fraction of lynx habitat occurs on private lands. Mortality due to incidental trapping or illegal shooting has the potential to cause cumulative adverse effects, but the magnitude of this mortality is unknown and MFWP has implemented several programs

and regulations aimed at reducing this risk. Climate change has the most potential for adverse cumulative effects due to larger and more frequent disturbances than were typical in the past and the potential reduction in the amount and persistence of deep snow. At this time, the magnitude of effects of future climate change is unknown. Future climate change is expected to impact lynx habitat by further reducing the cold climatic conditions that create and maintain boreal forests as lynx habitat. Reduced snowpack and earlier snow melt may also reduce the lynx's competitive edge as a predator of snowshoe hares in deep, fluffy snow. Warmer temperatures may lead to a reduction in available habitat for lynx as subalpine forests recede to even higher elevations.

Canada Lynx—determination of effects and rationale

Summary and conclusion regarding landscape scale effects on the Canada lynx

In its 2007 biological opinion, the Service concluded that the objectives, standards and guidelines in the amended forest plans provide comprehensive conservation direction adequate to reduce and/or avoid most adverse effects to lynx from forest management on National Forest System lands and would not result in jeopardy to the lynx distinct population segment. Continuing to implement this set of direction, with two minor modifications, is expected to contribute to the conservation of the lynx because the upper tier of anthropogenic influences identified in the Lynx Conservation Assessment and Strategy (ILBT, 2013) that are of greatest concern to the conservation of the lynx (climate change, vegetation management, wildland fire management, and fragmentation of habitat) would be addressed by plan components.

Summary and conclusion regarding Forest-scale effects on the Canada lynx

The proposed action may affect and is likely to adversely affect the Canada lynx.

Rationale for Determination

The biological assessment analyzes changes that could occur in Canada lynx habitat (see Figure B-9) on the Flathead National Forest over the anticipated life of the revised forest plan, considering (1) the context of the natural range of variation and potential changes in climate; (2) the amount and distribution of vegetation treatments that could occur in the wildland-urban interface to protect communities at risk, based upon community protection plans adopted under the Healthy Forest Restoration Act; (3) the amount and distribution of vegetation treatments that could occur using exceptions to the vegetation standards, and (4)habitat connectivity.

Timber harvest, precommercial thinning, fuels reduction and other fire management activities that may occur under the proposed action—particularly in the General Forest management area—have the potential to adversely affect Canada lynx and their habitat. At the project level, all activities would be subject to plan components, including standards and guidelines (see Appendix D) designed to avoid or minimize adverse effects to individual lynx and the habitats they occupy on federal lands. Given that we cannot predict exact locations of future projects that may use exceptions or wildland-urban interface exemptions to the vegetation standards and, consequently, adversely affect lynx and their habitat, we conclude that the proposed action may affect and is likely to adversely affect the Canada lynx. Forest-specific changes to standard VEGS6 and guideline HU G11 are anticipated to have minor effects at the Forest and cumulative effects scale. Similarly, updated estimates of treatments that could occur using exceptions and exemptions to the vegetation standards are anticipated to have minor effects at the Forest and cumulative effects scale. There may be localized adverse effects to lynx habitat, but these would be limited by standards VEGS1 and VEGS2. These standards are adaptive to climate change and wildland fire because they limit vegetation management in adjacent lynx analysis units and limit vegetation management in lynx analysis units that have 30 percent or more of their lynx habitat that is not yet hare habitat, whether due to

management or wildfire. Even in the wildland urban interface, fuel treatment projects may not result in more than three adjacent LAUs exceeding standard VEGS1, thus limiting detrimental effects from fuel treatment projects. In addition, VEGS1 limits the amount of vegetation management that can occur in lynx habitat on NFS lands in any one decade to promote sustainability of diverse vegetation conditions over time. The desired conditions described in the revised forest plan consider new science regarding habitat quality, distribution, and connectivity. With respect to the second tier of anthropogenic activities (recreation, minerals/energy management, forest/backcountry roads and trails, grazing by domestic livestock, and mortality due to incidental trapping or illegal shooting), plan components for management activities are integrated to promote conservation of lynx.

Canada Lynx Critical Habitat

Introduction

On September 12, 2014, the Service issued a final rule revising the critical habitat designation and the distinct population boundary for the contiguous United States distinct population segment of the Canada lynx (USFWS, 2014a). Under the Endangered Species Act, specific areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features that (1) are essential to the conservation of the species and (2) may require special management considerations or protection. Areas outside the geographical area occupied by the species at the time it is listed could also be designated as critical habitat if a designation limited to its current range would be inadequate to ensure the conservation of the species.

In its designation of critical habitat, the Service stated, “we consider lynx habitat to include forested areas with the potential, through natural succession, to produce high-quality snowshoe hare habitat, regardless of their current stage of forest succession” (Federal Register / Vol. 79, No. 177 / Friday, September 12, 2014 / Rules and Regulations pg. 54808). This is consistent with the Flathead’s mapping and modeling of potential lynx habitat. The Service also stated,

> when determining critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features necessary for lynx. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Given the scale of the lynx critical habitat units, it was not feasible to completely avoid inclusion of water bodies, including lakes, reservoirs, and rivers; grasslands; or human-made structures such as buildings, paved and gravel roadbeds, parking lots, and other structures that lack the PCE for the lynx. These areas, including any developed areas and the land on which such structures are located, that exist inside critical habitat boundaries are not intended to be designated as critical habitat. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this final rule have been excluded by text in this rule. Therefore, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the physical or biological features in the adjacent critical habitat. (USFWS, 2014a, p. 54823)

Affected Environment—critical habitat

The Flathead National Forest lies within critical habitat unit 3. Lynx critical habitat unit 3 consists of about 9,783 mi2 in the Northern Rocky Mountains (Figure B-14). Lynx are known to be widely distributed throughout this unit, and breeding has been documented in multiple locations. Lynx critical habitat unit 3 coincides with the lynx core area in northwestern Montana/northeastern Idaho. Lynx critical

habitat unit 3 overlaps the NCDE recovery zone/primary conservation area for the grizzly bear to a large extent. According to the USFWS, this area appears to support the highest density lynx populations in the Northern Rockies. It likely acts as a source population and provides connectivity to other portions of the lynx's range in the Rocky Mountains. This area contains the physical and biological features essential to the conservation of the lynx (the primary constituent elements and its components) laid out in the appropriate quantity and spatial arrangement.

The designation of critical habitat does not prohibit development or forest management activities, but federal agency actions must not result in destruction or adverse modification of critical habitat. The federal action must be separately evaluated for effects on the species and on its critical habitat.

Key indicators

To determine if the action would result in destruction or adverse modification of critical habitat, this analysis of resource elements important to Canada lynx critical habitat focuses on the primary constituent element.

The USFWS determined that the primary constituent element for lynx critical habitat is

1. Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

    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 snow conditions that are generally deep and fluffy 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.

    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 would adversely affect adjacent foraging or denning habitat.

Natural disturbance processes historically played an important role in maintaining a mosaic of boreal forest successional stages (primary constituent element 1; PCE1) that provides habitat for both snowshoe hare and Canada lynx. Glacier National Park occupies portions of critical habitat between the Bob Marshall Wilderness Complex and Canada. In these areas there is a high potential for natural disturbance processes to play a continued role in maintaining a vegetation mosaic, supporting lynx, and providing connectivity to Canada. In Glacier National Park, an increase in wildfires since about 1990 has affected about 12 percent of critical lynx habitat. These burned areas will provide PCE1a, described above, once trees and shrubs have grown tall enough and dense enough to support snowshoe hares and lynx. Wildfires, insects, and disease are likely to provide abundant down trees for denning in Glacier National Park and other forested lands.

Critical habitat occurs on about 3,425 mi^2 of Flathead NFS lands, which is about 35 percent of critical habitat unit 3 (Figure B-14). About 49 percent of the critical habitat on the Flathead National Forest is in wilderness. There are only two lynx analysis units on the Flathead National Forest that do not include some critical habitat: the Haskill Mount and Blacktail lynx analysis units west of Flathead Lake and Highway 93.

New and ongoing federal projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to the PCE of lynx critical habitat. In its final rule designating lynx critical habitat, USFWS identified the following federal actions that potentially could adversely modify critical habitat. Briefly, these are:

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.

Effects of the framework programmatic action– Canada lynx critical habitat unit 3

The Northern Rockies Lynx Management Direction was completed in 2007, prior to the final designation of critical habitat, and therefore did not include an analysis of the effects on critical habitat. Nevertheless, the NRLMD amendment to 18 national forest plans adopted plan components that maintain the physical and biological features that provide critical lynx habitat and directly or indirectly contribute to the primary constituent element, the key indicator for analysis of critical habitat. Table 10 below shows how the management components of the Northern Rockies Lynx Management Direction contribute to or support the critical habitat primary constituent element. A detailed discussion of these plan components and their effects can be found in the section above on Canada lynx.

Table 10. Canada lynx critical habitat primary constituent element in relation to Northern Rockies Lynx Management Direction (NRLMD).

Primary Constituent Element	Primary Constituent Element Description	Associated NRLMD Objective, Standard, and/or Guideline
1.	*Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:*	VEG O1, VEG O2, VEG O3, VEG O4
a	Presence of snowshoe hares and their preferred habitat conditions, including 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;	VEG O1, VEG O2, VEG O3, VEG O4; VEG S1, VEG S2, VEG S5 and VEG S6; VEG G1, VEG G4, VEG G5 and VEG G10; GRAZ G1, GRAZ G2, GRAZ G3, and GRAZ G4; HU G1, HU G2, HU G8 (and VEG G10 in WUI).
b	Winter snow conditions that are generally deep and fluffy for extended periods of time;	VEG G4; HU G4, HU G11, and HU G12

Primary Constituent Element	Primary Constituent Element Description	Associated NRLMD Objective, Standard, and/or Guideline
c	Sites for denning that have abundant coarse woody debris (downed trees and root wads);	VEG O1; VEG G11; HU G1
d	Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or 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.	ALL 01, ALL S1, ALL G1; GRAZ G4; HU G3 and HU G7; LINK 01, LINK S1 and LINK G1

Primary Constituent Element 1a (PCE1a)

Critical habitat unit 3 includes the Kootenai National Forest, Flathead National Forest, Seeley District of the Lolo National Forest, and Lincoln District of the Lewis & Clark/Helena National Forest where critical habitat is managed to provide boreal forest landscapes supporting a mosaic of differing successional forest stages and containing presence of snowshoe hares and their preferred habitat conditions. These Forests also follow management direction in the NRLMD. As a result, they may treat some areas of critical habitat using the exceptions and/or exemptions to the NRLMD vegetation standards. Table 11 shows the acres of exceptions or exemptions used by these Forests through 2016.

Table 11. Acres of hare habitat treated in critical habitat unit 3.

Exception or Exemption category	Flathead NF acres	Kootenai NF acres	Seeley RD-Lolo NF acres	Lincoln RD-Lewis & Clark/Helena NF acres
VEGS5 exceptions	940	1860	0	0
WUI exemptions	6456	3095	0	954

Lands where active vegetation management occurs cover a minority of the Forest (about 20 percent); however, they are unevenly distributed across the Forest area. Conservatively, areas where regeneration timber harvest has occurred since 1990 may not yet have developed dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow. About 2 percent of lynx critical habitat on the Forest has had regeneration timber harvest since 1990 (including lands in the wildland-urban interface as well as lands outside it. In addition, areas that have been burned by wildfire since 1990 may not yet have developed dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow. About 24 percent of critical habitat on the Forest has been burned by stand-replacing wildfires since 1990, temporarily reducing PCE1a.

The revised forest plan standard VEGS1 limits vegetation management activities in an LAU if wildfire creates a situation where more than 30 percent of an LAU does not yet provide hare habitat, helping to ensure actions that would reduce or remove understory vegetation within boreal forest stands do not occur on a scale proportionate to the large landscape used by lynx. The revised forest plan standard VEGS2 promotes development of PCE1a but limits regeneration harvest on NFS lands to 15 percent of lynx habitat in each LAU per decade to provide for distribution of hare habitat over time and space.

Alternative B modified would protect existing lynx habitat that provides primary constituent element 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 wildland-urban interface

(WUI) as defined by HFRA, subject to a cumulative limit of no more than 6 percent of lynx habitat on the Forest under the incidental take estimate for the 2007 NRLMD. Additionally, fuel 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 Canada lynx critical habitat. Figure B-18 displays critical habitat in relation to the current wildland-urban interface within the geographic areas of the revised Flathead National Forest plan.

The wildland-urban interface (WUI; see glossary) is defined by the Healthy Forests Restoration Act. An analysis of these WUI boundaries and critical habitat on the Forest shows that much of the WUI is at lower elevation and is modelled as relatively low quality habitat (Kuennen, 2017c). The maximum WUI exemption estimate is 103,800 acres for the Flathead National Forest out of approximately 2.2 million acres of critical habitat on NFS lands on the Forest. National Forest System lands in the Salish Geographic area that are west of Kalispell and south of Highway 2 are not in critical habitat, so cumulative WUI exemptions could be used on a maximum of about 5 percent of critical habitat across the Forest. As of 2015, about 0.4 percent of critical habitat had been affected by WUI exemptions. Fuel treatments under the WUI exemption may affect critical habitat by causing temporary reductions in PCE1a in areas where high quality habitat, dense understory vegetation, and the WUI overlap, but are not likely to occur on a scale proportionate to the large landscape used by lynx. Vegetation management activities would undergo additional site-specific consultation at the project level.

Lands that are suitable for timber production are most likely to have regeneration harvest. These lands comprise 21 percent of critical habitat distributed across 68 of 109 LAUs on the forest. Timber harvest could also occur on lands that are not suitable for timber production but where timber harvest is allowable. All timber harvest must be consistent with desired conditions, standards, and guidelines of the revised forest plan. On the heavily forested Flathead National Forest, vegetation management activities are not likely to result in a loss of boreal forest landscapes supporting a mosaic of differing successional forest stages with preferred habitat conditions for snowshoe hares at the large landscape scale discussed in the critical habitat rule. Additional site-specific consultation would occur at the project level. With the proposed action alternative B modified, 57 percent of critical habitat distributed across 78 of 109 LAUs, would be in wilderness or recommended wilderness where no commercial timber harvest would occur (some LAUs have both suitable timber lands and either wilderness or recommended wilderness).

The Forest proposes that the acreage that could be treated under the existing exceptions to VEG S5 and VEG S6 (based upon incidental take determined during NRLMD consultation) may be increased under alternative B modified, compared to estimates provided in 2007. Under Alternative B modified, exceptions to the vegetation standards would be estimate to occur on up to 15,460 acres, compared to about 1,460 acres that were estimated for purposes of incidental take in the 2007 biological assessment. This figure includes acres that could be treated with existing exceptions to vegetation standards VEGS5 and VES6 but that cannot be specifically identified at the present time. For planning purposes, potential treatment needs, updated in 2016, are 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 2500 acres to restore whitebark pine in wildfire areas and forests with sapling-size trees (VEG S5 existing exception 6)

Under alternative B modified, the listed vegetation exceptions under existing forest plan would remain in place with one forest-specific change. An additional exception to VEG S6 would allow the felling of trees within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. This new exception to VEGS6 would be anticipated to remove understory vegetation and reduce the quality of hare habitat within about 4,400 acres of boreal forest stands, affecting about 0.2 percent of Canada lynx critical habitat, a minor amount.

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 VEGS5 and VEGS6 would require additional site-specific consultation at the project level. The range of acres anticipated for treatment under all exceptions to standards VEGS5 and VEGS6 represents about 0.5 to 0.7 percent of critical habitat on the Flathead National Forest, a minor amount. Standards VEGS1 and VEGS2 limit the amount of habitat that can be treated at any given time and also limit the distribution of treatments.

Connectivity of mature forest, percent composition of young regenerating forest, low perimeter-area ratio of young regenerating forest patches, and adjacency of mature to young regenerating forest types are important for lynx reproduction and survival at the scale of a lynx home range (Kosterman 2014). The perimeter-area ration of young regenerating forest patches is anticipated to be highly variable across the Forest's critical habitat, depending upon whether patches are created by wildfire or by vegetation management activities such as timber harvest. With the proposed action alternative B modified, standard ALL S1 and guideline ALL G1, as well as proposed management areas (MAs) and their distribution (see table 3 and Figure B-2), help to provide connectivity of mature forest at the critical habitat scale. Plan components for old growth and riparian management zones, integrated with plan components for vegetation management, help to provide for adjacency of mature to regenerating forests 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.

Primary Constituent Element 1b (PCE1b)

It is not possible to reliably predict effects of future winter climate change on deep, fluffy snow at the Forest scale (see discussion below for the scale of critical habitat unit 3). The effects of proposed changes in winter recreation plan components on deep, fluffy snow are discussed. With alternative B modified, there would be new, integrated plan components to replace Amendment 24 adopted in 2006 and a new forest-specific guideline to replace the previous NRLMD guideline HU G11 adopted in 2007. Amendment 24 designated specific areas, routes and seasons of use for over-snow vehicle use. Seasons of use would not be changed under alternative B modified and many of the areas and routes suitable for motorized over-snow use would not be changed, but some routes and areas suitable for motorized over-snow use would be changed to respond to changing conditions and public input (Kuennen, 2017b).

As described in detail in the section on Canada lynx, the proposed new guideline FW-GDL-REC-04 states,

> To limit the risk of cumulative impacts to Canada lynx, 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, in lynx habitat on NFS lands at a forestwide scale. 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. (Specific locations of routes or areas suitable for motorized over-snow vehicle use are specified in Figure B-44 in this BA.)

Under the 2012 planning rule, guidelines must be met unless the objective of the guideline can be met using other methods. The proposed guideline would allow the Forest to shift areas to meet changing vegetation conditions and needs, but would not allow a net increase in the suitable area or miles. Changes in routes, groomed routes, or areas open to over-snow motorized use would undergo additional site-specific consultation at the project level and would need to be consistent with motorized over-snow suitability, as explained in the section on Canada lynx. In the future, there may be shifts in areas where motorized over-snow use occurs, but impacts to the total area providing PCE1b on the Forest would not increase, so there are not likely to on impacts at a scale proportionate to the large landscape used by lynx.

Nonmotorized over-snow use also occurs across the Forest but is generally dispersed, except in designated cross-country ski areas. Designated cross-country ski areas are now included in management area 7. Two of these areas, Round Meadow and Essex, are located in Canada lynx critical habitat. The boundaries of these areas are not proposed to change with alternative B modified so at the critical habitat scale, deep fluffy snow would not be affected.

Motorized over-snow use would be suitable on approximately 28 percent of critical habitat and designated cross-country ski areas would occur on <1 percent of Canada lynx critical habitat. Although snow compaction would occur, maintaining the miles and acres where these uses are currently allowable would be expected to have minor effects on critical habitat. Based upon the findings of Squires and others (2010) as well as Kolbe and others (2007) for northwest Montana, proposed changes in management direction for over-snow use are anticipated to have minor effects. Much of the Flathead National Forest is not accessible to motorized over-snow use due to wilderness or recommended wilderness designation. Even in areas where motorized over-snow use is suitable, dense forest cover precludes use. Deep, fluffy snow would continue to be available in critical habitat at the large landscape scale discussed in the critical habitat rule.

Primary Constituent Element 1c (PCE1c)

Lynx dens in northwest Montana are typically found in mature multistory stands of spruce-fir forests with dense horizontal cover and abundant coarse woody debris although they may also be located in mid-seral, regenerating stands (J. R. Squires et al., 2008). Young stands that are either naturally sparse or mechanically thinned were seldom used for denning. Denning habitat is generally abundant across the coniferous forest landscape of northwest Montana and is not likely to be limiting for lynx (J. R. Squires et al., 2008, 2010; J. R. Squires & Kennedy, 2006). Downed wood is highly variable in amount, sizes, species, and stages of decay, both across the landscape and over time. Recent fires have likely increased the amount of down wood in parts of the forest, and as the snags fall, there will be a period of time where downed woody material will be especially high in these fire areas. About 20-30 years following a wildfire on the Forest (on average), dense horizontal cover is also abundant. The majority of Forest lands are within management areas where natural ecological processes and disturbances will be the primary factor affecting snag and downed wood conditions. These natural processes are expected to create an abundance of snags and downed wood at the forestwide scale, with amounts within desired ranges.

The revised forest plan desired condition for downed wood is to maintain amounts that contribute to forest structural diversity, soil ecological function, and habitat for animal species associated with down wood for feeding, denning, reproduction, and shelter. Table 12 displays the current and desired conditions for the amount of downed wood across the biophysical settings that have the potential to provide boreal forest landscapes supporting a mosaic of differing successional forest stages (critical habitat PCE).

Table 12. Current conditions and desired range in average total tons per acre of downed wood, as averaged across all forested acres within each biophysical setting on the Forest

Broad PVT (biophysical setting)	Current estimate (total tons per acre) [1]
Cool Moist	18.6
Cold	12

1- Source: FIA data using R1 Summary database (Hybrid 2011) analysis tools.

With the proposed action alternative B modified, 57 percent of critical habitat distributed across 78 of 109 LAUs, would be in wilderness or recommended wilderness where no commercial timber harvest would occur (some LAUs have both suitable timber lands and either wilderness or recommended wilderness). Wilderness and recommended wilderness areas have had stand-replacing wildfires as well as trees killed by insect or disease activity, creating abundant denning habitat as trees fall down. Many of the forests in areas suitable for timber production and within wildland-urban interface areas would typically be managed in ways that maintain relatively vigorous trees and limit losses due to insects, disease and fire where possible. This would tend to result in lower tree mortality rates, and a potentially lower density of down wood across these areas over time as compared to areas less influenced by human actions and affected more by natural disturbances (such as wilderness). Salvage harvest of dead trees would also reduce down woody material. However, even in areas suitable for timber production, forestwide guideline FW-GDL-TE&V-10 provides for retention of down woody material in harvest units, where available. Exceptions may occur, for example when there is insufficient material of suitable size prior to harvest, within developed recreation sites, or where fuel reduction is desired to decrease expected fire behavior (e.g., within wildland-urban interface). In addition, guideline VEG G11 addresses the distribution of denning habitat for Canada lynx and ensures that it would be assessed site-specifically during project level consultation in critical habitat. On the heavily forested Flathead National Forest, management activities are not likely to result in a shortage of denning habitat at the large landscape scale discussed in the critical habitat rule. Plan components would support denning habitat at a scale proportionate to the large landscape used by lynx.

Primary Constituent Element 1d (PCE1d)

Matrix habitat, by definition, is habitat that is important to lynx for movement. However, the vegetative condition and structure of matrix habitat is not relevant to its value. Therefore, 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 (USFWS, 2014a).

Forest-specific plan components for habitat connectivity (detailed in the Canada lynx section above), standards ALL S1 and LINK S1, and guideline ALL G1 and LINK G1 would provide for matrix habitat. ALL S1 requires that new or expanded permanent development and vegetation management projects must maintain connectivity in an LAU and/or linkage area and ensures that connectivity would be assessed site-specifically during project level consultation in critical habitat. Guideline ALL G1 states that methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. In addition, several new desired conditions and guidelines in the proposed action that are designed to promote connectivity for multiple species, would allow continued movement of lynx along the putative travel corridors identified by Squires and others in 2013. Plan components that would apply to summer corridors identified by Squires and others (such as Guideline FW-GDL-IFS-13, GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06, GA-NF-DC-07, GA-SM-DC-04, and GA-SV-DC-08) may also address objectives of matrix habitat by facilitating long-distance movements (Squires et al.

2013). Plan components would support habitat connectivity at a scale proportionate to the large landscape used by lynx.

Actions that have the potential to adversely modify critical habitat

Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx.

At the Forest scale, the amount and distribution of timber harvest and forest road building is limited by management areas under alternative B modified, including existing and proposed wilderness areas (management area 1), inventoried roadless areas (located within management areas 5a or 4a), some special areas (management area 3b), inner riparian management zones located in a variety of management areas, and other proposed management areas (such as MA6a, which is not suitable for timber production). On the heavily forested Flathead National Forest, there are no actions contemplated under management areas for alternative B modified that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx.

Table 13 displays the acres and percentage of Canada lynx critical habitat in each Forest management area. The effects for each management area are described in detail in the section on Canada lynx.

Table 13. Acres and percentage of Canada lynx critical habitat in each Forest management area

Management Area	Critical Lynx Habitat Acres	Percentage of Critical Lynx Habitat
1a Designated wilderness	1,069,992	49
1b Recommended wilderness	189,705	9
2a Designated wild and scenic rivers	5,349	< 1
2b Eligible wild and scenic rivers	14,392	1
3b Special areas	1,165	< 1
4a Research natural areas	5,544	< 1
4b Experimental and demonstration forests	9,357	< 1
5a Backcountry nonmotorized year-round	144,301	7
5b Backcountry motorized year-round, wheeled vehicle use only on designated routes/areas	49,491	2
5c Backcountry: motorized over-snow vehicle use	109,973	5
5d Backcountry: wheeled motorized vehicle use only on designated routes/areas	9,668	< 1
6a General forest low	112,128	5
6b General forest medium	271,341	12
6c General forest high	166,542	8
7 Focused recreation areas	32,963	2
Total	**2,191,912**	

Permanent loss or conversion of boreal forest. There are no actions contemplated under alternative B modified that would cause permanent loss or conversion of boreal forest at the large landscape scale discussed in the critical habitat rule. There is no locatable mineral or leasable energy development activity occurring on the Flathead National Forest. Much of critical habitat is subject to a "no surface occupancy" stipulation or is withdrawn from mineral development.

Traffic volume and speed. Alternative B modified does not contemplate increasing traffic volume or speed on roads that divide critical habitat. The revised forest plan includes a guideline stating 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. There are no actions contemplated under alternative B modified that would increase traffic volume or speed at the large landscape scale discussed in the critical habitat rule.

Cumulative effects to Canada lynx critical habitat unit 3

Cumulative effects under the Endangered Species Act include state, tribal, loca, or private actions that are reasonably certain to occur in the action area. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in the cumulative effects analysis in this biological assessment.

PCE1a: Tribal lands within the proposed Critical Habitat Unit 3 include about 370 square miles of the Flathead Reservation in Montana, managed by the Confederated Salish and Kootenai Tribes. In their 2014 *Final Environmental Assessment: Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx*, the USFWS (USFWS, 2014d) stated:

> In accordance with Secretarial Order 3206, "American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act" (June 5, 1997); the President's memorandum of April 29, 1994, "Government-to-Government Relations with Native American Tribal Governments" (59 FR 22951); Executive Order 13175 "Consultation and Coordination with Indian Tribal Governments;" and the relevant provision of the Departmental Manual of DOI (512 DM 2), the Service believes that fish, wildlife, and other natural resources on Tribal lands are better managed under Tribal authorities, policies, and programs than through Federal regulation wherever possible and practicable. We excluded Tribal lands from the final designation in 2009, and we are again considering excluding Tribal lands from the final revised designation. (p. 46)

PCE1b: There is a potential for future changes in climate to reduce the extent of deep snow habitats preferred by lynx. According to the Canada lynx species status assessment (2016), climate models project that the northwest Montana/northeast Idaho unit will maintain snow into the future. McKelvey et al. (2011) estimated that contiguous areas of spring snow cover would become smaller and more isolated throughout the Columbia River Basin, with greatest losses at the southern periphery, but with possible increases in snow at higher elevations in the core. In addition, spring snowmelt is already occurring about two weeks earlier in recent decades. Mills and Johnson (2013) forecasted that annual average duration of snowpack will decrease by 29–35 days by midcentury. This may result in a contraction of the area where lynx have a competitive advantage in deep snow. Downscaled winter climate and precipitation models have a higher level of uncertainty than summer climate models (Joyce, Talbert, Sharp, Morissette, & Stevenson, in press).

PCE1c: Denning habitat is not limited in critical habitat unit 3.

PCE1d: There are several two-lane highways within critical habitat on the Flathead National Forest. Federal transportation-related projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to the PCE of lynx critical habitat as well as effects to the species. Consultation for projects within designated critical habitat would need to specifically evaluate the PCE. For projects where there is no federal nexus, critical habitat designation does not impose rules or restrictions on land use (USFWS, 2014d).

Development of private lands will likely continue and may reduce habitat connectivity across valleys that are located between blocks of lynx habitat on public lands.

Canada lynx critical habitat determination of effects and rationale

The proposed framework programmatic action *may affect, is likely to adversely affect* designated Canada lynx critical habitat.

Rationale for Determination

The biological assessment analyzes changes that could occur in Canada lynx critical habitat unit 3 on the Flathead National Forest over the anticipated life of the revised Forest plan (see Figure B-14). Within Canada lynx critical habitat unit 3, the proposed action contributes to boreal forest landscapes with a mosaic of differing forest successional stages providing the physical or biological features essential to the conservation and recovery of the Canada lynx population.

Timber harvest, precommercial thinning, fuels reduction and other fire management activities that may occur under the proposed action—particularly in the General Forest management area—have the potential to adversely affect Canada lynx critical habitat. Given that we cannot predict exact locations of future projects, we conclude that the proposed action may affect and is likely to adversely affect Canada lynx critical habitat. At the project level, activities would be subject to plan components, including standards and guidelines (see Appendix D) designed to avoid or minimize adverse effects. On the heavily forested Flathead National Forest, management activities are not likely to create a barrier or impede lynx movement between foraging and denning habitat at the large landscape scale discussed in the critical habitat final rule. The revised forest plan requires that new or expanded permanent developments and vegetation management projects in a lynx analysis unit and/or a linkage area must maintain habitat connectivity, and it has numerous plan components designed to facilitate habitat connectivity that consider all lands. There are no actions contemplated under alternative B modified that would cause permanent loss or conversion of boreal forest at the large landscape scale discussed in the critical habitat rule. Alternative B modified does not contemplate increasing traffic volume or speed on roads that divide critical habitat. The revised forest plan includes a guideline stating 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.

Grizzly Bear

Background

This biological assessment is being written in concert with the development of the final grizzly bear conservation strategy for the NCDE, incorporating habitat-based recovery criteria that will be appended to the NCDE chapter of the Grizzly Bear Recovery Plan (USDA, 2016b, 2016c). In Fund for Animals v. Babbitt, 967 F. Supp. 6 (D.D.C. 1997), the Court ruled that the Service needed to "establish a threshold of minimal habitat values to be maintained within each Cumulative Effects Analysis Unit in order to ensure that sufficient habitat is available to support a viable population." The Service began working with multiple agencies in the NCDE in 2009 to develop a habitat management strategy to support a viable population of grizzly bears in the NCDE. The Service then gathered public comments on the draft Grizzly Bear Conservation Strategy (GBCS) and the habitat-based criteria it contained. The public comment period for the draft GBCS began on May 2, 2013. On May 11, 2016, a notice was published in the Federal Register notifying scientists and other interested parties that they would have the opportunity to submit oral or written comments on the habitat-based recovery criteria for the NCDE grizzly bear population. On July 7, 2016, the Service conducted a workshop with oral presentations by the public and also accepted written comments during July.

The process in the NCDE cumulative effects analysis area is similar to the process used in the Greater Yellowstone Ecosystem (USFWS, 2013e). Following a public workshop, the USFWS appended the Yellowstone chapter of the Grizzly Bear Recovery Plan to include three objective and measurable criteria within the recovery zone, including a secure habitat standard, a developed site standard, and a livestock allotment standard (USFWS, 1993). Similar objective and measurable criteria were included in the draft GBCS for the NCDE, recognizing differences in the two ecosystems, their grizzly populations, and their stressors.

The draft NCDE GBCS includes measurable criteria for motorized access and secure habitat, developed recreation sites, livestock allotments, minerals management, and vegetation management. The conservation strategy also addresses measures to maintain or enhance connectivity between grizzly bear ecosystems and the proper storage of food and attractants. The draft GBCS for the NCDE states:

> For grizzly bear conservation to be successful, providing habitat on the landscape is not enough. For grizzly bears to survive, people must accept the grizzly as a cohabitant of the land. Tolerance can be maintained when the public has confidence in management agencies to respond quickly and appropriately to grizzly bear-human conflicts and the public is equipped with the knowledge to understand and avoid grizzly bear-human conflicts. The objective of conflict management is to maximize human safety and minimize property losses while maintaining a viable population of grizzly bears. (p. iv)

Multiple agencies work with the public towards this end.

Development of the Draft NCDE Grizzly Bear Conservation Strategy

In preparation for delisting, a conservation strategy often is developed to ensure that appropriate protections will be in place to maintain the recovered population into the future. The Grizzly Bear Recovery Plan (USFWS, 1993) specifically called for development of a conservation strategy so that continuity and consistency of management would be provided following delisting. Representatives of Montana Fish, Wildlife and Parks, the Montana Department of Natural Resources and Conservation, the Blackfeet Nation, the Confederated Salish and Kootenai Tribes, Glacier National Park, the U.S. Forest Service, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, and the Bureau of Land Management were appointed as members of the Interagency Conservation Strategy Team. Their goal was to describe the management and monitoring programs that would maintain a recovered grizzly bear population in the NCDE.

In May 2013, a draft conservation strategy for the NCDE was released to the public for review and comment (Federal Register vol. 78, no. 86, p. 26064, May 2, 2013). The draft conservation strategy was designed by the Interagency Conservation Strategy Team to

- describe and summarize the coordinated strategies, standards, and guidelines to manage the grizzly bear population, grizzly bear-human conflicts, and grizzly bear habitat, such that continued conservation of the grizzly bear population in the NCDE will be ensured;
- document the regulatory mechanisms, legal authorities, policies, management documents, and monitoring programs that are needed to maintain a recovered grizzly bear population in the NCDE;
- document the commitments agreed to by the participating agencies.

When finalized, the conservation strategy will not change the legal status of grizzly bears in the NCDE. The intent is to support delisting from the Endangered Species Act by demonstrating the agencies' ongoing commitment to conserve the species. Once the grizzly bear is delisted under the Endangered Species Act, the Forest Service will evaluate the NCDE grizzly bear for management as a Regional

Forester sensitive species, and a determination of whether this status is warranted will be made at that time. The Forest Service will consider the NCDE grizzly bear as a potential species of conservation concern during any plan revision within the range of the NCDE grizzly bear as required by FSH 1909.12 Ch. 10, 12.52(d)(2)(b). This paragraph requires consideration of species that were from the Federal list of threatened or endangered species within the past 5 years. In addition, national forests will continue to follow direction established in existing land management plans until amended or revised.

Ongoing grizzly bear conservation actions by the Forest Service

Over the years, the Forest Service has undertaken substantial actions both inside and outside the NCDE recovery zone to maintain or improve grizzly bear habitat and to reduce grizzly bear-human conflicts on the national forests. These actions will continue under all of the alternatives. Following are examples of some of those conservation actions.

Issuance of food and attractant storage orders and regulations

Food storage orders require that food, garbage and other attractants are stored properly so that grizzly bears cannot obtain access to them. This prevents food-conditioning of bears, which usually leads to grizzly bear-human conflicts, injuries, or fatalities. Food storage orders have been issued and implemented in the NCDE since the mid to late 1980s. The Kootenai National Forest implemented a forestwide food storage order in 2011, which covers their portion of the NCDE recovery zone/primary conservation area and the Cabinet-Yaak recovery zone. In 2010, the Flathead, Helena, Kootenai, Lewis and Clark, and Lolo National Forests jointly issued a food storage order that covered the portions of the forests that are within the NCDE recovery zone/primary conservation area. Over time, as more grizzly bears were observed outside the recovery zone/primary conservation area, attractant storage orders have been extended to other portions of the Forests to prevent or minimize grizzly bear-human conflicts. In addition, the Forest Service has coordinated with communities, counties, and organizations on implementation of local ordinances regarding food and garbage storage on lands adjacent to the national forests.

Bear-resistant containers and facilities

Bear-resistant containers and facilities include bear-resistant food storage boxes and panniers, garbage containers, meat hanging poles, etc. National forests within the NCDE have provided bear-resistant facilities at campgrounds, trailheads, dispersed campsites, and other areas both within and, in some cases, outside of the recovery zone/primary conservation area. Some national forests have programs to loan or rent bear-resistant containers for short-term uses. The Forest Service has fenced or closed garbage dumps, in coordination with local communities, to further reduce conflicts with grizzly bears.

Information and education

A variety of informational and educational materials (e.g., pamphlets, brochures, signs, videos, etc.) and programs are provided to the public at Forest Service offices. Signs and brochures about proper behavior and safety procedures in bear country are placed at campgrounds, trailheads, dispersed recreation sites, picnic areas, etc. The Forest Service has cooperated with Montana Fish, Wildlife and Parks and other cooperating institutions and individuals in giving presentations and offering workshops that address bear identification; safe camping, hiking, hunting, and working procedures to use in bear habitat; the use of electric fencing to reduce conflicts between bears and livestock (e.g., chickens, pigs, beehives, sheep, cattle); and the proper use of bear-deterrent pepper spray. Wilderness rangers and other backcountry patrols have been used to inform and educate the public on food storage orders and to check on compliance with these orders. Field patrols have been used during hunting seasons to reduce hunter-caused conflicts and grizzly bear mortalities.

Special grizzly bear requirements in contracts and permits

Many contracts and special-use permits in the NCDE contain provisions requiring protection of the grizzly bear and its habitat, as well as proper storage of food and attractants. Some contract and permit provisions require temporary or permanent cessation of permitted activities to resolve grizzly bear-human conflicts. Timber sale prescriptions and contracts incorporate provisions to protect grizzly bear habitat. For example, silvicultural prescriptions are designed to maintain or enhance food sources, timing provisions are aimed at reducing the potential for grizzly bear-human conflicts, and specific contract provisions require proper food storage and temporary or permanent cessation of permitted activities to resolve grizzly bear-human conflicts.

Livestock grazing

Existing livestock grazing permits may include special provisions such as proper storage of food and attractants as well as carcass removal. Annual monitoring of livestock allotments is performed to check on compliance and assess any conflicts. Disposal of animal carcasses has been emphasized to reduce conflicts with grizzly bears.

Land adjustments

Important grizzly bear habitat has been acquired through land exchanges and acquisitions on the NCDE national forests. The cooperative "Legacy Land" acquisition of Plum Creek Timber Company lands by the Nature Conservancy, Flathead National Forest, and Lolo National Forest is a landmark example, to name just one.

Motorized route management and monitoring

During recent decades, motorized routes have been restricted in some areas in order to provide security for grizzly bears and other wildlife. Annual monitoring is performed to evaluate compliance with access restrictions and to provide information and education to the public. Monitoring also helps to identify when repairs are needed to keep road closures effective.

Highway and railroad mortality

For many years, the Forest Service has coordinated with transportation agencies and railroad companies to seek to reduce the risk of collisions with grizzly bears. For example, in 1991, the Great Northern Environmental Stewardship Area (GNESA) was formed through an agreement with the Burlington Northern Santa Fe Railroad and multiple state, federal and tribal partners for the rail line that traverses the Middle Fork Flathead River Corridor. The GNESA agreement established a conservation trust fund and identified several railroad operation and maintenance procedures that would be followed to minimize train-bear incidents and ensure a rapid response and removal of attractants from the railroad right-of-way. The Forest Service maintains the Wildlife Crossings Toolkit website (https://www.fs.fed.us/wildlifecrossings/index.php) which was developed in partnership with the National Park Service, Federal Highway Administration and the American Association of State Highway and Transportation Officials. This website provides state-of-the-art information for biologists, engineers, and transportation professionals to assist in reducing wildlife mortalities and maintaining or restoring habitat connectivity across transportation infrastructure on public lands.

Ongoing and anticipated management actions on other federal lands

Glacier National Park lands represent about 19 percent of the primary conservation area. The Bureau of Land Management, USFWS, and Bureau of Reclamation collectively manage a very small fraction (0.4 percent) of the primary conservation area. Under the Endangered Species Act, all federal agencies are directed to use their authorities to seek to conserve endangered species and threatened species and must

consult with the USFWS if their actions may affect a listed species or its critical habitat. Federal land management is guided by agency land-use plans, the Interagency Grizzly Bear Guidelines, and the requirements of biological opinions. Management of grizzly bear habitat on federal lands has been an important factor leading to the recovery of the NCDE grizzly bear population.

The expectation in developing the NCDE conservation strategy is that the signatories will incorporate the relevant set of habitat standards and guidelines into their respective management plans, consistent with their own requirements. All federal agencies would manage motorized access within the primary conservation area so that (1) there is no net decrease in secure core from the baseline and no net increase in open and total motorized route densities; (2) the number and capacity of developed recreation sites are limited; (3) there is no net increase in the number of livestock allotments and no net increase in the number of sheep from the baseline; (4) vegetation management will be conducted in a way that is compatible with grizzly bear habitat needs; and (5) mineral and energy development will be designed to avoid, minimize, or mitigate adverse impact to grizzly bears.

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. On Bureau of Land Management land within the NCDE recovery zone/primary conservation area, the NCDE food storage guidelines are incorporated into Bureau of Land Management contracts. The NCDE food storage guidelines are also incorporated into contracts in areas that are outside the recovery zone/primary conservation area) but in an area known to be occupied by grizzly bears. The National Bison Range complex is located within the NCDE and administered by USFWS. These refuges are day use only, with no overnight camping allowed. Users are expected to pack out their trash; there are no garbage receptacles anywhere on the refuges. All federal agencies are making efforts to prevent or reduce grizzly bear-human conflicts.

The network of federal lands in northwestern Montana provides a high degree of landscape permeability for grizzly bears. Federal agencies have been cooperating in improving habitat connectivity and mitigating impacts of highways and other developments that impede movement by wildlife, including grizzly bears.

Relationship between Endangered Species Act listing and the Grizzly Bear Conservation Strategy

The USFWS completed a 5-year status review of the grizzly bear in 2011. Part of the status review involved an assessment of the adequacy of regulatory mechanisms, which was one of the factors that led to the listing of the grizzly bear as a threatened species. The USFWS concluded that the existing regulatory mechanisms in the lower 48 states were incomplete. With regard to National Forest System lands, regulatory mechanisms were found lacking or incomplete with respect to incorporating motorized access direction into the forest plans, and portions of some national forests lacked food storage orders, which will become increasingly important to grizzly bear conservation as grizzly bear and human populations both expand.

The grizzly bear recovery plan acknowledges that maintenance of a healthy, recovered grizzly bear population will depend on effective, coordinated management. The draft NCDE grizzly bear conservation strategy provides up-to-date scientific information and a comprehensive set of management recommendations to sustain the grizzly bear population in the NCDE. Each of the signatories to the conservation strategy will contribute and cooperate as appropriate to its mission and jurisdiction.

Adoption of the draft NCDE grizzly bear conservation strategy includes acknowledging the following management zones on National Forest System lands in the NCDE (see Figure B-5):

- **Primary conservation area –** the same as the recovery zone identified in the Grizzly Bear Recovery Plan (USFWS, 1993)
- **Management zone 1 –** a defined area surrounding the primary conservation area, within which the grizzly bear population status and trend would be monitored
- **Salish demographic connectivity area –** a portion of zone 1 with specific habitat measures to allow female grizzly bear occupancy and eventual dispersal to other ecosystems in the lower 48 states (i.e., the Cabinet-Yaak and Bitterroot ecosystems)
- **Management zone 2** – an area where grizzly bears would be expected to be present at low densities, which would provide the opportunity for grizzly bears, particularly males, to move the longer distance between the NCDE and the Greater Yellowstone Ecosystem
- **Management zone 3 –** areas where grizzly bears do not have enough suitable habitat to support long-term survival and occupancy; the management emphasis would be on conflict response. No additional forest plan components are needed or would be proposed for zone 3.

NFS lands would no longer be designated as **management situations 1**, **2** or **3**.

Affected Environment—Occupied grizzly bear habitat at a landscape scale

There are six identified grizzly bear ecosystems located in the states of Wyoming, Washington, Idaho, and Montana, including the Greater Yellowstone Ecosystem, Northern Continental Divide Ecosystem (NCDE), Bitteroot Ecosystem, Cabinet-Yaak Ecosystem, Selkirk Ecosystem, and Northern Cascades Ecosystem. The recovery zone/primary conservation area for the NCDE grizzly bear encompasses about 5.7 million acres. Lands managed by the USFS make up approximately 60.9 percent (3,840,415 acres) of the grizzly bear recovery zone/primary conservation area within the NCDE. Regulations for planning land and resource management (36 CFR 219), adopted in 1982 and modified in 2012 (77 FR 21162, April 9, 2012), require the USFS to manage habitats to support viable populations. The national forests in the NCDE (Flathead, Kootenai, Helena-Lewis and Clark, and Lolo) each have individual forest plans that provide management direction for grizzly bear habitat. Two of these national forests have now officially been consolidated, but their two plans will be amended until a decision is made on the revised Helena-Lewis and Clark National Forest Plan (see the amendment BA).

This biological assessment assesses the effects of the programmatic management framework to be implemented on the Flathead National Forest, and a separate biological assessment addresses the effects of the programmatic management framework to be implemented on the other four national forests in the NCDE. The programmatic management framework is based upon management zones delineated by the draft Grizzly Bear Conservation Strategy (USFWS, 2013c), which encompass the area currently occupied by NCDE grizzly bears, as well as additional areas to provide connectivity to other grizzly bear ecosystems (see Figure B-5 and Figure B-17). Management direction for the five forests in the NCDE is consistent except where there are unique management zones for a particular forest. Acreage in each management zone for each national forest in the NCDE is displayed in table 14.

Table 14. Acres of National Forest System land included within the NCDE recovery zone/primary conservation area (PCA); zone 1, including the demographic connectivity areas (DCAs); zone 2; and zone 3. The percent of total acres across all ownerships in each management zone is shown in parentheses.

National Forest	Recovery zone/PCA	Zone 1 including DCAs	Zone 2	Zone 3
Flathead	2,136,536 ac (37%)	231,548 ac (5%)	-	-
Helena	183,758 ac (3%)	149,207 ac (3%)	642,786 ac (14%)	5,792 ac (< 1%)

National Forest	Recovery zone/PCA	Zone 1 including DCAs	Zone 2	Zone 3
Kootenai	118,770 ac (2%)	283,302 ac (6%)	-	-
Lewis and Clark	777,963 ac (14%)	6 ac (<1%)	2 ac (< 1%)	972,612 ac (8%)
Lolo	268,390 ac (5%)	386,274 ac (8%)	38 ac (< 1%)	-

Grizzly bear population ecology, biology, habitat descriptions, and relationships identified by research are described in detail in the literature cited. The following description of the affected environment provides a summary in the context of the NCDE, focusing on the Flathead National Forest and information that is necessary to understand the consequences of the proposed federal action.

NCDE grizzly bear population, distribution, and status

In each grizzly bear recovery zone, the Grizzly Bear 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, as amended, p. 26). The Grizzly Bear Recovery Plan identified a minimum NCDE-wide grizzly bear population of 391 bears. In 2004, Kendall and others (2009) conducted a genetic capture/recapture study that encompassed the entire recovery zone/PCA and adjacent areas thought to be inhabited by bears. The mean population estimate was 765 bears (95 percent confidence interval [CI]: 715–831), including all age classes. The male population estimate was estimated to be 295 individuals (95 percent CI = 276–324) and the female population estimate was 471 individuals (95 percent CI: 427–531), well exceeding recovery goals. In 2014, the population estimate for the NCDE was 960 grizzly bears (Costello et al., 2016).

All estimates indicate that the NCDE grizzly bear population is growing. Costello's analyses result in estimates that differ slightly from Mace and others (2012) and led to a slightly lower estimate of the annual rate of population growth ($\lambda = 1.023$, or about 2 percent) for the NCDE grizzly bear population than that previously reported ($\lambda = 1.031$, or about 3 percent) (R. D. Mace et al., 2012). Costello and others stated, "We do not believe the observed difference in the two estimates is a result of actual population change. Our current models include 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."

Boyce et al. (2002) estimated the probability of the NCDE population persisting for 100 years as 0.94–0.99, based on an estimated population size of 400 grizzly bears and an estimate of 500 for carrying capacity. Only two years later, DNA sampling documented a minimum population size of 550 grizzly bears and an estimated population size of 765 bears (Katherine C. Kendall et al., 2009). Therefore, the probability of persistence is likely slightly higher than this estimate. Using demographic parameters from several populations in the northern Rocky Mountains, Weilgus (2002) estimated that minimum population sizes of 200–250 grizzly bears were needed to minimize extinction probability (i.e., < 0.05 probability of the population dropping below 100 individuals within 20 years). This time frame of 20 years was much shorter than the 100 years considered by Boyce et al. (2002). Nonetheless, population estimates for the NCDE (Costello et al., 2016; Katherine C. Kendall et al., 2009) indicate the grizzly bear population is 3–4 times higher than these minimum thresholds.

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 (Figure B-16). Twenty-

three bear management units were delineated in the NCDE, and 12 of these are located on or partially on the Flathead National Forest.

There is wide distribution of grizzly bears across the NCDE bear management units (Katherine C. Kendall et al., 2009; R. D. Mace & Roberts, 2011). Costello and others evaluated occupancy of the 23 bear management units in the NCDE by females with offspring during 2004–2014. Using the 6-year running tally as set forth in the Recovery Plan (USFWS, 1993), they documented full occupancy of the recovery zone/primary conservation area starting in 2009 and continuing until 2014. In addition, using similar methods, they documented full occupancy throughout areas of zone 1 (Costello et al., 2016).

The population subgoals for the NCDE grizzly bear recovery zone was listed in the Recovery Plan (USFWS, 1993, p. 59) as:

- 10 females with cubs inside Glacier National Park (GNP) and 12 females with cubs outside GNP over a 6-year running average both inside the recovery zone and within a 10-mile area immediately surrounding the recovery zone;
- 21 of 23 BMUs occupied by females with young from a running 6-year sum of observations with no two adjacent BMUs unoccupied;
- Known human-caused mortality not to exceed 4 percent of the population estimates based on the most recent 3-year sum of females with cubs, and no more than 30 percent of the 4 percent mortality limit shall be females;
- These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved;
- Occupancy in the Mission Mountains portion of the ecosystem.

However, as described in the five-year status review of the grizzly bear (USFWS 2011 p. 16), sightability of females with young has always been a challenge in this heavily forested ecosystem. For this reason, USFWS discontinued recording the number of females with cubs and their distribution in the NCDE as of 2004. Instead, USFWS has relied on new science and techniques developed through an extensive DNA-based population estimate (Kendall et al. 2009) and a study of radio-collared bears sampled proportionately to relative population density, enabling calculation of reproductive rates, survival rates, and population trend (Mace et al. 2012). Subsequent work by Costello et al. (2016) has further refined the methods used for monitoring and reporting population distribution, vital rates (including an estimate of unreported mortalities), and population trend. The following summarizes the findings of these and related studies of population size, distribution and trend in the NCDE.

Multiple measures indicate that the NCDE grizzly bear population has expanded, both in numbers and in distribution.. Using a 6-year running tally, the demographic standard of 21 of 23 BMUs occupied by females with young was met each year beginning in 2006. Using the 6-year running tally, the demographic standard of no two adjacent BMUs unoccupied was met each year beginning in 2009.

Grizzly bears are well distributed across the NCDE and their distribution continues to expand beyond the recovery zone identified in the recovery plan. Mace and Roberts (2011) mapped the distribution of grizzly bears in the NCDE (Figure B-17). The grizzly bear population has now expanded well beyond the recovery zone/primary conservation area, another indication of population growth. The current distribution is 21,313 square miles, covering the entire recovery zone/primary conservation area, most of zone 1, and parts of zones 2 and 3 (Costello et al., 2016). The Mission Mountains and Salish connectivity areas are known to be occupied by grizzly bears, and grizzly bear distribution now encompasses about 63 percent of the Ninemile connectivity area established by the draft Grizzly Bear Conservation Strategy.

Using all of the verified grizzly bear locations from 2004–2014 (N= 210,126) Costello and others (2016) estimated the total distribution area for grizzly bears had increased 139 percent from the area of the recovery zone/PCA where bear distribution was estimated prior to 1993 (USFWS, 1993).

On the Forest, grizzly bears occupy an area of the recovery zone/primary conservation area (PCA) totaling over 2.1 million acres and an area outside the recovery zone/primary conservation area totaling about 231,000 acres (see table 15 above), including the Salish demographic connectivity area in zone 1 (figure b-17). Grizzly bears continue to expand into other portions of zones 1, 2, and 3 as well.

In summary, available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al. 2016).

Grizzly bear reproduction, survival, and mortality

To maintain a healthy (recovered) grizzly bear population in the NCDE, it is necessary to have a balance between reproduction and mortality (USFWS, 2013e). 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 (R. D. Mace et al., 2012). Mean litter size in the NCDE is about two cubs, with a range from one to four cubs (R. D. Mace & Waller, 1997b; C. C. Schwartz, Miller, & Haroldson, 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 (R. D. Mace & Waller, 1997a; C. C. Schwartz et al., 2003). Teisberg and others studied 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 truly opportunistic omnivores, grizzly bears in all regions of the NCDE exploit diverse combinations of food items to arrive at productive body conditions (Teisberg, Madel, Mace, Servheen, & Robbins, 2015). Costello and others (2016) also estimated the number of annual grizzly bear mortalities during 2004–2014 as a sum of (1) management removals; (2) radio-marked losses; and (3) estimated total reported and unreported losses of non-radioed bears. Mortalities have a variety of causes and fluctuate from year to year, but despite mortalities, the survival rate for adult females (the most important group affecting population trend) is high, at 0.947 with a 95 percent confidence interval of 0.919–0.972 (Costello et al., 2016).

To ensure population stability or growth, Costello's analysis suggested that total estimated mortality of independent bears should not exceed 5.3 percent (or 2.3 percent for females and 3 percent for males). During 2004–2014, 71 percent of the total estimated mortality of independent bears was known human-caused mortality. So, assuming 71 percent, then the human-caused mortality threshold would be approximately 1.6 percent for females (0.71*2.3 percent) and 2.1 percent for males (0.71*3.0 percent), for a total of 3.7 percent. This number is very close to the 4 percent indicated in the recovery plan. During Costello's 11-year study period, mortality thresholds were not exceeded during any two consecutive years (Costello et al., 2016). In the NCDE, the most frequent known causes of documented human-caused mortalities of independent-aged grizzly bears during 2004–2014 were listed as management removals, poaching/malicious kills, and defense of life. Accounting for the fact that management removals were documented with 100 percent accuracy whereas other deaths often go unreported, Costello and others (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, 2013c). Unsecured grizzly bear attractants on private lands such as chicken coops, garbage, human foods, pet/livestock foods, bird food, 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 (see monitoring section of the revised forest plan for monitoring of habitat parameters on the Flathead National Forest).

Population monitoring and management of human-grizzly bear conflicts is under the authority of Montana Fish, Wildlife and Parks (MFWP). MFWP has several bear management specialists in the NCDE, including one who manages human-bear conflicts on the Forest who works with and educates the public to reduce mortality.

Legal hunting of grizzly bears has not occurred in Montana since 1991 (Pac & Dood, 1998), but it has occurred in Canada. In Montana, grizzly bears are occasionally killed by poachers, are mistakenly killed during the black bear hunting season, and are killed in self-defense (Costello et al., 2016). As a result, Montana instituted a mandatory black bear hunter testing and certification program to help educate hunters in distinguishing species and reducing mistaken identity and, therefore, reducing grizzly bear mortalities.

Within the Forest's geographic areas, the number of grizzly bear mortalities on NFS lands per decade has declined from about 100 in the decade from 1976-1985 to 28 in the most recent decade from 2006-2015. Within the Forest's geographic areas, the number of grizzly bear mortalities on lands other than NFS lands has increased from about 20 in the decade from 1976-1985 to 55 in the most recent decade from 2006-2015. These totals do not include bears that were determined to have died of natural causes or those that were counted as mortalities because they were trapped by professional bear managers for purposes such as augmentation of the Cabinet-Yaak grizzly bear ecosystem.

Management by MFWP may include regulated hunting in the future, once the NCDE grizzly population is delisted. Should hunting be part of grizzly bear management, there are currently no known factors that would limit regulation of harvest on the Forest. MFWP would monitor mortality due to hunting and its effects on the NCDE grizzly bear population. Grizzly bear population density and home ranges within the NCDE

Grizzly bear densities within the NCDE vary but are generally highest in Glacier National Park and on adjacent national forest lands (including the Flathead National Forest), decreasing toward the southern portion of the ecosystem (Katherine C. Kendall et al., 2009). Grizzly bears are large animals with high metabolic demands during the non-denning season. Adequate nutritional quality and quantity are important factors for successful reproduction. Mace and Roberts (2013) found that grizzly bear diets include more animal matter towards the southern and eastern periphery of the NCDE and include more plant matter in the northern and western portions of the NCDE. This pattern is presumed to reflect, at least in part, natural environmental gradients across the NCDE that influence habitat productivity.

Grizzly bear home ranges overlap and change seasonally, annually, and with reproductive status. The grizzly bear population density estimate inside Glacier National Park is approximately one bear per 8,154 acres (Katherine C. Kendall et al., 2008). Mace and Roberts (2012) evaluated home ranges of 34 female grizzly bears that lived in or adjacent to Glacier Park, based upon data collected from 2004-2011. Most home ranges (59 percent) straddled the Park boundary, overlapping lands managed by the Flathead

National Forest, the Helena-Lewis and Clark National Forest, and the Blackfeet tribe. Home ranges were, on average, smallest for bears that lived 100 percent within the Park and larger for females that straddled the Park boundary. Portions of the Kootenai National Forest and Lolo National Forest were also part of the study area.

Genetic connectivity in the NCDE

Genetic connectivity of grizzly bear populations has been examined at multiple scales. At an international scale, Proctor and others (2015) studied connectivity between the United States and Canada using genetic testing and movement data from radio-collared grizzly bears, with data gathered between 1979 and 2007. Both male and female grizzlies moved freely across the U.S./Canada border on the northern edge of the NCDE (including the Forest). The authors concluded there is currently little risk of significant reduction in the present high levels of genetic diversity in the NCDE grizzly bear population. Within the NCDE, few barriers to grizzly bear genetic exchange appear to exist. Both male and female movements have been documented across existing highway corridors. Researchers concluded that habitat connectivity is within levels that ensure both demographic and genetic connectivity (Miller & Waits, 2003; Waller & Servheen, 2005).

The draft Grizzly Bear Conservation Strategy also addresses genetic connectivity between U.S. grizzly bear ecosystems. The Flathead National Forest is located within the northwest Montana portion of the NCDE on the west side of the Continental Divide. Zone 1 on the Flathead National Forest contains a portion of the Salish demographic connectivity area (Figure B-5). The Salish demographic connectivity area has an objective of providing genetic connectivity between the NCDE and the Cabinet-Yaak Grizzly Bear Ecosystem to the west through occupancy by female bears but at a lower density then in the primary conservation area. The Salish demographic connectivity area is currently occupied by female grizzly bears (Costello et al., 2016).

Grizzly bear habitat

In total, grizzly bear habitat on the Flathead National Forest comprises nearly 40 percent of the NCDE grizzly bear recovery zone/primary conservation area ((USFWS, 2013c), distributed across six geographic areas identified in the revised forest plan (see Figure B-1). Table 15 displays the approximate acreage in each geographic area on the Flathead National Forest within grizzly habitat management zones, totaling about 2.4 million acres (see Figure B-5)

Table 15. Grizzly 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	490,824	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 provides diverse foods, cover, denning habitat, and space for this wide-ranging species. Diversity provides a wide range of vegetation types required to produce a varied food supply (USFWS, 1993)(as amended). The quantity and quality of grizzly bear habitat within the Forest consists

of a diverse, ever-changing vegetation and landscape mosaic providing a variety of foods, cover conditions, vast areas providing habitat security, and habitat connectivity. Grizzly bear habitat on the Flathead National Forest and elsewhere in the NCDE 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 bear habitat is also affected by a variety of human activities. Gibeau and others (2002) concluded that there were significant differences in grizzly bear response to roads, trails, and major development features based upon the bear's sex, age class, proximity of high quality habitat, and time of day. Gibeau and Stevens (2005) reported that bears took advantage of high-quality habitat near development when humans were inactive by using roads, trails, and human facilities at night or when unoccupied.

As stated in the Grizzly Bear Recovery Plan, the impacts of logging, mining, livestock grazing, and many forms of recreation in grizzly bear habitat can be mitigated through well-designed management programs (USFWS, 1993, p. 22). As stated in the draft Grizzly Bear Conservation Strategy (USFWS, 2013c):

> The available habitat for bears is determined largely by people and their activities. Human activities are the primary factor impacting habitat security. Human activities and the social structure and relationships among resident bears are the two major influences on the accessibility of available foods for bears. The question of how many grizzlies can live in any specific area is a function of overall habitat productivity (e.g., food distribution and abundance), the availability of habitat components (e.g., denning areas, cover types), the levels and types of human activities, grizzly bear social dynamics, learned behavior of individual grizzly bears, and stochasticity. Because carrying capacity in such an omnivorous and opportunistic species can vary annually and even day to day, there is no known way to deductively evaluate habitat components to calculate the maximum number of grizzly bears a landscape can support. Therefore, controlling human-caused mortality, monitoring both population and habitat parameters, and responding when necessary with adaptive management (Walters and Holling 1990) are the best ways to ensure a healthy grizzly population. The USFWS defines adaptive management as "a method for examining alternative strategies for meeting measurable biological goals and objectives, and then, if necessary, adjusting future conservation management actions according to what is learned." This Conservation Strategy allows for modification of management practices in response to new or changing conditions. (p. 18)

Grizzly bear habitat and grizzly bear foods

The search for energy-rich food appears to be a driving force in grizzly bear behavior and habitat selection. Grizzly bears are known to switch foods according to which foods are available (Aune & Kasworm, 1989, p. in USFWS 2013; Katherine C Kendall, 1986; LeFranc Jr., Moss, Patnode, & Sugg III, 1987; R. D. Mace & Jonkel, 1986; Martinka & Kendall, 1986; Servheen, 1981). Grizzly bears will consume almost any food available, including living or dead mammals or fish, insects, worms, plants, berries, human-related foods, and garbage (Knight, Blanchard, & Mattson, 1988; D. J. Mattson, Blanchard, & Knight, 1991; C. C. Schwartz et al., 2003). Mattson and others (1991) hypothesized that grizzly bears are always sampling new foods in small quantities so that they have alternative options in years when preferred foods are scarce.

High-energy food items used by grizzly bears occur across a range of habitats, so if ecosystem processes or changes in climate make one food item less available, other food items are likely to become more available. For example, wildfire and avalanches are ecosystem processes that have been found to benefit grizzly bear habitat. Hamer and Herrero (1987) suggested that forest disturbance-created conditions for

diverse early successional plant communities benefitted grizzly bear foraging in Alberta. In northwest Montana, Zager and others (1983) found that grizzly bears foraged in fruit-producing shrubfields in post-fire habitats disproportionately in the summer/autumn. Nielsen and others (2004) reported on average fruit production for six fruit-bearing species used by grizzly bears and stated that there was a nonsignificant difference between clearcut and uncut forests in their study area. Two huckleberry species (*V. caespitosum* and *V. membranaceum*) had higher fruit production in clearcuts, one species had greater fruit production in forests, and no difference in fruit production between clearcuts and forests was evident for the remaining species. Overall, Nielson and others found that clearcuts provided a diverse array of food resources for grizzly bears, particularly roots and tubers, herbaceous materials, and ants. They suggested that forest design and silviculture consider strategies that maximize grizzly bear food abundance while minimizing human access (S. E. Nielsen et al., 2004).

Several items appear to comprise a significant portion of grizzly bear diet in all areas (S. Anderson, 2010; IGBC, 1986; LeFranc Jr. et al., 1987, p. 11). A significant portion of grizzly bear diet is comprised of

- *Equisetum Sp. and grasses* (grasses and sedges are found in burned areas and moist riparian habitats that are abundant on the Forest)
- *Heracleum lanatum*, *Trifolium sp., and Taraxicum sp.* (early seral species that are also found in burned areas, logged areas, and riparian areas)
- roots of *Hedysarum* are dug in northern Montana; where *Hedysarum* is absent, roots of *Lomatium sp., Erythronium sp.*, and *Perideridia sp.* are dug (abundant in avalanche chutes)
- The fruit of two shrub taxa, *Vaccinium sp.* and *Shepherdia sp.,* are the primary sources of energy and fat during the mid and late seasons in much of the continental interior, whenever available. The overwintering berries of *Arctostaphylos sp.* are an important early-season diet item in the northern ecosystem of Montana (early seral species found in portions of the Forest where the tree canopy is sufficiently open to allow enough light for berry production, such as burned areas and logged areas).
- The nuts of *Pinus albicaulis* are important only in the most southern portion of grizzly bear range (not within the NCDE).
- Local concentrations of large ungulates are an important source of protein wherever available. Rodents (primarily ground squirrels and microtines) supplement the annual diet of the grizzly bear throughout much of continental North America (ungulates and rodents are distributed across the Forest during the non-denning season when grizzly bears are foraging). In contrast to the Greater Yellowstone Ecosystem, in Glacier National Park and adjacent national forest lands, meat accounts for a smaller proportion of the grizzly bear diet (IGBC, 2016).

Because the grizzly bear eats a wide variety of foods, with availability that is constantly changing due to factors such as wildfire, avalanches, plant succession, and annual changes in production due to weather, carrying capacity and food production cannot be calculated. In addition, increasing bear density influences access to food resources and foraging efficiency, and thus bear populations are likely limited by social factors rather than any limitation of food biomass itself (Bruce N. McLellan, 1994).

Grizzly bears are an omnivorous and opportunistic species that has adapted to the natural range of variation in foods (USFWS, 2013c). Habitat on the Forest provides a high diversity of bear foods that meet the needs of grizzly bears as the seasons and available foods change, so they are not reliant on any one food. 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 following paragraphs provide a summary of seasonal changes on the Forest and adjacent areas.

Upon den emergence in the spring, bears in the NCDE may search avalanche chutes for animal carcasses buried by the snow before descending to lower elevations to seek newly emerging vegetation (Aune & Kasworm, 1989; Katherine C Kendall, 1986; LeFranc Jr. et al., 1987; R. D. Mace & Jonkel, 1986; Martinka & Kendall, 1986; Servheen, 1981). As snow melts, grizzly habitat use extends to higher elevations. In the western portion of the NCDE, including the Flathead National Forest, riparian and wetland habitats (Ruby, 2014) and avalanche chutes continue to be important to bears during summer, and autumn (R. D. Mace & Waller, 1997a). Avalanches regularly occur on the Forest and adjacent areas of the NCDE, restoring conditions that are favorable for grizzly bears (Weaver, 2014).

Graves and others (2011) created an avalanche chute distribution map for the NCDE by assigning each grid cell with three or more chutes visible on remote imagery (Figure B-20). Examination of the study area indicated that the cutoff of three provided a good discrimination of areas with many versus almost no avalanche chutes. Another Glacier National Park study (Reardon, Pederson, Caruso, & Fagre, 2008) assessed trends in avalanches using combined historic and tree-ring records for 27 avalanche years in the 1910–2003 time period. The study found that the mean avalanche return period in Glacier National Park was 3.2 years and that avalanche years were associated with positive snow water equivalent anomalies at a nearby snow course. Minimum avalanche extent was highly variable but not associated with snowpack anomalies. The findings suggest that changes in Pacific climate patterns that influence snowfall could also alter the frequency of natural snow avalanches in the montane forests of the Park and surrounding areas. According to the draft Grizzly Bear Conservation Strategy, “Decreased snowpack could lead to fewer avalanches thereby reducing avalanche chutes, an important habitat component to grizzlies, across the landscape. However, increases in ‘rain on snow’ events may decrease the stability of snowpack resulting in increases in avalanches” (USFWS, 2013c, p. 31). Avalanches are widely distributed and abundant in the NCDE, with the majority of acres occurring in Glacier National Park as well as in two adjacent Forests: the Flathead and the Lewis and Clark.

During summer, grizzlies may feed on army cutworm moths and ladybird beetles on the rocky talus areas at high elevations of the Forest, as well as on the adjacent Lewis and Clark National Forest, CSKT tribal lands, and Glacier National Park lands (Aune & Kasworm, 1989; Craighead & Mitchell, 1982; Klaver et al., 1986; Servheen, 1983; Sumner & Craighead, 1973; J. White, Don, Kendall, & Picton, 1998). Once berries become available in the summer, grizzlies consume a wide variety of berries found on the Forest and elsewhere in the NCDE, including huckleberries, buffaloberries, serviceberries, hawthorn berries, chokecherries, and, to a lesser degree, alderleaf buckthorn berries and mountain ash (Katherine C Kendall, 1986; LeFranc Jr. et al., 1987; R. D. Mace & Jonkel, 1986; Martinka & Kendall, 1986; Bruce N. McLellan & Hovey, 1995; Servheen, 1981). These diverse berry-producing shrubs provide ripe fruit at various times throughout the summer and fall months, ripening at lower elevations first and progressing upslope. The amount and species of berries in bear diets vary annually based on annual fruit production and distribution (Bruce N. McLellan & Hovey, 1995).

In northwest Montana, production of berries is affected by forest canopy cover, temperature, and soil moisture conditions, which can vary considerably from low to high elevations and from year to year. Because most of the Forest is heavily forested, wildfire, timber harvest, and other vegetation management activities that affect canopy cover also affect grizzly bear food production. Areas burned by wildfire in recent decades are widely distributed across the NCDE, including the Flathead National Forest, and generally provide high-quality habitat for grizzly bear foraging for a few decades (Figure B-21). Prolonged drought (which can increase acres burned by wildfire and reduce production of some species of

berries) has also occurred during the time period that the grizzly bear population has met recovery goals. Grizzly bears have adjusted to these changes affecting food availability.

Prior to the spread of white pine blister rust, grizzlies in the NCDE fed on whitebark pine seeds from late summer through fall when and where they were available (Aune & Kasworm, 1989; Katherine C. Kendall & Arno, 1990; R. D. Mace & Jonkel, 1986; Shaffer, 1971). However, data on whitebark pine mortality rates from the early to mid-1990s indicated that 42–58 percent of all whitebark pine trees surveyed within the NCDE were dead (Katherine C. Kendall & Keane, 2001) and no longer produced seeds. Recent remeasurement of a subset of the 1990s plots showed that mortality of whitebark pine trees has more than doubled in the past two decades (Halofsky et al., in press). Despite this loss, the grizzly bear population is increasing, illustrating the flexibility of grizzly bear diets and high habitat diversity in the NCDE (USFWS, 2013c).

Grizzly bears are also known to feed on animals and hunter-discarded gut piles, especially in the fall. Teisberg and others found that fall diets of NCDE grizzly bears consist of higher amounts of meat (32 percent for adult males, 21 percent for adult females) (Teisberg et al., 2015). Adult male grizzly bear diets shifted from 3 percent to 33 percent meat from summer to fall in the northwest portion of the NCDE (lower Swan, lower South Fork of the Flathead, North Fork of the Flathead, and Whitefish Range). Adult female bears also shifted their diet, but not as much as males (R. D. Mace & Roberts, 2013).

To examine grizzly bear abundance in relation to bear foods and other habitat factors, Graves and others studied an area spanning the NCDE that was centered over Glacier National Park. Bear abundance was determined based upon genetic detection using rub trees and hair traps. The authors used a grid of 19.76 x 19.7 km cells, representing median male home range size for males (Graves et al., 2011). They then calculated the number of individual bears detected in each grid cell and summarized 15 variables within each grid cell. The authors developed indices of vegetation by assigning habitat variables to each grid cell within their study area. Mesic habitat was derived from a remote sensing-based LANDFIRE cover type classification. The cover type map incorporates terrain and climate data (indirect indices of the vegetative component of habitat), describes sub-canopy vegetation, uses most vegetative bear foods as indicator species for the ecological classifications, and should be available for monitoring at 10-year intervals. To calculate the percentage of mesic habitat, the authors extracted riparian and mesic cover types which are known to contain bear foods. They also included precipitation (based on DAYMET climate models; https://daymet.ornl.gov/) because this is monitored and is expected to be directly influenced by climate change (Graves et al., 2012).

Graves and others (2012) found that amount of mesic habitat, historical presence of bears, and bear management level (as defined by experts) were most closely associated with both male and female grizzly bear abundance. In addition, the amount of meadow and shrub habitat was closely associated with female grizzly bear abundance (see table 3 in Graves et al., 2012). Their distribution of mesic habitats and meadow/shrub habitats is shown in Figure B-22 and Figure B-23

Grizzly bear habitat and cover

Cover helps to reduce the risk of grizzly bear disturbance or displacement and also supports habitat connectivity. Figure B-24 shows areas with at least 25 percent cover of trees greater than 5 inches d.b.h. (source: 2012 VMap GIS layer for the Flathead National Forest). On the Flathead National Forest, trees in this d.b.h. category generally provide shade and cover. Areas lacking in trees over 5 inches d.b.h. (displayed in white on Figure B-24) are considered temporary because most are due to recent wildfires or tree harvest. Persistent grass/shrub/non-forest openings (displayed in yellow on Figure B-24) are considered more permanent because they are due to biophysical factors (such as presence of rocky ridges) or human development. Lynx standards for vegetation management, which apply to most of the Forest,

ensure that dense horizontal cover, the rate of regeneration harvest, and habitat diversity are considered when planning management activities, also benefitting grizzly bears.

The greatest temporary impact on forest connectivity in the Flathead National Forest GAs, considering all land ownerships, is wildfire (Figure B-21). A high percentage of the South Fork Flathead and North Fork Flathead GAs have been burned by wildfire (about 20 percent of all land ownerships), whereas a low percentage of the Swan Valley and Salish Mountains GAs has been burned by wildfire (about 3 percent of all land ownerships). As of 2000, the most recent year for which LANDFIRE data was available, the Salish Mountains GA had the highest percentage of area recently harvested (about 9 percent of all land ownerships), the Swan Valley GA had a moderate amount (about 6 percent of all land ownerships), and the Middle Fork GA had the lowest (less than 1 percent of all land ownerships). The Hungry Horse and North Fork GAs each had about 2 percent of their land area recently harvested on all ownerships.

Grizzly bear habitat and connectivity

Human activities during the non-denning season can affect habitat availability and connectivity for grizzly bears as well as the risk of human disturbance and/or human-caused mortality. Schwartz and others (2010) found that grizzly bear survival in the Greater Yellowstone Ecosystem declined as road density, number of homes, and site developments increased. Habitat availability and connectivity can affect grizzly bears at multiple scales—between grizzly bear ecosystems, within ecosystems, and within a home range. The following section addresses habitat at the scale of the Flathead National Forest as a whole and at larger scales. Habitat security at the home range scale is discussed in the section on grizzly bear habitat security below.

At a landscape scale, effects to habitat connectivity occur with respect to "habitat permeability" and the "developed human footprint" on other land ownerships, including communities, highways, land converted to agriculture, and other factors (TNC, 2016). Table 16 displays the percent of each GA affected by more permanent human developments (source: Montana Natural Heritage Program database query for all land ownerships, based upon 1999–2000 Landsat imagery used for the original ReGAP and Landfire products, which is the most recent data for all land ownerships).

Table 16. Human ecological systems by percent of area within geographic areas on the Forest (source: (MHP-MTFWP, 2013)

Ecological System	Hungry Horse	Middle Fork	North Fork	Salish Mts.	South Fork	Swan Valley
Developed, Open Space	0.624	0.088	0.377	3.023	0.000	1.557
Low Intensity Residential	0.323	0.049	0.311	1.485	0.000	0.626
High Intensity Residential	0.015	0.017	0.017	0.134	0.000	0.024
Commercial / Industrial	0.141	0.024	0.187	0.717	0.000	0.072
Railroad	0.035	0.181	0.042	0.089	0.000	0.000
Major Roads	0.061	0.162	0.090	0.293	0.000	0.158
Other Roads	1.028	0.115	1.460	3.316	0.042	2.201
Quarries, Strip Mines and Gravel Pits	0.009	0.007	0.000	0.099	0.015	0.012
Pasture/Hay	0.427	0.040	0.104	2.356	0.000	0.451
Cultivated Crops	0.532	0.000	0.014	5.207	0.000	0.631
Introduced Upland Vegetation—Perennial Grassland and Forbland	0.000	0.001	0.000	0.000	0.000	0.000
Total Human Ecological Systems	3.195	0.682	2.604	16.719	0.057	5.734

As shown in Table 16 and Figure B-24, the developed "human footprint" ranges from less than 1 percent in the South Fork and Middle Fork Flathead River Geographic Areas (GAs) up to about 17% of the Salish Mountains GA. The Swan Valley GA has a moderate but more dispersed human development footprint compared to the Salish GA. In other words, 83-99% of each geographic area on the forest is largely uninhabited by people. Grizzly bears generally avoid the "developed human footprint" in and around Kalispell, but may be drawn to residences in smaller rural communities and valley bottoms if attractants are present. For grizzly bears, areas with higher levels of permanent human development may be associated with avoidance during certain seasons or times of day or higher grizzly bear mortality due to conflicts with humans.

At a larger landscape scale, The Nature Conservancy mapped landscape permeability for the Pacific Northwest (McRae et al., 2016), including the area from the NCDE to the Greater Yellowstone Ecosystem (Figure B-25); areas with high permeability are shown in blue, areas with moderate permeability are shown in yellow, and areas of low permeability are shown in brown. Overall, the network of federal lands in northwestern Montana provides a moderate to high degree of landscape permeability for grizzly bears, and connectivity is not impaired (Kuennen, 2015). Federal agencies have been cooperating in improving habitat connectivity and mitigating impacts of highways and other developments that impede movement by wildlife, including grizzly bears.

Proctor and others (2015) and Weaver (2013) modeled and mapped preferred "linkage habitats" for grizzly bears along highways within the Flathead National Forest and adjacent areas (including Canada) in order to inform management of connectivity; see also Proctor (2015). Their models and maps were based upon resource selection functions that indicate relative habitat importance. Waller and Servheen studied grizzly bear habitat connectivity along the Highway 2 corridor between Glacier National Park and the Flathead National Forest, evaluating trans-highway movements of 42 grizzly bears and relating them to highway and railroad traffic volumes as well as other corridor attributes (Waller & Servheen, 2005). They found that grizzly bears strongly avoided areas within 0.31 mile of the highway and that highway crossing frequency was negatively related to highway traffic volume. Most highway crossings occurred at night when highway traffic volume was lowest (Waller & Servheen, 2005). Waller and Miller also found that traffic volumes had increased when they compared the 1999-2001 study periods and the 2012-2013 periods (Waller & Miller, 2015). Traffic volume increases were most dramatic during the hours in which grizzly bears were most likely to cross the highway, thus suitable highway crossing opportunities have declined along the Highway 2 corridor between Glacier National Park and the Flathead National Forest.

Northrup and others studied grizzly bear response to traffic levels on the entire road network in southwestern Alberta. Bears selected areas near roads traveled by fewer than 20 vehicles per day and were more likely to cross these roads. Bears avoided roads receiving moderate traffic (20–100 vehicles per day) and strongly avoided high-use roads (> 100 vehicles per day) at all times (Northrup, Stenhouse, & Boyce, 2012). They also found that traffic patterns caused a behavioral shift in grizzly bears, with increased use of areas near roads and movement across roads during the night when traffic was low.

Despite higher levels of avoidance along some of the highway corridors and higher mortality associated with some permanent human developments, the grizzly population continues to grow and expand (Costello et al., 2016). The Grizzly Bear Conservation Strategy addresses connectivity from the NCDE to the Cabinet-Yaak Ecosystem in the Salish demographic connectivity area (DCA) that occurs on the Flathead and Kootenai National Forests. Management direction for the Salish DCA is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Grizzly bear habitat security

Maintaining large areas of secure habitat is important to the survival and reproductive success of grizzly bears, especially females (R. D. Mace et al., 1999; C. C. Schwartz et al., 2010), and is a major goal of the draft NCDE grizzly bear conservation strategy. Throughout the NCDE, wilderness areas provide a high degree of habitat security for grizzly bears. The NCDE contains large acreages of congressionally designated wilderness, totaling about 1.1 million acres within the Forest portion of the recovery zone/primary conservation area (see Figure B-26 and Figure B-27). The Wilderness Act of 1964 precludes a variety of activities, including road construction, motorized use or mechanized transport, and permanent human habitation (except as specifically allowed by the enabling legislation, such as the Schafer airstrip). New livestock allotments, new mining claims, new oil and gas leases, or other developments that would impair wilderness character are also prohibited. The NCDE also contains substantial acreage of inventoried roadless areas (see Figure B-3), as well as other lands that have little or no permanent human presence or road development. On the Flathead National Forest, a total of about 1.6 million acres inside the primary conservation area is currently designated as wilderness, inventoried roadless areas, or other backcountry management areas that contribute to high levels of habitat security for grizzly bears.

Grizzly bear habitat security has been modeled and mapped using a variety of methods at a variety of scales (Kuennen & Warren, 2015). One indicator of habitat security is the pattern of security core habitat across the Flathead National Forest portion of the PCA and within subunits representing female home ranges. On NFS lands, security core levels are high in most places within the Forest's recovery zone/primary conservation area (see Figure B-26) (USDA, 2014c). The following sections discuss habitat security at the scale of grizzly bear subunit.

At its peak in the late 1980s, the Forest had about 2,934 miles of open roads (

Figure 4). From the end of 1994 to the end of 2011, about 694 miles total miles of system road were reclaimed or decommissioned (see definitions in Amendment 19 of the 1986 Flathead National Forest Plan). Additional seasonal and yearlong restrictions to existing roads also occurred during this time period. About 348 miles of open road were also restricted between 1995 and 2010. By 2010, the average open road density had decreased to about 0.4 mile per square mile. An influx of funds provided by the American Recovery and Reinvestment Tax Act of 2009 allowed the Forest to complete much-needed road management work, but funding has declined since.

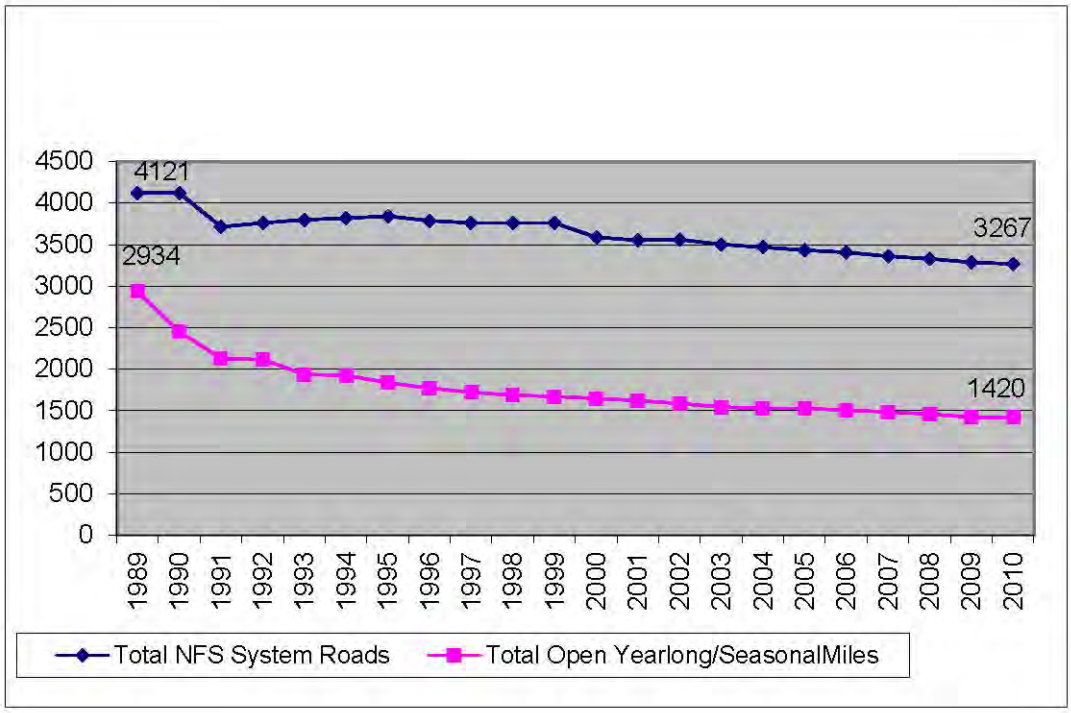


Figure 4. Trend in road miles on the Flathead National Forest

McLellan (2015) studied the interaction of roads, human activities, and food sources for grizzly bears over a 30-year time period in a multiple-use landscape in British Columbia that had high levels of human activity (including logging, gas exploration, and grizzly bear hunting). McClellan stated that a significant implication of his study is that the abundance of a high-energy food source growing in undisturbed portions of his study area enabled the grizzly bear population to increase in spite of intense industrial development and the highest density of hunter-killed grizzly bears in British Columbia. Once the high-energy food source declined, the grizzly bear population declined. He stressed that managers should identify which high-energy foods are important in various ecosystems and try to maintain or enhance these foods while reducing human access into habitats where they are abundant. Research studies have used a variety of methods to assess the effects of human access on habitat security and grizzly bear use.

Ruby (2014) studied grizzly bear habitat use along Montana Highway 83 in the Swan Valley portion of the Forest. 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 that grizzly bears exhibited little negative selection for high open road densities within the Swan Valley study area, using high-quality habitats around human developments. Even though road density parameters in the Swan Valley subunits did not meet 19 percent OMAD, 19 percent TMAD, and 68 percent security core, grizzly bears continued to use Swan Valley habitats. 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, citing the work of Delibes et al. published in 2001, Mattson et al. in 1990, Neilson et al. in 2004, and C. C. Schwartz et al. in 2010.

Numerous studies using various methods have documented that excessive road density in grizzly bear habitat affects behavior and habitat use and lowers bears' survival rate during the non-denning season (Boulanger & Stenhouse, 2014; D. J. Mattson, Knight, & Blanchard, 1987; M. Mattson, 1996; Bruce N. McLellan & Shackleton, 1988; Waller & Mace, 1997). Some older studies looked at motorized road use based upon data obtained with weekly telemetry flights, and some newer studies used satellite technology to track a bear's location each half hour or hour. Some studies assessed effects to grizzly bears of all sex, age, and reproductive classes, and others assessed effects on each class. Some studies analyzed roads based on a "moving window analysis" method and others analyzed linear road densities. The terms "motorized access" or "motorized routes" are used to encompass both roads and trails that receive motorized use. The effects of motorized trails on grizzly bears were not part of the Swan Mountain Range study by Mace and others (R. D. Mace, Waller, Manley, Lyon, & Zuuring, 1996) and have not been well studied.

In summary, although research methods and findings have changed over the years, numerous studies have documented that excessive open road densities in grizzly bear habitat during the non-denning season lowers their survival rate (Boulanger & Stenhouse, 2014; D. J. Mattson et al., 1987; M. Mattson, 1996; Bruce N. McLellan & Shackleton, 1988; Waller & Mace, 1997).

Motorized access in the primary conservation area—moving window analysis method

Research findings from the Swan Mountain Range of the Flathead National Forest have been used to evaluate the effects of motorized access on grizzly bears in the NCDE. Mace and others (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:

- Road density was lower within the composite of the multiannual home ranges of 14 adult and subadult female grizzly bears (1.1 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);
- As total road density increased, the probability of selection by grizzly bears declined;
- 56 percent of the composite female home range was unroaded compared to 30 percent outside the composite home range;
- Within seasonal ranges, grizzly bears were more likely to use areas with higher road densities during spring than during other seasons;
- Selection for habitats within a 0.5 km (0.31 mile) buffer around roads decreased as traffic volume increased.

Based on these findings, 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 were called bear management unit (BMU) subunits. The moving window analysis method has been used to evaluate the effects of motorized route density in grizzly bear subunits across the NCDE recovery zone/primary conservation area. Under the alternatives being considered for the Flathead revised forest plan and the amendments of the Helena, Kootenai, Lewis and Clark, and Lolo National forest plans, this method would continue to be used to assess effects on grizzly bears in the NCDE recovery zone/primary conservation area. 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). These recommendations were used as the basis for open and total motorized access density and security core objectives for the Flathead forest plan amendment 19, adopted in 1995. The Forest's amendment 19 considers both motorized roads and motorized trails.

The Forest's 12 bear management units in the recovery zone/primary conservation area were further subdivided into 73 subunits (Figure B-30). The amendment 19 decision applies management direction to 54 of the 73 subunits because it does not apply to un-roaded subunits in wilderness. Three subunits in the Stillwater River portion of the recovery zone/primary conservation area were not included in amendment 19 because they have very little NFS land acreage.

Flathead National Forest Plan amendment 19 adopted the moving window analysis method and established limits for total motorized access density (no more than 19 percent with density exceeding 2 mi/mi^2), open motorized access density (no more than 19 percent with density exceeding 1 mi/mi^2), and security core (at least 68 percent) within each of the 54 bear management subunits (where amendment 19 applies) with more than 75 percent National Forest System lands (unless amended). In bear management subunits with less than 75 percent National Forest System lands, no net increase in the percentage of open or total motorized access density was allowed, and no net decrease in the percentage of security core in a subunit was allowed (USDA, 1995b).

In 1998, the NCDE access task group, a group of grizzly bear experts, suggested that (1) the basic premise of managing open and total road densities as well as security core areas during the non-denning period is valid; (2) although amendment 19 is considered effective for managing access in grizzly bear habitat to support recovery of the species, other strategies may also be effective; and (3) seasonal road closures to protect seasonally important grizzly bear habitat can be useful and effective. Since 1998, many other studies of grizzly bear habitat use in relation to roads have been conducted, using a variety of definitions, methods, and statistical techniques.

Summary of habitat security trends in the primary conservation area during the non-denning season

In 1995, there were many more miles of open and total roads than there are today. In 1995, 16 of the Forest's 40 subunits with > 75 percent NFS lands met or exceeded 68 percent security core habitat. By 2016, the number of subunits exceeding the minimum of 68 percent security core had greatly increased and a total of about 731 miles of road had been decommissioned (see the 2016 amendment19 annual report of conditions thru 2015 for more details) (USDA, 2016a). Between 1995 and 2016, habitat conditions for grizzly bears on the Flathead National Forest had greatly increased the availability of secure grizzly bear habitat as well as its 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 Forest has acquired more than 45,000 acres of former Plum Creek Timber Company lands through the Legacy Project and other land acquisitions (see Figure B-42 and Figure B-43). 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 vast 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 amendment 19 was adopted, 14 subunits had less than 75 percent NFS lands (USDA, 1995b, p. 6). These 14 subunits were not required to meet 19 percent OMAD (open motorized access density, also called OMRD or open motorized route density), were not required to meet 19 percent TMAD (total motorized access density, also called TMRD or total motorized route density), and were not required to meet 68 percent security core. Instead, these subunits were managed for "no net increase" in OMAD or TMAD and "no net loss" of security core. As a result of the Legacy land acquisition and a district court decision related to the Glacier Loon and Buck Holland subunits (USDC-Missoula, 2014), the Forest is now reporting conditions in relation to A19 motorized access for 47 rather than 40 subunits because the Forest manages greater than or equal to 75 percent of the land. 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 in the INFRA database, also increasing the miles of roads managed by the Flathead National Forest. The Forest does not have complete knowledge of all roads on the acquired lands, so field road logs are being completed to get information such as the type and location of closure devices.

The status of the 47 grizzly bear subunits is shown in Table 17and Figure B-31 and Figure B-32. (USDA, 2016a, 2016d). Table 17 shows OMAD, TMAD or security core percentages in parentheses if projects have gone through section 7 consultation and are expected to be implemented in the near future. In summary:

- Thirty-seven of 47 subunits with > 75 percent NFS lands would meet or are less than 19 percent OMAD or meet site-specifically amended standards (5 subunits),
- Thirty-two of 47 subunits with > 75 percent NFS lands would meet or are less than 19 percent TMAD or meet site specifically amended standards (2 subunits),
- Thirty-one of the 47 subunits with > 75 percent NFS lands meet or are over 68 percent CORE (27 subunits) or meet site specifically amended standards (4 subunits).

Table 17. Status of bear management unit (BMU) subunits where NFS lands > 75% and where amendment 19 applies (draft 2016 A19 report)[1].

#	BMU Subunit	Open Motorized Access Density (%)	Total Motorized Access Density (%)	Security Core (%)
1	Frozen Lake	10	4	80
2	Ketchikan	14	3	73
3	Upper Trail	14	4	88
4	Lower Whale (amended 37-19-47)	36	17	50
5	Upper Whale Shorty	12	11	86
6	Red Meadow Moose	25	17	68
7	Hay Creek	25	16	55
8	Coal and South Coal	15	19	73
10	Werner Creek (amended 29-19-63)	29	20	63
11	Lower Big Creek	18	19	71
12	Canyon McGinnis (amended 19-33-53)	19	32	50
17	Peters Ridge	52	25	34
19	Swan Lake	39	26	45

#	BMU Subunit	Open Motorized Access Density (%)	Total Motorized Access Density (%)	Security Core (%)
22	Lion Creek	18	47	41
23	Meadow Smith	20 (18)	53	42
24	Buck Holland	24	41	40
25	Crane Mountain	31	58	25
27	Piper Creek	19	45 (43)	55
28	Cold Jim	18	57 (54)	43 (44)
29	Hemlock Elk	6	30 (29)	64
30	Glacier Loon	22	41	48
31	Beaver Creek	6	26 (25)	66
32	Doris Lost Johnny (amended 57-19-36)	57	19	36
33	Wounded Buck Clayton (amended 27-30-65)	27	30	65
35	Emery Firefighter	19	20 (19)	58 (68)
36	Riverside Paint	18	16	71
37	Jewel Basin Graves	19	19	68
38	Wheeler Quintonkon (amended 25-19-68)	25	19	68
39	Logan Dry Park	30	36	51
40	Lower Twin	9	2	92
41	Twin Creek	0	0	100
42	Moccasin Crystal	8	1	81
43	Stanton Paola	8	3	81
44	Dickey Java	9	0	81
45	Long Dirtyface	0	0	100
46	Tranquil Geifer	0	2	85
47	Skyland Challenge	20	17	65
48	Plume Mtn Lodgepole	0	0	97
49	Flotilla Capitol	0	0	99
50	Ball Branch	7	12	84
51	Kah Soldier	19	19	68
52	Spotted Bear Mtn	19	18	68
53	Big Bill Shelf	11	6	80
54	Jungle Addition	19	19	68
55	Bunker Creek	5	3	92
56	Gorge Creek	0	0	90
57	Harrison Mid	1	0	95

[1] – There are 16 subunits with >75% NFS lands that are completely within the wilderness and not included in Amendment 19.

The Forest expects to continue to inventory its roads and the results will probably cause shifts in percentages. In addition, Appendix TT to the 1986 forest plan (as amended) states that roads are considered fully reclaimed if all stream-aligned culverts are removed. Reclaimed roads that fully satisfy the definition of a reclaimed road are not included in calculations of total motorized access density

(TMAD). Because the Forest does not have complete knowledge of its road system and is uncertain whether stream-aligned culverts remain on some of the roads classified as "impassable" in the INFRA database, we have modeled total motorized access density in two ways in order to depict the existing condition:

1. assuming there are no stream aligned culverts on impassable roads
2. assuming there are stream-aligned culverts on impassable roads

Table 18 shows total motorized access density (TMAD) for 18 out of 47 amendment 19 subunits where these assumptions make a difference in the percentages. Figure B-38 displays the status of the amendment 19 units.

Table 18. Total motorized access density percentages that change based upon assumptions

Subunit Name	TMAD % assuming no stream-aligned culverts	TMAD % assuming stream-aligned culverts present
Ball Branch	12	14
Buck Holland	41	42
Bunker Creek	3	10
Canyon McGuinness	32	38
Cedar Teakettle (<75% NFS lands)	27	30
Coal and South Coal	19	27
Cold Jim	55	56
Crane Mountain	58	61
Doris Lost Johnny	20	27
Frozen Lake	4	5
Jewel Basin Graves	19	20
Lower Whale	17	18
Meadow Smith	53	54
Porcupine Woodward (<75% NFS lands)	73	75
Red Meadow Moose	17	19
South Fork Lost Soup (<75% NFS lands)	47	50
State Coal Cyclone (<75% NFS lands)	25	27
Wounded Buck Clayton	30	31

While the difference in assumptions makes a difference in the TMAD percentage, it does not change the on-the-ground condition. The roads in question have been determined to be impassable because they are brushed in or have had the first portion of the road (typically 200 to 600 feet) treated in such a manner so as to preclude its use as a motorized or non-motorized travel way during the non-denning season. From the standpoint of grizzly bear security, if the road is impassable, it likely does not matter whether stream-aligned culverts remain. The Forest is conducting inventories of the roads in question to determine whether stream-aligned culverts are present or not. The Forest will update the baseline as field road surveys are completed and the INFRA database is updated.

Habitat security in the Swan Valley Grizzly Bear BMU Subunits

Additional habitat management direction applies to some of the grizzly bear subunits in the Swan Valley because of its history of intermingled land ownership. 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, 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. Conditions in the Swan Valley have changed since amendment 19 and the SVGBCA were adopted. The acquisition of former Plum Creek Timber Company lands by state and federal agencies totals about 66,000 acres throughout the 230,000-acre Swan River watershed.

During the two decades from 1996-2015, Plum Creek Timber Company (PCTC), 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. Table 19 displays the acres of harvest in the 11 Swan Valley grizzly bear subunits managed under the SVGBCA from 2006-2015 (Ruby, Baty, & Kloetzel, 2016).

Table 19. 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/TNC 1996-2005 (acres)	Timber Harvest PCTC/TNC 2006- 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
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 important 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.

The only remaining parties to the Swan Valley Grizzly Bear Conservation Agreement are the USFS and the Montana Department of Natural Resources and Conservation (DNRC). DNRC manages a large block of lands in four grizzly bear subunits: Goat Creek, Lion Creek, Porcupine Woodward, and South Fork Lost Soup (about 55,900 acres out of 124,362 acres, or about 45 percent of the lands in these four subunits). In these four subunits, about 32,090 acres are in inventoried roadless areas (IRAs) managed by the Forest. Other private lands in these subunits total less than 2 percent of the subunit acreage. Table 20 displays OMRD, TMRD, and security core for three subunits where DNRC and the USFS continue to share land management and where the Forest Service manages *less than* 75 percent of the acreage (see table 17 for grizzly bear subunits where the Forest manages 75 percent *or more* of the acreage).

Table 20. Open motorized access density, total motorized access density, and security core habitat for subunits shared by USFS and DNRC, with less than 75% NFS lands (2016 annual A19 report).

Subunit Name	Open Motorized Access Density (%)	Total Motorized Access Density (%)	Security Core (%)
Goat Creek	23	59	39
Porcupine Woodward	27	73	15
South Fork Lost Soup	25	47	37

Both DNRC and the Forest Service have closed roads in the Swan Valley grizzly bear subunits to benefit wildlife, including grizzly bears, as displayed in Table 21.

Table 21. Miles of restricted and historical roads per subunit on DNRC and USFS lands located in the Swan Valley (excluding public highways, county roads, and roads on small private lands). All values are miles of road to the nearest mile.

Subunit Name	DNRC Gated	DNRC Physical Barrier	DNRC Historic/ Reclaimed	USFS Gated[1]	USFS Physical Barrier[2]	USFS Historic/ Reclaimed[3]
Beaver Creek	---	---	---	52	5	8
Buck Holland	---	---	---	38	20	1
Cold Jim	---	---	---	81	42	10
Glacier Loon	---	---	---	46	28	6
Goat Creek	86	21	9	0	9	9
Hemlock Elk	---	---	---	54	18	2
Lion Creek	17	7	0	32	18	3
Meadow Smith	---	---	---	63	48	1
Piper Creek	0	0	0	48	30	0
Porcupine Woodward	117	29	13	12	23	32
South Fork Lost Soup	44	28	8	6	4	5

[1] Gated roads are closed by a locked gate and considered available for administrative use; considered a restricted road.

[2] Physical barrier roads are closed by various types of physical barriers and generally are not available for motorized administrative use; considered a restricted road.

[3] Historical or reclaimed roads are no longer used by the cooperator, no longer exist, and/or are not on the cooperator's system.

Grizzly bear habitat security in BMU subunits *outside* the Swan Valley Grizzly Bear Conservation Agreement Area where NFS lands total less than 75% of the acreage

In four of the Forest's 73 subunits in the PCA, the Forest Service now manages less than 75% of the acreage and "no net loss" in road densities and "no net decrease" in security core apply (see table 22).

Table 22. Existing status of BMU Subunits that are not included in the Swan Valley Grizzly Bear Conservation Agreement where NFS lands total < 75%.

#	BMU Subunit	RD	Open Motorized Access Density (%)	Total Motorized Access Density (%)	Security Core (%)
9	State Coal Cyclone	GV	29	25	58
13	Cedar Teakettle	GV	25	27	24
18	Noisy Red Owl	SL	20	16	52
34	Coram Lake Five	HH	26	46	14

Note. GV = Glacier View, TL = Tally Lake, SL = Swan Lake, HH = Hungry Horse.

In summary, the grizzly bear population in the NCDE is stable to increasing and expanding in distribution even though there are grizzly bear subunits that do not meet 19% OMAD, 19% TMAD, or 68% security core and even with a high level of timber harvest activity and road use in the subunits with intermingled ownership that occurred in the Swan Valley from 1996-2015. Because there are many acres of young forest that will not be suitable for additional harvest for many decades, and because PCTC (now Weyerhaeuser)/TNC no longer manage lands in the eleven subunits shown in Table 21, 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 acquisition of lands formerly owned by Plum Creek Timber Company has several benefits for grizzly bears. It ensures that the acquired private lands will not be sold or subdivided for permanent human development, reducing the risk of grizzly bear food conditioning, habituation, and fragmentation that can be associated with private land development. It also reduces the need for coordination of timber harvest activities in 11 grizzly bear subunits and helps to maintain or improve habitat quality for grizzly bears and other wildlife species (see Figure B-42 and Figure B-43). In their biological opinion on the effects of the revised implementation schedule for the Flathead National Forest's amendment 19 (USFWS, 2014c), the USFWS 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."

Administrative use of roads

Amendment 19 of the forest plan addressed motorized administrative use of closed routes in the grizzly bear recovery area (PCA), and appendix TT of the forest plan clarified allowable levels of administrative use. Appendix TT stated 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. Based upon the findings of Mace and Waller (1996), the administrative use of roads allowed under amendment 19 would not cause avoidance or underutilization of habitat by grizzly bears.

Grizzly bear habitat security and motorized use in zone 1

A moving-window analysis was used for establishing plan components and analyzing effects of motorized use in the primary conservation area, but a different method for establishing plan components and analyzing the effects of motorized use was selected for zone 1 (including the Salish demographic connectivity area) in recognition of the differing grizzly bear management objectives. Instead of a moving window analysis, the linear density of roads or routes open to public motorized use was applied. The evaluation of effects of linear density on grizzly bears was based on research by Boulanger and Stenhouse

(2014). This research is the best available science on the effects of roads on grizzly bears of different sex and age classes (C. Servheen, USFWS, pers. comm. to R. Kuennen, 2015).

Boulanger and Stenhouse (2014) studied 142 grizzly bears monitored in Alberta from 1999-2012. They found that sex and age class survival was related to road density. The roads in the Alberta study area were almost entirely (96.5 percent) gravel secondary roads associated with settlements and industrial resource extraction activities. In Alberta, for the most part, resource roads are all-weather gravel roads that are open for public use year round (Stenhouse & Boulanger, 2016). We believe all these roads would meet our definition of "open for public use during the non-denning season." More recently there have been efforts at gating, but these have not yet formed part of Boulanger and Stenhouse's ongoing research. They are now looking at how effective these access control measures may be in terms of both human and grizzly bear behavior. The authors did not include motorized trails in their model.

In the Alberta study, demographic modeling found strong spatial gradients in the grizzly bear population trend based upon road density. Threshold values for road density needed to ensure population stability were estimated to refine targets for population recovery of grizzly bears in Alberta. A summary of the threshold values and how they were used in the NCDE is shown in Table 23.

Table 23. A summary of the threshold values and their use in the analysis for NCDE zone 1 based on Boulanger and Stenhouse (2014).

Objective described in the Alberta study (Boulanger & Stenhouse, 2014)	Reported density km/km^2	Converted tomiles/sq. mi.[1]	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 1.25 km/km^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. Density calculation included both roads and trails open for public motorized use in the non-denning season.
Grizzly bear mortality risk – Most grizzly bear mortalities occurred at road densities greater than 1.0 km/km^2 except for adult males, whose 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 area. Density calculation included both roads and trails open for public motorized use in the non-denning season.
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	NA [see moving window analysis method used in the recovery zone/primary conservation area, where the management objective is to function as a core conservation area].

[1] Formula: 1 km = 0.6214 mi; 1 km^2 = 0.3861 mi^2

Outside the recovery zone/primary conservation area, the 1986 forest plan identified geographic units and a range of public open road densities for each. Table 24 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, updated as of 2015 each (USDA, 2015). Geographic units are not the same as grizzly bear management subunits and no subunits were identified in zone 1.

Table 24. Density of roads open to the public motorized vehicle use by geographic unit

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
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

[1] See map of Salish geographic units (USDA, 2015).

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 & Stenhouse, 2014) and are below the upper thresholds established by the 1986 forest plan, but mortality risk is elevated in some geographic units for some grizzly bear sex and age classes.

Grizzly bear habitat and dispersed recreation

Quinn and Chernoff (2010) prepared a report on the effects of recreation activities on wildlife. The authors stated that response of wildlife to different disturbance activities is largely a function of

- detection distance – the distance between humans and wildlife at which human presence is first detected.
- the sensitivity of a given species to human presence (including previous experience with human activity).
- the zone of influence associated with a given activity (determined by noise generated, speed of travel, intensity of use).
- timing of the effect (e.g., life stage of the animal, breeding season, dispersal season)

Grizzly Bear habitat and recreation: denning season

Grizzly bears hibernate in dens during the winter months. 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, Swenson, Andersen, & Barnes, 2000). The average elevation of 252 grizzly bear dens in the

NCDE ranged from 6,427 to 6,906 feet (R. Mace, 2014). It has been estimated that about 47 percent of National Forest System lands in the primary conservation area provides potential denning habitat (R. Mace, 2014). The availability of denning habitat is not likely to be a limiting factor for grizzly bears in this area (USFWS, 2013c).

The impacts of winter recreation activities on denning bears are not well studied, but there is no evidence to indicate that current levels of nonmotorized or motorized over-snow vehicle use are inhibiting the recovery of the grizzly bear population in the NCDE (R. Mace, MFWP, pers. comm., 2015). In the draft GBCS, the USFWS (2013c) stated 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 (Swenson, Sandegren, Brunberg, & Wabakken, 1997), with sample sizes so small they cannot be legitimately applied to assess population-level impacts (Harding & Nagy, 1980; Hegg, Murphy, & Bjornlie, 2010; Reynolds, Reynolds, & Follmann, 1986).There are no reports of den abandonment by grizzlies in the lower 48 states due to snowmobiling activity (Hegg et al., 2010; Servheen & Cross, 2010). The draft GBCS stated that current levels of snowmobile use are not appreciably reducing the survival or recovery of grizzly bears (USFWS, 2013c).

Areas open to motorized over-snow vehicle use on the Flathead National Forest is limited by the winter use provisions of the Flathead's Winter Motorized Recreation Plan (amendment 24) (USDA, 2006). The purpose and need for Amendment 24 was to clarify management direction regarding over-snow motorized use and meet the requirements of a settlement agreement resulting from a lawsuit challenging over-snow motorized use on the Flathead National Forest. The selected alternative responded to the purpose and need by establishing a Winter Motorized Recreation Management Plan that clarified where, when, and under what conditions over-snow vehicles were allowable on the Flathead National Forest and amended the forest plan to be consistent with that management plan. This decision identified areas and routes suitable for motorized over-snow vehicle use, including four "late-season areas" within the primary conservation area where motorized over-snow vehicle use is allowable in the areas defined by amendment 24 as follows; Canyon Creek groomed route corridor until April 15; Six Mile until April 30; Skyland Challenge until May 15; Lost Johnny until May 31 (USDA, 2006, p. appendix A).

Mace did a GIS assessment of the distribution of 252 verified grizzly bear dens in the NCDE as of 2014 with respect to areas open to motorized over-snow vehicle use or closed to motorized over-snow vehicle use (R. Mace, 2014). He found that 25 percent of the 252 dens were in designated wilderness (19 percent of the 25 percent are female grizzly bears), 15 percent of the dens were in Glacier National Park (13 percent of the 15 percent are female grizzly bears), 31 percent of the dens were in areas open to motorized over-snow vehicle use until April 1 (27 percent of the 31 percent are female grizzly bears), 5 percent of the dens were in areas known as "late season areas"—open to motorized over-snow vehicle use after April 1 (4 percent of the 5 percent are female grizzly bears), and 24 percent were in other areas closed to motorized over-snow vehicle use on the Forest (23 percent of the 24 percent are female grizzly bears) (Ake, 2015). The percentage of den locations is proportional to the amount of modeled denning habitat in each category (Kuennen, 2015).

Grizzly bear habitat and recreation: den emergence time period

Bear research scientists and managers have suggested that in the period shortly before or after den emergence in the spring, a female with cubs may be particularly vulnerable to disturbance by people because cubs have limited mobility after den emergence and the females and their cubs have high energetic needs (Haroldson, Ternent, Gunther, & Schwartz, 2002; R. D. Mace & Waller, 1997a). However, such effects have never been documented and there are no known scientific papers supporting this potential impact.

Some members of the public expressed a concern that changes in climate may cause grizzly bears to emerge from their dens earlier, increasing the potential for conflicts with nonmotorized or motorized over-snow use. The draft GBCS established dates for the denning season. West of the Continental Divide on the Flathead National Forest, the denning season is defined as December 1-March 31. Mace collected data on known dens in the NCDE and on the Flathead National Forest through 2014. On the Flathead National Forest, den emergence dates ranged from April 16-May 29, with the exception of one bear emerging on April 4 of one year, so April 1 is a conservative date for den emergence. In 2015, a year with lower than average snowfall overall, the earliest known bear emergence date on the Flathead National Forest was April 23 for males and April 28 for females (R. Mace, pers. comm., 2015). Mace did not detect shifts in den emergence of the NCDE grizzly bear population associated with changes in climate (Costello et al., 2016).

Nonmotorized use on the Forest is not restricted during the denning or den emergence time periods. Table 25 and table 26 show current areas and routes open to motorized over-snow vehicle use in the primary conservation area according to season (denning season for grizzly bears and den emergence time period). During the denning season, about 22 percent of the primary conservation area on the Forest 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 about 2 percent of the acreage within the primary conservation area (see Figure B-31 and

Figure B-32). Note that miles and acres displayed in table 25 and table 26 reflect the amendment 24 decision, but numbers may be different due to realignment of data layers and GIS updates.

Table 25. 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	513,134 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.

The Forest's annual amendment 19 report displays open and total route density and security core figures for the two-month season of April-May (see table 26).

Table 26. Late spring open and total route density and security core percentages (USDA, 2016a).

#	BMU Subunit	RD	Open Route Density		Total Route Density		Security Core	
			Late Spring	Non-denning	Late Spring	Non-denning	Late Spring	Non-denning
Canyon Creek Area								
10	Werner Creek (amended)	GV	18	29	23	20	61	63
11	Lower Big Creek	GV	15	18	same	19	70	71
12	Canyon McGinnis (amended)	GV/TL	24	19	33	32	41	50
13	Cedar Teakettle (< 75% NFS land)	GV	15	25	same	27	24	24
Lost Johnny Area								
32	Doris Lost Johnny (amended)	HH	79	57	77	19	17	36

33	Wounded Buck Clayton (amended)	HH	51	27	62	30	34	65
17	Peters Ridge	HH/SL	14	52	18	25	66	34
Sixmile Area								
19	Swan Lake	SL	27	39	24	26	54	45
38	Wheeler Quintonkon (amended)	HH/SB	20	25	23	19	64	68
18	Noisy Red Owl (< 75% NFS land)	SL	13	20	15	16	60	52
50	Ball Branch	SB	2	7	14	12	89	84
Challenge/Skyland Area								
47	Skyland Challenge	HH	51	20	50	17	31	65
46	Tranquil Geifer	HH	7	0	7	2	81	85

In the Table 26 above, where the open and/or total route density decreased, those subunits either had (1) roads closed during April-May that were open in the summer or (2) wheeled motorized trail traffic is assumed to not occur due to spring conditions. Where the open and/or total route density increased, those subunits either (1) contained "play" areas with density assumed to be > 2.0 mi/mi^2 or (2) had additional over-snow routes not present as open roads in other seasons. Where security core increased, it was assumed wheeled motorized traffic was not occurring due to spring conditions, so those motorized trails were not buffered. Where security core decreased, those subunits either (1) contained "play" areas, which were buffered 500 meters and the area plus the buffer is not considered CORE or (2) contained route corridors (100 feet either side of route), which were buffered 500 meters and the route corridor plus the buffer is not considered core.

The USFS and MFWP 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 (A. H. Jacobs, 2013). The agencies have not detected any conflicts due to over-snow use on the Flathead National Forest. The grizzly bear population in the NCDE has grown and expanded in distribution with the level of over-snow use that has been occurring. The draft GBCS stated that monitoring would continue to support adaptive management decisions about snowmobile use.

Grizzly bear habitat and recreation during the non-denning season

Table 27 shows the different types of allowable trail uses on the Forest by approximate miles and recreation type; trails can have multiple types of use on them so the miles displayed are overlapping, not additive. In the primary conservation area, motorized trails are included in calculations of OMRD, TMRD, and secure core. In the Salish demographic connectivity area, motorized trails are counted in the linear density of motorized routes. The effects of motorized trails are included in the section on grizzly bear habitat security above. The following section focuses on effects of nonmotorized trails.

Table 27. Allowed summer trail use on the Flathead National Forest in miles

Bicycle	Hiking	Pack and Saddle	Wheeled Motorized
806	2,053	2,012	226

Nonmotorized trails

Several studies have investigated the behavioral response of bears to nonmotorized trails (Jope, 1985; Kasworm & Manley, 1990; R. D. Mace & Waller, 1996; MacHutchon, 2014; B. N. McLellan & Shackleton, 1989; D. White, Kendall, & Picton, 1999). These studies vary considerably in study design, trail use levels, grizzly bear sample sizes, and conclusions as to the impacts of nonmotorized 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, p. 34), 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 (p. 274). 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.

Nonmotorized recreation uses (hiking, horseback riding, mountain biking) also affect the risk of grizzly-bear human conflicts (S. Herrero & 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 (S. 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.

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 (D. 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.

In 1994 and 1998, the Interagency Grizzly Bear Committee chartered 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" *nonmotorized* trails be considered in calculations of "core" habitat in the grizzly bear recovery area (IGBC, 1998, p. 4). Because there were no data or literature available to determine the threshold number of parties defining a "high intensity use" trail or how high-use trails might relate to grizzly bear population parameters, the threshold value to be used to for a trail's influence on security core was determined by a panel of experts. The panel recommended that trails receiving > 20 parties per week be considered "high intensity use" and that an influence zone would be used that was the same as motorized routes, for the purpose of deducting from the effectiveness of security core habitat (IGBC, 1998, p. 4). Amendment 19 uses a definition of 20 parties per week for at least one month.

The Forest has about 2,041 miles of national forest system trails in the primary conservation area, and about 275 miles of this total were considered to be "high use" using the IGBC criteria. Figure B-28 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.

Because of the lack of studies demonstrating population-level impacts associated with nonmotorized 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 nonmotorized use levels, the NCDE conservation strategy team recommended removing consideration of high-intensity use nonmotorized trails to define core habitat effectiveness (USFWS, 2013d).

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 & Herrero, 2000; Quinn & Chernoff, 2010).

Although a variety of methods can be used to reduce the risk of grizzly bear-human conflicts due to nonmotorized 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 nonmotorized trail use, off-trail backcountry use, developed recreation sites, or private or other agency lands), MFWP, 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 nonmotorized trails have been demonstrated, and there are relatively few "high intensity use" trails on NFS lands.

Grizzly bear habitat and 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 include those designed for overnight use and those designed for day use (see definition in NCDE glossary, appendix D).

Developed recreation sites that support overnight public use have a higher potential to increase both the levels of bear attractants and grizzly bear mortality risk (USFWS, 2013c). Summarizing the findings of a number of studies, the draft GBCS stated, "Developed sites are generally associated with frequent, overnight or prolonged human use that may increase both the levels of bear attractants and grizzly bear mortality risk. Developed sites can impact bears through temporary or permanent habitat loss and displacement but the primary concern regarding developed sites is direct bear mortality or removal from the ecosystem due to bear/human conflicts caused by unsecured bear attractants, habituation, and food conditioning" (USFWS, 2013c, pp. 24-25). The draft GBCS concluded that "securing potential attractants is the single most effective way to prevent bears from becoming food conditioned and displaying subsequent unacceptable aggressive behavior" (p. 96). Food storage orders requiring proper storage of attractants are in place on all Forest lands.

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 conflicts. Most of the grizzly bears killed or removed by management agencies in the NCDE in the past had been involved in conflicts related to unsecured attractants such as garbage, bird feeders, pet/livestock feed and human foods. Although the majority of these mortalities occurred on private lands, the risk of grizzly bear mortality at developed recreation sites on public lands in the primary conservation area remains of concern.

Although food storage orders are highly effective, the draft NCDE GBCS includes measures to further reduce the risk of grizzly bear-human conflicts at overnight developed recreation sites by limiting increases in their number and capacity within the primary conservation area. Because the draft GBCS focuses on developed recreation sites with frequent, overnight, or prolonged human use, the grizzly bear analysis also focuses on these sites.

On the Forest, there are 63 campgrounds, 63 recreation residences, and 20 lookouts/cabins/lodges designed for overnight use on NFS lands in the primary conservation area (see table 28 for the number of sites and table 29 for their capacity).

Table 28. 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 29. 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	68	63

The Forest also has one developed resort on NFS lands in the primary conservation area, the Whitefish Mountain Resort, as well as an unknown number of dispersed recreation sites. The Forest has consulted

with USFWS on the effects of various resort expansion projects since 1989 (USDA-USFWS, 2016; USFWS, 1989, 1995a, 2007a, 2011b, 2012b, 2013b, 2015a). The Forest has one developed ski resort that operates during the grizzly bear denning season—Blacktail Mountain, in zone 1 outside the Salish demographic connectivity area. Food storage orders are also effective at reducing the risk of grizzly-bear human conflicts at these resorts.

Management direction for recreation is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Grizzly bear habitat and livestock allotments

Although grizzly bears frequently coexist with large livestock (such as adult cattle) without preying on them, grizzly bears will often kill smaller animals such as calves, domestic sheep, goats, or chickens when they encounter them (C. R. Anderson, Ternent, & Moody, 2002; Knight & Judd, 1983; Orme & Williams, 1986). If repeated depredations occur, managers may relocate bears or remove them from the population (counted as a grizzly bear mortality). Because of the increased risk to grizzly bears posed by actions taken to protect sheep and other small livestock, the 1986 Interagency Grizzly Bear Guidelines emphasized the reduction of livestock allotments on public lands. Grizzly bear predation on small animals (especially chickens) continues to be a source of grizzly bear-human conflicts on private lands, but multiple agencies and non-government organizations (NGOs) are making concerted efforts to reduce this source of grizzly bear mortality.

Between 1980 and 2008, there were only three grizzly bear mortalities related to livestock depredations on public land in the NCDE, and none of these occurred on the Flathead National Forest. This accounts for less than 1 percent of all known grizzly bear mortalities during this time in the NCDE. At their current levels, livestock allotments on public land within the NCDE are not a threat to grizzly bears in the lower 48 states. As stated in the draft GBCS, "Current levels of grazing on permitted livestock allotments in forested environments are not displacing grizzly bears in significant ways and are not likely to affect vegetation structure enough to result in direct competition for forage species on public lands within the NCDE, as evidenced by the increasing population trend in the NCDE" (USFWS, 2013c, p. 25). As a result, the draft GBCS included measures to keep livestock grazing at or below the baseline levels.

No sheep grazing and very limited cattle grazing occurs on the Flathead National Forest. The Forest currently has seven active cattle allotments—four in the Salish geographic area outside the recovery zone/primary conservation area and three in the Swan Valley geographic area inside the recovery zone/primary conservation area (see Figure B-33 and Figure B-34).

Current allotment acreage represents approximately 3 percent of NFS lands, consisting of about 81,500 acres. Authorized grazing on the Flathead National Forest 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 Forest has also declined.

There have been no known livestock-related grizzly bear mortalities on the Flathead National Forest. 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, 2013c, p. 25) Livestock carcasses are promptly removed and livestock feed is properly stored on Forest lands, as required by the attractant storage orders that are in place (USDA, 2010b, 2011a).

There are permitted grazing operations on NFS land for horses and mules in the NCDE, 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. There are no permitted honeybee operations on the Forest.

Management direction for livestock allotments is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Grizzly bear habitat and vegetation management

Timber harvest, wildfire, prescribed fire and other vegetation management activities may alter the amount and arrangement of cover and forage. Grizzlies in the NCDE occupy numerous types of habitat, including those with forest cover and those without (Aune & Kasworm, 1989; R. D. Mace & Waller, 1997a). Vegetation management can increase the quantity and quality of grizzly bear foods through increased growth of grasses, forbs, and berry-producing shrubs (Kerns, Alexander, & Bailey, 2004; Zager et al., 1983).

In the dense forests of the Forest, thick growth of conifers provides high levels of cover but may reduce the availability of key bear foods. Mace and Waller (1997a) studied grizzly bear habitat use in the Swan Mountain Range of the Forest and found that the highest grizzly bear densities obtained over time were in those locations with ≤ 40 percent overstory tree canopy. They stated that vegetal foods used by grizzly bears (including grasses, forbs, and shrubs) were more common in open to open timbered habitats and that available foods in timber harvest units were used by grizzly bears provided there was restriction of vehicular traffic. They found that grizzlies were more likely to use cutting units harvested 30-40 years ago than older or newer cutting units and that these were the most preferred habitats during summer (R. D. Mace & Waller, 1997a). Mace and Waller reported that grizzly bears avoided lower-elevation, more accessible harvested areas as well as areas less than 30–40 years following regeneration harvest where cover was not available.

In a recent Alberta study, Stewart and others assessed habitat selection near edges created by human activities as well as natural edges based upon GPS telemetry data from 26 grizzly bears. These authors found that there was no selection of edges associated with human activities in the spring, but they found that both male and female grizzly bears selected for edges associated with human activities (roads and timber harvest) in summer and fall and were not displaced. They attributed this selection to increased food resources at transitions between harvested areas dominated by shrubs, and conifer stands providing cover. Their study area has high levels of timber harvest as well as oil and gas exploration, with forest harvest edge accounting for about 52 percent of all edges. Although they did not observe displacement, they cautioned that use of edges created by humans can result in higher mortality risk to grizzly bears. Therefore, they recommended limiting access to habitat that is heavily selected by bears during the fall ungulate hunting season when human use is extensive and grizzly bear mortality from human self-defense or illegal kills is highest (Stewart et al., 2013).

Mace and others (1999) also described the seasonal relationship between vegetation, human activity, and habitat use by female grizzly bears, considering all land ownerships, in their Swan study area. During spring, female grizzly bears used low-elevation habitats, where winter snow melted first and succulent vegetation favored by bears appeared. These lower-elevation habitats also contained most of the human activities and roads, so reductions in habitat use from potential were highest during spring. Areas with a high density of high traffic-volume roads were strongly avoided, and no bears were observed near high-impact human activity points. These authors suggested that there is value in road closures aimed at minimizing traffic on roads within important seasonal habitats (R. D. Mace et al., 1999).

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. The study area has forest roads and residences relatively well distributed throughout the valley bottom intermixed with quality bear habitat. 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 nighttime 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 noted that it can result in human encounters resulting in grizzly bear mortality or management-related removals from the population (S. E. Nielsen et al., 2004; Ruby, 2014; C. C. Schwartz et al., 2010). 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.

Table 30 and Figure 5 display the approximate forestwide acres and trend of timber harvest from 1960 through 2012 (USDA, 2014b). Commercial timber harvest has affected a total of approximately 17 percent of the NFS lands on the Flathead National Forest. In total, about 46 percent (304,750 acres) of the suitable land base on the Forest 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 30. 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)

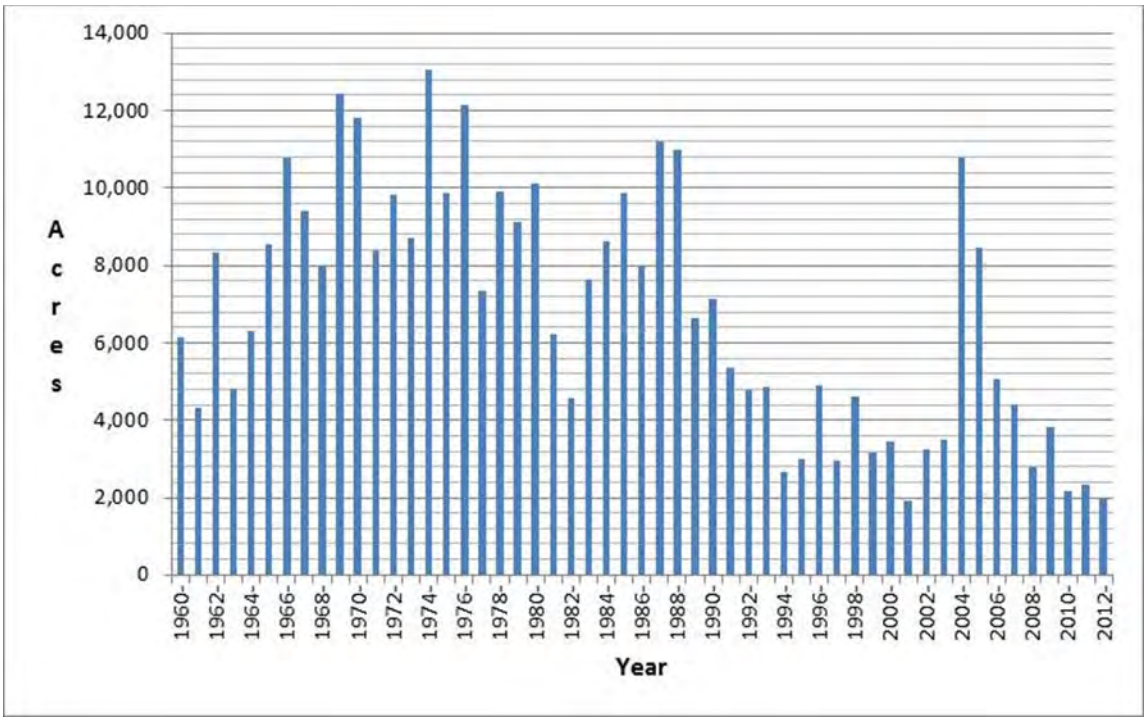


Figure 5. Approximate acres of past commercial timber harvest on the Forest by year from 1960-2012.

Table 31 displays the approximate acres harvested for each of the six geographic areas on the Flathead National Forest 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 primary conservation area.

Table 31. 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	320,004	82,219 (26%)
Salish Mountains	262,859	122,016 (46%)
Swan Valley	364,440	100,415 (28%)
Total	2,392,807	394,247 (16%)

The Interagency Grizzly Bear Guidelines addressed vegetation management activities, and these guidelines were incorporated into the 1986 Flathead Forest plan for timber management in grizzly bear management situations 1 and 2, which has guided management for the last 30 years. The draft GBCS (USFWS, 2013c) 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. Grizzly bear distribution is known to have expanded since 1992.

Management direction for vegetation management is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Grizzly bear habitat and leasable, locatable, and salable mineral activities

Mineral and oil and gas development have the potential to increase grizzly bear mortality risk from associated motorized use, habituation, and/or increased grizzly bear-human encounters and conflicts. Permanent habitat loss, habitat fragmentation, and displacement from habitat may also occur.

Management of mineral and energy resources has been defined by federal laws, regulations, and legal decisions. Thus, certain laws, regulations, and polices pertain to specific mineral and energy resource types. The land status of a specific location further dictates the applicable laws, regulations, and policy. The mineral and energy resource authority to manage lands within NFS lands is jointly shared by the Department of Interior (Bureau of Land Management) and the Department of Agriculture (Forest Service).

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 Flathead National Forest planning area. Based on the results of a February 2, 2014, query of the BLM mining claim database, one active mining claim (MMC195448) is located within the planning area. The Mary Dee II lode claim is located in the Hungry Horse geographic area. The Forest has low potential for locatable minerals as displayed in Figure B-35.

Saleable Minerals: The Forest'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 in the planning area. 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. The Forest issued 78 FUPs in 2013.

Leasable Minerals: The production of oil and natural gas is conducted through a leasing process. 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 Flathead National Forests to be inadequate. The court specified that no activity could take place on the leases until an environmental impact statement (EIS) is 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 Forest are withdrawn from mineral entry (Figure B-37). 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

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 Forest Service 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 Forest, and the Forest has some ability to manage surface resources. FSM 2832 provides direction for administration of an outstanding mineral right (source of minerals information is volume 2 of the Flathead National Forest assessment (USDA, 2014b), as updated by the 2015 leasing withdrawal).

Management direction for minerals is described in the preferred alternative and analyzed in the section of this biological assessment on effects of the framework programmatic action.

Trends at the NCDE scale

In its 5-year status review in 2011, the USFWS explained that the IGBC was created in 1983 to coordinate and implement management efforts across multiple federal lands and different states within the various recovery zones. Since 1986, national forest and national park plans have incorporated the guidelines (IGBC, 1986) to manage grizzly bear habitat in the lower 48 states. The guidelines defined five management categories for Federal lands within which grizzly bear habitat could be managed differently depending on its importance to the population. These different management categories favored grizzly bear uses over human uses to varying degrees while emphasizing actions that contributed to recovery and conservation (IGBC, 1986).

The USFWS concluded that management improvements made as a result of the guidelines include but are not limited to (1) federal and state agency coordination to produce nuisance bear guidelines for quick response, resolution, and minimization of grizzly bear/human confrontations; (2) reduced motorized access route densities through restrictions, decommissioning, and closures; (3) highway design considerations to facilitate population connectivity; (4) closure of some important habitat areas to all human access in national parks or tribal wilderness areas during certain seasons that are particularly important to grizzlies; (5) closure of many areas to oil and gas leasing, or implementing restrictions such as no surface occupancy; (6) reduction and/or elimination of sheep allotments; and (7) expanded education programs to reduce the number of grizzly mortalities caused by preventable grizzly bear/human conflicts.

Overall, adherence to the guidelines has changed land management practices on federal lands to increase security and to maintain or improve habitat conditions for the grizzly bear. The USFWS stated that the issue of human population growth is best addressed through access management, limitations on site development, and educational outreach. The USFWS stated, “With these mitigation measures in place, we do not consider human population growth to be a threat to grizzly bear populations in the lower 48 States” (USFWS, 2011c, p. 36).

Timber harvest has decreased on all five national forests within the NCDE from approximately 450 million board feet in 1975 to 100 million board feet in recent years (2003-2008). There are currently 31 oil and gas leases within the NCDE: 30 on the Lewis and Clark National Forest and 1 on the Helena National Forest. In 1997, the Lewis and Clark National Forest decided to no longer allow surface occupancy for oil and gas. In 2006, these lands on the Lewis and Clark National Forest and some areas of the Flathead National Forest were permanently withdrawn from any future leasing under the mining laws and mineral leasing laws by Public Law 109-432, the Tax Relief and Health Care Act of 2006.

In the NCDE as a whole, there are 23 BMUs and 126 BMU subunits. In 2008, the average portion of each subunit in the NCDE containing OMAD greater than 1 mile per square mile was 14 percent; the average portion of each subunit containing TMAD greater than 2 miles per square mile was 14 percent; and an average of 70 percent of each subunit provided security core habitat (USFWS, 2011c). Access conditions in the recovery zone/primary conservation area continued to improve since 2008.

Climate change

On October 6-7, 2009, the Wildlife Conservation Society and the USFWS held a workshop entitled "Climate Change Impacts on Carnivores in the Northern U.S. Rockies: Strategies for Conservation." Participants included a diverse group of scientists and managers from government agencies, universities, and conservation science non-governmental organizations, including MFWP, Idaho Fish and Game, U.S. Forest Service, U.S. Geological Survey, USFWS, National Park Service, Wildlife Conservation Society, The Nature Conservancy, National Wildlife Federation, and the University of Montana.

Participants discussed the relationship between the rate of climate change, the types of change in bear foods and habitats that might result from these changes, and the ability of bears to adjust their food habits and perhaps seasonal ranges. It was hypothesized that a more rapid rate of change could challenge adaptive success but that this could vary depending on the particular food economies used by individual bears.

The group of workshop participants recommended monitoring potential effects of climate change on grizzly bears and the every-changing availability of bear foods by monitoring grizzly bear body condition using methods such as stable isotope analysis and body fat measurements. Teisberg and others (2015) studied grizzly bear population health and body condition and concluded that grizzly bears in all regions of the NCDE exploit diverse combinations of food items to arrive at productive body conditions (Teisberg et al., 2015). The draft GBCS states that monitoring would be conducted to assess the adequacy of food production and the types of foods grizzlies use across the landscape each year by monitoring grizzly bear body condition and food habits using the most appropriate and available technology.

Nielsen and others (2013) evaluated the importance of six different factors on springtime body size patterns in grizzly bears of Alberta, Canada. The six factors we examined were (1) regional habitat productivity, (2) inter-annual variability in productivity, (3) habitat quality, (4) human footprint and activity, (5) rate of landscape change, and (6) density dependence. The authors stated, "Given the short season associated with high-alpine environments, such as the Rocky Mountains in Alberta, we hypothesize that individuals with a limited growing season and temperature-limited ecosystems, such as interior grizzly bears, might actually benefit from increases in season length associated with climate change. This prediction is largely consistent with observed body size and seasonality patterns in grizzly bears across North America, but may be dependent on sufficient snow cover during the denning period" (Scott E. Nielsen et al., 2013)

With respect to shifts in the denning season, the draft NCDE grizzly bear conservation strategy defined denning season dates and stated that dates will be adjusted if the 10-year average den emergence data for

females or females with offspring shows a shift of at least a week. Denning in the NCDE has been monitored and the analysis of effects of alternatives on denning habitat uses modeled denning habitat provided by Mace (2014), which is the best available scientific information.

Reduced snowpack or shorter winter season could improve over-winter survival of bears, assuming that sufficient bear foods are available later in the fall and earlier in the spring. However, a shorter denning period could increase the potential for spring and fall encounters between grizzly bears and hunters and/or recreationists, which in turn would increase the risk of mortality to grizzly bears.

The extent of and rate at which individual plant species or plant communities will be impacted by climate change is difficult to foresee with any level of confidence (Fagre, Peterson, & Hessl, 2003; Walther et al., 2002). However, there is general consensus that grizzly bears are flexible enough in their diet that they will not be impacted directly by plant community changes in response to climate change (Servheen & Cross, 2010).

Fire frequency and severity are predicted to increase in the western United States as a result of climate change. Large, uncharacteristically severe wildfires that convert mature forest to early successional condition alter the availability of grizzly bear foods and cover, potentially changing how bears use the landscape. Decreases in forest cover could benefit grizzly bears by increasing the production of shrubs, berries, and root crops in the years following large fires (Blanchard & Knight, 1996).

The potential positive and negative effects of climate change would likely be variable across the ecosystem and are difficult to predict. Grizzly bears are habitat generalists and opportunistic omnivores, which may make them less susceptible to changes in plant communities than some other species of wildlife. The high degree of uncertainty emphasizes the importance of long-term monitoring of the grizzly bear population so that any necessary adjustments can be made.

The draft GBCS states, “Most grizzly bear biologists in the U.S. and Canada do not expect habitat changes predicted under climate change scenarios to directly threaten grizzly bears . . . . These changes may even make habitat more suitable and food sources more abundant. However, these ecological changes may also affect the timing and frequency of grizzly bear/human interactions and conflicts (Servheen & Cross, 2010)” (p. 92).

Effects of the framework programmatic action

One of the ways in which the Forest Service provides guidance for the conservation of federally listed species and their habitats is through the forest plans, which provide a programmatic framework for management. This can be a particularly effective approach for wide-ranging species such as the grizzly bear. Updating forest plans with the habitat-related elements in the conservation strategy that are relevant to management of NFS lands would provide a consistent set of management direction across the national forests in the NCDE recovery zone/primary conservation area. The Flathead National Forest’s revised plan incorporates this consistent set of management direction but also makes other changes to the Forest’s management direction that are assessed for their effects. A separate biological assessment for the amendment forests (Helena-Lewis and Clark, Kootenai, Lolo) also assesses effects on the NCDE grizzly bear population.

For purposes of the Endangered Species Act, “effects of the action” refers to the effects of the programmatic framework detailed in the revised forest plan for the Flathead National Forest on the species and/or its designated critical habitat. The environmental baseline includes the past and present impacts of actions and human activities in the action area, considering the anticipated impacts of proposed

federal projects in the action area that have already undergone section 7 consultation, and the cumulative impact of state or private actions that are contemporaneous with the consultation in process.

This section considers the effects to the NCDE grizzly bear population and its habitat as guided by the plan components (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 D), as well as key plan components not targeted for the grizzly bear, have the potential to affect its persistence and recovery. Monitoring items will help make the plan adaptive.

As is typical of forest plans, this 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 Flathead National Forest is responsible for section 7 consultation on future projects (conducted under the revised forest plan) while the grizzly bear remains a listed species. The revised plan is intended to provide the regulatory framework that would apply on NFS lands in the NCDE for grizzly bears if and when the bear is delisted.

Key indicators for analysis

The Grizzly Bear Recovery Plan (USFWS, 1993) identified adequate effective habitat as the most important element in grizzly bear recovery. Effective habitat is a reflection of an area's ability to support grizzly bears based on the quality of the habitat and the type/amount of human disturbance associated with it. Effective habitat allows for sufficient space for grizzly bears to roam and use available habitats. The draft NCDE GBCS (USFWS, 2013c) provides a management framework that identifies different levels of emphasis by management zone. Six key habitat features and conditions associated with human activities with the greatest potential to impact grizzly bears are identified in the draft conservation strategy. These are (1) the amount and distribution of secure core habitat, (2) motorized route densities, (3) developed recreation sites, (4) livestock allotments, (5) vegetation management, and (6) mineral and energy development.

To assess key habitat features and conditions, key indicators for analysis of effects of the revised forest plan for the Flathead National Forest related to risk factors and habitat effectiveness are displayed Table 32.

Table 32. Key indicators for assessing effects to grizzly bears

Resource Element	Indicator
Grizzly bear habitat security—influence on habitat quality/availability in the primary conservation area	Percentage of each bear management unit subunit in secure core, percent with open motorized route density more than 1 mi/mi^2, and percent with total motorized route density more than 2 mi/mi^2 during the non-denning season. Potential impacts due to temporary reductions to allow for projects or administrative use.
Grizzly bear habitat diversity and climate change	Forestwide plan components for aquatic and terrestrial ecosystems
Grizzly bear habitat connectivity	Forestwide plan components that support habitat connectivity
Vegetation management and human-caused disturbance/ displacement	Forestwide plan components to minimize adverse effects of vegetation management in the primary conservation area

Resource Element	Indicator
Recreation activities and the potential for disturbance or grizzly bear–human conflicts	Plan components to limit the number and capacity of sites with overnight use in the primary conservation area and limit grizzly bear-human conflicts Forestwide food storage orders Forestwide plan components to reduce the risk of disturbance and grizzly bear-human conflicts
Livestock grazing allotments—potential for conflicts or mortality risk	Plan components to limit the number of cattle allotments and history of conflicts within primary conservation area, zone 1, and the DCA
Oil, gas and mineral development—potential habitat loss, disturbance/displacement, mortality risk, grizzly bear-human conflicts	Mineral withdrawals, no surface occupancy stipulations, potential for development in the PCA and zone 1, forestwide plan components to minimize adverse effects

Summary of effects of forestwide plan components

Under the existing forest plan, the Interagency Grizzly Bear Guidelines (1986) are applied to the portion of the Flathead National Forest located within the NCDE recovery zone. About 99 percent of the acres within the recovery zone on the Forest are management situation 1 or 2, which gives the most stringent protection to grizzly bear habitat and about 1 percent are management situation 3, which gives more consideration to human uses and development (1986 forest plan appendix OO). Management of grizzly bears outside the recovery zone has been addressed through site-specific consultation.

Under the revised forest plan, the recovery zone/primary conservation area totals about 90 percent of the total Forest area. Areas that were previously outside the recovery zone/primary conservation area would be designated as zone 1 (totaling about 10 percent of the total Forest area). Zone 1 includes the Salish demographic connectivity area (Figure B-5).

Under 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. Similarly, previous amendments to the forest plan (e.g., amendments 19 and 24) would no longer be part of the revised forest plan, but many of the past actions that have created the current environmental baseline would be retained, such as the attractant storage orders and standards for "no net change" to the baseline (see NCDE glossary in appendix D) for open motorized access density, total motorized access density, motorized effects to secure core habitat, linear road density in zone 1, and motorized over-snow use) as well as administrative use of restricted roads. Additional desired conditions, standards, guidelines, and monitoring items would be added for vegetation, connectivity, recreation, livestock grazing, and minerals (including those for zone 1 in the Salish Mountains geographic area). In summary, the forest plan revision would add components (desired conditions, objectives, standards, guidelines, and monitoring items) aimed at maintaining conditions that contribute to supporting recovery of the NCDE grizzly bear population and providing connectivity with other grizzly bear recovery zones. Effects of the proposed action (alternative B modified) are described in detail in the following sections.

Grizzly bear habitat security

Primary conservation area

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.

Forestwide 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). The following conditions are not considered a net increase/decrease from the baseline:

- administrative use (see NCDE glossary in appendix D);
- temporary use of a motorized route for a project (see "project (in grizzly bear habitat in the NCDE)" that meets the conditions stipulated in 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 listed under NCDE-MIN;
- updated/improved data on a motorized route without an actual change on the ground;
- changes in technology or projections resulting in changed open motorized route density, total motorized route density, or secure core values without actual change on the ground (e.g., a switch 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 to a better location (e.g., to the nearest intersection or turnout) to allow a turn-around providing for public safety, to reduce vandalism, or to improve enforcement of the closure;
- the agency exchanges, acquires, buys, or sells lands with motorized routes;
- a change in a motorized route is necessary to comply with federal laws;
- 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 non-federal landowner that decreases the percentage of secure core or increases OMRD or TMRD values on adjacent national forest;
- use of a motorized route for emergency situations as defined by 36 CFR 218.21;
- temporary roads (see NCDE glossary in appendix D).

During the time period that the NCDE grizzly bear population was growing and expanding in distribution, changes to OMAD, TMAD, and security core percentages occurred as a result of the items listed in the bullets above under FW-STD-IFS-02 (USDA, 2014a, 2016a). Many of these changes in numbers resulted in no change in on-the-ground conditions for grizzly bears or were minor or short-term changes. For example, the Forest has had temporary changes in OMAD, TMAD, and security core numbers for emergency situations such as wildfires, but the baseline numbers in the grizzly bear subunit were subsequently restored. When the Forest acquired the Legacy lands in the Swan Valley, OMAD and TMAD numbers increased and security core numbers decreased, even though conditions had not changed on the ground. With standard FW-STD-IFS-02, the Forest is clarifying that these situations do not result

in a net change to baseline habitat conditions for the grizzly bear population. The Forest is also clarifying its definitions of roads with respect to on-the-ground conditions for grizzly bears.

The draft grizzly bear conservation strategy also adopted new procedures for calculation access density. With the proposed action, high-use nonmotorized trails would no longer be deducted from security core percentages (see section on nonmotorized trails for the rationale). Table 33 provides a comparison of security core with a deduction for high-use trails included in the percentages and secure core, with no deduction for high use trails.

Table 33. Comparison of grizzly bear habitat security percentages with and without deductions for high use non-motorized trails.

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
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

This change in the calculation of percentages does not result in a change in on-the-ground conditions for the grizzly bear. As shown in Figure B-28, many of the high-use nonmotorized trails in the NCDE are in Glacier National Park or in wilderness areas. Additionally, calculations of grizzly bear management subunit percentages for open motorized access density and total motorized access density under

amendment 19 did not include management situation 3 lands, but these lands are now included in calculations. Roads that meet the definition of impassable do not count in TMRD calculations (see road categories in the NCDE glossary, appendix D). To avoid confusion, the draft GBCS uses the terms open motorized route density (OMRD), total motorized route density (TMRD), and secure core to reflect the revised definitions and calculation procedures. We have adopted the same terminology and procedures for discussing the effects of the proposed action for the forest plan revision.

The proposed action, alternative B modified, would apply to all 73 bear management subunits on the Forest. Table 34 shows OMRD, TMRD and secure core percentages for all 73 subunits with Flathead National Forest lands; 63 of these now have greater than or equal to 75% NFS lands and 10 (shaded in the table) have less than 75% NFS lands. Some subunits have projects that are nearing completion and others have gone through recent consultation but are not yet near completion. The draft grizzly bear conservation strategy identified the baseline as a subunits access conditions as of December 31, 2011 but also recognized that the percentage calculations would be updated. As outlined in FW-STD-IFS-02, there may be changes in percentages with no change in on-the-ground conditions (e.g. due to updates in the data recorded in various databases, spatial re-alignments of GIS layers, a change in a motorized route by another landowner, and/or acquisition of lands by the Forest Service). As outlined in FW-STD-IFS-02, these changes can cause an increase in OMRD or TMRD percentages or a decrease in the secure core percentage with no on-the ground change. In these instances, the baseline percentages are updated, but are not considered a net increase in OMRD or TMRD nor a decrease in secure core. On-the-ground changes due to implementation of projects that have gone through consultation with the USFWS also update the baseline, as specified in FW-STD-IFS-02. In most cases, changes due to implementation of projects that have gone through consultation have resulted in improved on-the-ground conditions for grizzly bear habitat security. The exception is the Werner Creek subunit, where a decision was made to seasonally open a gated road following consultation, increasing the open motorized access density. Of the 73 Flathead National Forest subunits, 41 would meet all three motorized access percentages and 28 have had a percentage value change of 1 percent or more since 2011 (see table 34).

Based upon definitions and procedures for calculations under the revised forest plan, the summary of baseline access conditions across the Forest is as follows (existing condition, with decisions that have gone through recent consultation but are not yet fully implemented shown in parentheses):

- 16 (17) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have greater than 19% OMRD

- 10 of 10 subunits where NFS lands are less than or equal to 75% of total subunit acres have greater than 19% OMRD

- 16 (17) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have greater than 19% TMRD

- 9 of 10 subunits where NFS lands are less than or equal to 75% of total subunit acres have greater than 19% TMRD

- 20 (21) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have less than 68% secure core

- 10 of 10 subunits where NFS lands are less than or equal to 75% of total subunit acres have less than 68% secure core

Table 34. Status of motorized access for the proposed action. status of Motorized Access for NCDE BMU Subunits.

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	20 (18)	54 (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
Emery Firefighter	19	20 (19)	58 (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	26 (25)	66
Cold Jim	18	57 (54)	43 (44)
Crane Mountain	28	53	25
Glacier Loon	22	41	52

Subunit Name	OMRD Percentage	TMRD Percentage	Secure Core Percentage
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

Further reductions in motorized access would not be required in the future, so there may be negative effects on individual bears, particularly females, due to disturbance, displacement, or mortality risk. Although additional road closures are not required by the grizzly bear standards, the Forest has a forestwide objective (FW-OBJ-IFS-01) to decommission an additional 30-60 miles of roads or place them into intermittent stored service (see glossary) to meet multiple resource goals. This objective would improve access conditions for grizzly bears. Available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs.

Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al., 2016; Mikle et al., 2016), even though 19 percent OMAD, 19 percent TMAD, 68 percent security core has not been met in every BMU subunit. Habitat security conditions would be monitored by the Forest, and the grizzly bear population would be monitored by MFWP.

Another standard addresses temporary changes in road densities due to projects. It would allow temporary changes in road access due to projects within a bear management subunit, up to a limit of 5 percent increase in OMRD, 3 percent increase in TMRD, and 2 percent decrease in secure core calculated by a 10-year running average (see FW-STD-IFS-03 for details). Each project should be planned so that implementation does not exceed 5 years (see NCDE-GDL-IFS-01 for details), and pre-project road access conditions would generally be restored within 1 year of project completion (see NCDE-GDL-IFS-02 for details). These are guidelines because, for example, Forest Service timber contracts allow extension of contract term lengths under specific conditions. Compliance with these guidelines would be monitored and reported (see monitoring items in appendix D).

Most of the activities that qualified as "projects in grizzly bear habitat" have been timber harvest projects and associated activities. The temporary changes allowed to OMRD, TMRD, and secure core under FW-STD-IFS-03 are based on an analysis of six projects on federal land. This includes five projects that occurred on the Flathead National Forest and one on the Lolo National Forest, affecting 18 subunits. The projects were reviewed and allowed through consultation with the USFWS. Projects included post-fire salvage, timber harvest, and use of closed roads. They occurred between 2003 and 2010, a period during which the NCDE grizzly bear population is known to have been increasing (Costello et al., 2016; Katherine C. Kendall et al., 2009; R. D. Mace et al., 2012). Therefore, the duration of these projects and the associated increases in OMRD and TMRD 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.

Although the standards above 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 over most of the recovery zone/primary conservation area. The Forest has about 1.7 million acres in secure core habitat and only about 12 percent of secure core is likely to have temporary changes because it is outside of wilderness and inventoried roadless areas, so high levels of habitat security would continue to be maintained (see table 35 and

Figure B-29 for grizzly bear secure core). 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).

Table 35. Primary conservation area, secure core, and temporary changes in habitat security due to projects

PCA and Secure Core	Alt. B modified
Acres in the primary conservation area on the Forest	2,124,316 acres
Acres in secure core habitat	1,672,877 acres
Percentage of secure core habitat where a temporary decrease in secure core may occur	12%

Based upon new procedures for calculations and temporary increases in the 10-year running average of 5%, 3% and 2% that may occur under the revised forest plan, the summary of subunits that meet 19-19-68

under the baseline but could exceed 19% OMRD, 19% TMRD or have less than 68 percent secure core on a temporary basis are as follows:

- 11 (12) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet 19% OMRD on a temporary basis.
- 10 (11) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet 19% TMRD on a temporary basis.
- 5 (6) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet 68% secure core on a temporary basis.
- 2 (3) of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres may not meet all 3 numeric parameters on a temporary basis.
- 27 of 63 subunits where NFS lands are greater than or equal to 75% of total subunit acres have over 50% wilderness where it is anticipated that 19-19-68 would continue to be met and there would be few or minor temporary changes.

The proposed action also addresses administrative use. 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). Exceptions to this standard include:

- 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)".

During the time period that the NCDE grizzly bear population was growing and expanding in distribution, administrative use was allowed on gated roads if it met the criteria listed under standard FW-STD-IFS-01. Limited administrative use was also allowed in security core if it was necessary to remove culverts to improve habitat conditions for bull trout, following project-specific consultation. In most cases, it is not possible to do culvert work, road best management practice work, or weed control work during the denning season. In the past, if a subunit did not meet 19-19-68, gated roads had a "red lock" and administrative use was more restricted, but could still be approved by one of the Forest's decision-makers. Bermed and gated roads were also used for emergency purposes such as firefighting.

The Forest is clarifying that administrative use is needed to benefit multiple species and that the proposed action standard FW-STD-IFS-01 would allow administrative use on gated roads and also on roads in secure core habitat. Mace and others (1996, pp. 1395-1404)studied grizzly bear use of areas within a 0.5 kilometer (about 0.31 mile) influence zone of roads in the Swan Mountains of the Forest. Most grizzly bears exhibited either neutral or positive selection for this zone if it surrounded closed roads or roads receiving less than 10 vehicles per day, but avoided this influence zone if it surrounded roads having greater than 10 vehicles per day. The six trips per week that is allowed under administrative use is far less than the threshold of 10 vehicles per day reported by Mace and others, so disturbance to grizzly bears is expected to be minor. Unlimited use for one 30-day time period could disturb bears or cause avoidance in the affected area if it exceeded 20 vehicles per week, but this level of administrative use is unlikely and is administratively controlled by the Forest Service, and the total length of time a road can be temporarily opened for administrative use is restricted to a short period to minimize adverse impacts to grizzly bears. In contrast to public use, administrative use is authorized and managed by the Forest's decision-makers, so the risk of human-caused mortality to grizzly bears would be low.

By adding standards FW-STD-IFS-01 and FW-STD-IFS-03, allowances made for project implementation would permit some adverse impacts to individual bears as a result of human disturbance in a project area but would provide limits on the amount of disturbance per subunit as well as limit the duration of the disturbance. These impacts have been and would continue to be managed to provide for the needs of the grizzly bear. In addition, projects with temporary changes to OMRD, TMRD, or secure core will be monitored by the USFS (see monitoring items in appendix D), and the grizzly bear population will be monitored by MFWP. The forest plans are intended to be adaptive; they can be revised or amended in the future if monitoring indicates that changes to the allowable levels of temporary increases to TMRD or OMRD or temporary decreases to secure core are needed.

FW-STD-IFS-04 applies to temporary use of roads by the public. This standard 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 is not in secure core. There would be some increase in disturbance and the risk of grizzly bear mortality in areas outside of secure core, but the risk is minimized by limiting the duration and season when this could occur. Gated roads on the Forest 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 growing, with no apparent population-level effects.

Over the long term, the proposed action (alternative B modified) would maintain baseline levels of OMRD, TMRD, and secure core in the primary conservation area during the non-denning season that would provide for continued recovery of the NCDE grizzly bear population.

Zone 1

Grizzly bear demographic connectivity

For zone 1, the draft conservation strategy established a goal to maintain grizzly bear occupancy but at a lower density than in the primary conservation area. Zone 1 is not intended to provide core habitat for the NCDE grizzly bear population. 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 demographic connectivity area, the draft conservation strategy established a goal to provide for female grizzly bear occupancy and addressed genetic interchange with the Cabinet-Yaak Ecosystem. This goal is supported by the following 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-01), roads provide for public and administrative access to National Forest System lands. 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. ***See also*** **FW-DC-LSU-01.** NFS lands in the Swift Creek-Stillwater connectivity area (see figure B-54) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges.

In recognition of the differing grizzly bear management objectives for Zone 1 and the demographic connectivity areas, a different method for analyzing the effects of motorized use during the non-denning

season was used, as explained in the affected environment section. A summary of the modeled threshold values, and how they were used in the analysis of effects for Zone 1, is shown in table 36 below.

Table 36. Linear road density analysis for zone 1

Objective described in the Alberta study (Boulanger & Stenhouse, 2014)	Reported density km/km^2	Converted tomiles/sq. 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 1.25 km/km^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. Density calculation included both roads and trails open for public motorized use in the non-denning season.
Grizzly bear mortality risk – Most grizzly bear mortalities occurred at road densities greater than 1.0 km/km^2 except for adult males, whose 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 area. Density calculation included both roads and trails open for public motorized use in the non-denning season.

To be conservative, we analyzed the effects of both roads and motorized trails in zone 1, even though the study by Boulanger and Stenhouse did not include motorized trails. If both roads and motorized trails are included, the Salish demographic connectivity area has an open linear motorized route density of 1.5 miles per square mile as of 2015, below the modeled threshold of 2.0 miles per square mile needed for female occupancy, which is thus consistent with the goals of the draft grizzly bear conservation strategy. . Open road densities less than or equal to 1.6 mi/mi^2 not only supported occupancy but also provided lower levels of grizzly bear mortality in their study area (see table 36 and table 37). In the portion of zone 1 outside the Salish demographic connectivity area, the density of motorized routes open to public use is about 1.9 miles per square mile as of 2015, less than the modeled threshold of 2.4 miles per square mile that supports grizzly bear occupancy, but resulting in a higher risk of grizzly bear mortality. The standard would allow temporary increases in access for projects by Forest Service personnel and contractors, which may also result in disturbance, displacement or increased grizzly bear mortality risk to individual bears, but guidelines FW-TE&V-04, FW-GDL-WL-01 and 02 and contractual requirements would reduce this risk.

[2] Formula: 1 km = 0.6214 mi; 1 km^2 = 0.3861 mi^2

Table 37. 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

In the last decade, MFWP has also translocated grizzly bears from the NCDE to the Cabinet-Yaak Ecosystem in order to facilitate genetic interchange. In recent years, the number of documented grizzly bear reports in the area outside the recovery zone/primary conservation area has been increasing as the population in the NCDE has increased. More grizzly bears are exploring new territory further to the west (R. D. Mace & Roberts, 2012). The proposed action would maintain the baseline linear density of open motorized routes that has supported a grizzly bear population that has expanded into areas outside the recovery zone/primary conservation area (see Figure B-17) and contributed to habitat connectivity.

Grizzly bear habitat connectivity

The proposed action would provide for grizzly bear habitat connectivity because it includes the following key plan components:

- Revised Forest Plan Appendix A: standards and guidelines for lynx connectivity and linkage areas ALL 01, ALL S1, ALL G1, LINK 01, LINK S1, LINK G1, G2 for Canada lynx;
- Plan components for riparian connectivity (desired condition FW-DC-WTR-02, suitability FW-SUIT-RMZ-01, standards FW-STD-RMZ-01, 05, 06; guidelines FW-GDL-RMZ-08, 09, 11 through 15);
- Plan components for vegetation connectivity (desired conditions FW-DC-TE&V-15, FW-DC-TE&V-19, MA6 a,b,c-DC-02; standards FW-STD-TE&V-01, 02; guidelines FW-GDL-WL DIV-06, FW-GDL-TE&V-03, 07);
- Plan components for infrastructure including standard FW-STD-IFS-02 and guideline FW-GDL-IFS-12, which states that within areas specifically identified as being important for wildlife connectivity across highways (see table 18), the USFS should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety;
- Geographic area desired conditions GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06, 07; GA-SM-DC-03, and GA-SV-DC-09. For example, GA-HH-DC-03 states that the Coram connectivity area (see figure B-29) 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;
- Desired condition for lands FW-DC-LSU-01, which states 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 within wild and scenic river corridors.

These desired conditions and guidelines benefit grizzly bears in the primary conservation area and zone 1, including the Salish demographic connectivity area.

Grizzly bear habitat and recreation

Developed ski areas and/or developed year-round resorts

There is one developed year-round resort in the primary conservation area that has operated as a ski area since the 1940s and has operated during the non-denning season since the 1980s. As discussed in previous biological assessments, the Whitefish Mountain Resort likely causes disturbance and/or displacement of grizzly bears, but there have been no known grizzly bear mortalities. The Whitefish Mountain Resort has had mitigation measures in place to reduce grizzly bear-human conflicts during the non-denning season for decades. The following standards and guidelines would apply under alternative B-modified.

Standard FW-STD-REC-04 states, "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)".

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".

Desired condition GA-SM-MA7-Big Mtn-DC- states, "Year-round recreational opportunities in an alpine setting exist at the Whitefish Mountain Resort on Big Mountain. Winter recreation opportunities occur in all portions of the Whitefish Mountain Resort permit area. During the grizzly bear non-denning season, developed recreation opportunities are provided on the south facing slope in the Whitefish Mountain Resort permit area. The portion of the upper Hellroaring watershed below the Taylor Creek Road (NFS Road 9790 provides higher levels of grizzly bear habitat security".

These plan components would benefit the grizzly bear by limiting the risk of grizzly bear disturbance or displacement or grizzly-bear human conflicts.

There is one developed ski area in Zone 1, the Blacktail Ski Area. 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.

Motorized over-snow use

At the time amendment 24 was adopted, the Forest was revising its plan and there was a stated intention to carry Amendment 24 forward into the revised plan. However, the Forest halted plan revision due to a lawsuit on the proposed planning rule and is now revising its plan again under the 2012 planning rule. Based upon new public input on its revised forest plan, the Forest proposes to change some of the areas suitable for motorized and non-motorized over-snow use. Proposed changes in the revised forest plan would provide integrated management direction that responds to new science, uses updated habitat modeling and mapping, and addresses the 2012 planning rule requirements for ecological, social, and economic sustainability. The discussion of recreation effects is focused on the den emergence season because this is the time period with the highest risk of disturbance, particularly to female grizzly bears with dependent offspring.

With alternative B modified, about 60 percent of modeled grizzly bear denning habitat occurs within existing wilderness areas where motorized use is prohibited. About 13 percent of modeled denning habitat

is within recommended wilderness areas, and about 13 percent of modeled denning habitat is in other areas that are not suitable for motorized over-snow use. In these areas, individual grizzly bears may be disturbed by nonmotorized uses, such as back-country skiing or snowboarding, during the den emergence time period, but there would generally be low levels of human disturbance and population level effects are not anticipated. Inside the primary conservation area, alternative B modified would not increase the percentage of the Forest open to motorized over-snow vehicle use during the den emergence time period nor the dates that areas are open to motorized over-snow vehicle use. The USFWS wrote in their 5-year review for grizzly bear, "Our best information suggests that current levels of snowmobile use are not appreciably reducing the survival or recovery of grizzly bears" (USFWS, 2011c, p. 38). The NCDE population has been increasing and is likely headed towards delisting, so current levels of motorized over-snow vehicle use do not appear to be preventing the population from recovering. Because there is uncertainty regarding the potential effects of motorized over-snow use on females with cubs during the den-emergence time period and because this use could increase in the future, alternative B modified adopts 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)".

Currently, late-season snowmobile areas that are open during the den emergence time period occur in about 3 percent of modeled grizzly bear denning habitat on the Forest, a minor amount. There are about 19 miles of routes open to motorized over-snow use in modeled grizzly bear denning habitat after April 1, which could occur during the den emergence time period. Because very little modeled denning habitat is open when den emergence may be occurring and because many females with cubs are known to exit their dens during the latter part of the time period when these areas may be open to motorized over-snow use, the risk of disturbance is anticipated to be minor. Standard FW-STD-REC-05 would provide assurance that potential impacts to bears, particularly females with cubs, would not increase over time in the primary conservation area. Outside the primary conservation area, motorized over-snow vehicle use would be managed according to desired conditions for the winter recreational opportunity spectrum. Most areas outside the PCA are currently open to motorized over-snow use and would not have restrictions on this use in the future. There is a minimal amount of modeled grizzly bear denning habitat in the area outside the PCA, so the risk of disturbance or displacement to grizzly bears (including females with cubs) is very low.

Developed recreation sites with overnight use

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 primary conservation area and zone 1 (including the Salish demographic connectivity area), food/wildlife attractant storage special order(s) shall apply to all NFS lands. Food storage orders are in effect across the Forest 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 grizzly bear conservation strategy stated that the main concern with developed recreation sites has to do with overnight use. Under alternative B modified, two desired conditions and one standard address developed recreation sites designed and managed for overnight use. Within the primary conservation area, 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). The revised plan includes a standard stating that 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 (see FW-STD-REC-01 for details). Guideline FW-GDL-REC-01 states, "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)".

This set of plan components is consistent with what has occurred on the Forest through consultation during the time period when the NCDE grizzly bear population was stable to increasing and expanding in distribution (Costello et al. 2016). 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 for grizzly bears would be limited under the proposed action. Implementation and monitoring of the food storage orders, public education, and increases in the availability of bear-resistant food storage devices have all helped to reduce the number of grizzly bear-human conflicts on the Forest in recent decades. In addition, concerted efforts by MFWP to respond to grizzly-human conflicts, both on and off NFS lands, have greatly reduced the risks to both bears and people.

There are 11 bear management units within the primary conservation area on the Flathead National Forest, not counting the Stillwater bear management unit. Out of these 11, 6 are shared with other Forests or agencies (e.g., National Park Service). Therefore, in the next 10 years, the Flathead National Forest has the ability to increase 5 to 11 overnight developed recreation sites in the primary conservation area. Outside of the primary conservation area, the limitation on overnight developed recreation sites is not applied.

The draft GBCS states that "The intent of the developed recreation site standard is to not increase the number of developed sites or capacity at most overnight developed sites on public Federal lands within each BMU above levels known to have occurred at a time when there was a stable to increasing grizzly bear population" (USFWS, 2013c, p. 59). Although the NCDE grizzly bear population was listed as threatened under the Endangered Species Act, there were occasional increases in developed sites that were approved through consultation with the USFWS. To allow a similar level of increase in developed site numbers or capacity that occurred under listed status, one increase in the capacity or number of developed sites would be allowed per BMU per 10 years.

The Forest has one developed ski area (Whitefish Mountain Resort) in the primary conservation area, and it does not have overnight capacity on NFS lands. The Blacktail Mountain Ski Area is located in zone 1. No limits on developed recreation sites would occur in zone 1 with alternative B modified. Grizzly bear-human conflicts are monitored by MFWP and would continue to be monitored in the future so that adaptive changes could be made, if warranted.

Nonmotorized trail use

As stated in the affected environment section, individual grizzly bears may avoid nonmotorized trails or have conflicts with people on nonmotorized trails. But there are no demonstrated population-level effects to the NCDE grizzly bear as a result of nonmotorized trail uses. As a result, high use non-motorized trails are no longer deducted from security core percentages. The grizzly bear subunits meeting 68 percent

secure core do not change as a result of this change (see table 34). As stated in the draft GBCS, "If research demonstrates that high intensity use non-motorized trails do significantly impact grizzly bear populations or that there are areas of significantly higher mortality risk near high intensity use nonmotorized trails (as opposed to other trails or roads), this new information will be appropriately considered and incorporated through an adaptive management approach" (USFWS, 2013c, p. 23). In the future, grizzly bear population monitoring would be conducted by MFWP to determine if any population level effects of human uses are occurring. The proposed action includes plan components to reduce the risk of bear-human conflicts, benefiting grizzly bears.

Desired condition FW-DC-IFS-09 states, "The Forest's trail system provides a variety of high-quality motorized and nonmotorized recreational opportunities during summer and winter. Forest system trails access destinations, provide for loop opportunities that connect to a larger trail system, provide linkage from local communities to the Forest, and are compatible with other resources."

Desired conditions applicable to all MA7 management areas state:

> MA7-DC-01. Focused recreational opportunities are provided in specific areas in response to increasing demand. Local communities can readily access these areas for a variety of motorized and nonmotorized experiences.
>
> MA7-DC-02. These areas provide opportunities for large groups that may have higher levels of social interaction, as well as competitive and non-competitive events.

Because there may be some future effects to individual bears due to the above desired conditions of alternative B modified, alternative B modified includes the following guidelines to reduce potential effects to grizzly bears:

> FW-GDL-IFS-15. When developing, constructing, or reconstructing system trails, pertinent public 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,
> - designing and 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.
>
> FW-GDL-REC-05. To reduce or mitigate potential conflicts between wildlife and event participants as well as with other recreationists, recreation events, group use permits, and commercial activities should include permit measures that address potential conflicts such as, but not limited to location of the event, timing of the event, party size, and education on reduction of human-wildlife conflicts.

Grizzly bear habitat and livestock allotments

Cattle grazing is a relatively minor use of NFS lands on the Forest, 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.

> FW-DC-GR-01.Within the NCDE primary conservation area, 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. See also FW-DC-WL-01 and FW-DC-WL-02.

Although the Flathead National Forest has not had conflicts between cattle and grizzly bears, the proposed action, alternative B modified, includes the following standards which would result in reduced risk of future conflicts.

> FW-STD-GR-01. 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 conflict situation.
>
> 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. Bone yards shall not be established on National Forest System 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 net increase in the number of active cattle grazing allotments above the baseline (see glossary) on NFS lands. Note: Existing cattle 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. See also FW-STD-GR-01.

Guideline FW-GDL-GR-01 provides management direction on grazing practices and measures to protect key grizzly bear food production areas in order to reduce conflicting use by livestock in the primary conservation area. The following additional guideline would promote consistency across the NCDE and minimize the potential for conflicts on NFS lands in the primary conservation area.

> FW-GDL-GR-02. Within the NCDE primary conservation area, an allotment management plan and plan of operations 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).

As stated in the draft Grizzly Bear Conservation Strategy, “Current levels of grazing intensity [on permitted livestock allotments] in forested environments are not displacing grizzly bears in significant ways and are not likely to affect vegetation structure enough to result in direct competition for forage

species on public lands within the NCDE, as evidenced by the increasing population trend in the NCDE" (USFWS, 2013c, p. 25). As a result, the draft Grizzly Bear Conservation Strategy included measures to keep livestock grazing at or below baseline levels. The 2011 baseline was selected because available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al. 2016).

In addition, in order to reduce the cost of administering very small livestock allotments, the revised forest plan includes a site-specific guideline for the Swan Valley geographic area (GA-SV-GDL-06) that would reduce cattle grazing allotments if opportunities arise with a willing permittee. This management direction is not associated with the Draft Grizzly Bear Conservation Strategy but would further reduce risks to grizzly bears in the future.

In zone 1 in the Salish Mountains geographic area (see Figure B-5), the Flathead National Forest currently has active cattle grazing allotments but also has an attractant storage order that reduces the risk of grizzly bear-human conflicts associated with livestock. According to the draft GBCS (2013c), "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.)" (p. 25). Continued implementation of the Forest's attractant storage orders is expected to result in minimal risk of grizzly bear-livestock conflicts.

Grizzly bear habitat and vegetation management

As stated in the "affected environment" section, the grizzly bear is a habitat generalist that is adaptable to these changing vegetative conditions and the resulting changes in the availability of foods and cover. 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 (timber harvest, 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.

SIMPPLE modeling for alternative B-modified shows that grass/forb/shrub communities would increase by the fifth decade, corresponding closely to the amount of high and moderate severity wildfire and prescribed fire. These increases are likely to provide increases in bear foods, such as berry-producing shrubs and grasses that need more light. A downward trend occurs for the amount of area in the "small" forest size class, while there will be strong increase in the amount of area in the large classes by the fifth decade forestwide. These size classes provide cover and forested connectivity, as well as some forage. In the warm dry and warm moist broad potential vegetation types, the very large size class will also increase. Vegetative succession is responsible for majority of changes in the size classes, as trees grow and advance into larger forest size classes. However, low intensity prescribed fire and commercial thinning also is influencing this change to larger size classes by removal of smaller trees in favor of larger. In contrast, a downward trend in the very large forest size class is modeled forest wide for the cool moist-moderately dry and cold biophysical broad potential vegetation types. Stand-replacing wildfire, as well as Douglas-fir and spruce bark beetle, likely account for most of the loss of the very large forest size class and affect far

more area than timber harvest in the cool moist-moderately dry and cold biophysical broad potential vegetation types.

Changes in vegetation would be monitored at a forestwide and ecosystem-wide scale, using analysis tools such as FIA plots and VMAP, that classify all lands (see revised Flathead forest plan appendix A, plan monitoring questions and indicators for terrestrial ecosystems and vegetation as well as monitoring questions and indicators for wildlife. Vegetation management activities would also continue to be assessed through project-specific NEPA analysis as conditions change.

Inside the primary conservation area, 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 primary conservation area, 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. See also FW-GDL-WL-01.
>
> 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 the grizzly bear 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 vegetation guidelines for the primary conservation area that are specific to the grizzly bear, other standards and forestwide 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 (*Vaccinium globulare*, *Vaccinium membranaceum*), serviceberries (*Amalanchier alnifolia*), mountain ash (*Sorbus scopulina*), and buffaloberry (*Shepherdia Canadensis*). This desired condition may be met in wildfire areas, prescribed burn areas, or areas managed to produce timber. Lynx management standards VEGS1, VEGS2, VEGS5, and VEGS6 in the Northern Rockies Lynx Management Direction (see the revised forest plan, appendix A) apply across about 1.8 million acres of the Forest and would limit vegetation treatments in each LAU on the Forest as well as in three adjacent LAUs. 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. Forestwide, riparian management zones total about 427,320 acres and are not suitable for timber production, although timber harvest may occur under specific conditions (see bull trout section of the biological assessment for more details), so key wetland and riparian habitats used by grizzly bears would be managed to continue to support their needs.

Although there are known, usually short-term impacts to individual bears from vegetation management activities and associated road use, these impacts have been and would continue to be managed to support the NCDE grizzly bear population. In summary, available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al. 2016). The NCDE grizzly bear population would continue to be monitored by MFWP, including grizzly bear population trend, body condition (an indicator of food availability), survival, mortality, and grizzly bear-human conflicts.

Grizzly bear habitat and mineral/energy development

Mineral development can affect grizzly bears by causing long-term loss of habitat, increasing vehicle collisions, increasing grizzly bear disturbance/displacement, and increasing grizzly bear-human conflicts at camps. The proposed action has many standards and guidelines addressing minerals mitigation measures for grizzly bears. 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 reduce the risk that any future developments would have adverse impacts on the NCDE grizzly bear population. Most relevant at the present time are two guidelines that would address the primary saleable mineral activity that occurs on the Forest, These guidelines reduce the risk of grizzly bear-human conflicts and grizzly bear disturbance or displacement.

> FW-GDL-E&M-05. Within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), carrying bear deterrent 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 the blasting of rock or crushing of gravel.

Although the Forest has very low potential for oil and gas leasing, the proposed action would lower the risk of grizzly bear habitat loss and increased mortality risk even further because NCDE-STD-MIN-08 would require that no surface occupancy stipulations be applied to any new oil and gas leases in the primary conservation area. No activity can take place on suspended oil and gas leases until an EIS is completed. A leasing decision will not be a part of this forest plan revision.

Geographic area plan components

Swan Valley

As detailed in the existing condition section, land ownership in the Swan Valley geographic area has changed substantially since the current forest plan and the Swan Valley Grizzly Bear Conservation Agreement were adopted. As a result, the Forest now proposes to manage all of its BMU subunits with the same forestwide set of management direction and would terminate the previous agreement. Nevertheless, the Forest 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 forestwide plan components for the grizzly bear, vegetation, forest vegetation products, lands and special uses, recreation, forest infrastructure, partnerships and coordination, watersheds, riparian management zones, and non-native plants, additional plan components would provide benefits for the grizzly bear in the Swan Valley. Alternative B modified includes the following plan components that would continue to improve the habitat quality for grizzly bears in the Swan Valley:

Desired condition GA-SV-DC-08 states, "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-10) 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 states, "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 nonmotorized recreation opportunity spectrum settings and/or roads within bull trout watersheds."

As explained in the affected environment section, 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 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 Forest has made its best programmatic 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.

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 demographic connectivity area (see section on zone 1 above). Additional plan components would provide benefits for the grizzly bear in the Salish Mountains with alternative B modified.

Desired condition GA-SM-DC-04 states, "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 (see Figure B-24) provide habitat connectivity for wide-ranging wildlife species (e.g., grizzly bear, Canada lynx, elk) moving between the Whitefish and Salish Mountain Ranges."

Guideline GA-SM-GDL-01 states, "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 (see appendix C). 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 demographic connectivity area and providing elk habitat security in zone 1, which would indirectly benefit the grizzly bear population.

Management area plan components

The lynx section of the biological assessment describes the effects of specific management areas. Table 38 shows the distribution of MAs with respect to grizzly bear management zones.

Table 38. Distribution of revised forest plan alternative B-modified management areas for the grizzly bear management zones.

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%		

Management Area	Primary Conservation Area	Zone 1, Salish DCA	Zone 1, Outside DCA
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 the PCA, the majority of lands (over 66%) are in nonmotorized management areas (MA1a, MA1b, MA5a, as well as some of MA2a, MA2b, and MA3b), providing an interconnected network 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 would have high levels of levels of habitat diversity, primarily provided by wildand or prescribed fire.

In zone 1, the majority of lands (87%) are in general forest Management area 6. 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 a research natural area which is unroaded (MA3b). In zone 1, forestwide standards would apply that would reduce indirect effects of timber harvest, as described above. Timber salvage is likely to occur in MA6 if trees are burned by wildfire or killed by insects/disease, but the location of such areas is very unpredictable. Timber harvest, salvage harvest, fuels reduction, and precommercial thinning would be subject to forestwide desired conditions, standards and guidelines which would reduce indirect effects of timber harvest that may be detrimental to grizzly bears, regardless of management area designation, as discussed in the effects sections above.

Cumulative effects on the grizzly bear

Cumulative effects under the Endangered Species Act include state, tribal, local, or private actions that are reasonably certain to occur in the action area. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in the cumulative effects analysis in this biological assessment.

Context for analysis of cumulative effects

The analysis of cumulative effects provides a larger context in which to evaluate the effects of the five forest plans by considering conditions across all land ownerships within the NCDE. In 2013, the USFWS announced the availability of a draft grizzly bear conservation strategy for the NCDE population for public review and input. Both the grizzly bear recovery plan and the draft NCDE conservation strategy emphasized the need to coordinate management across multiple land ownerships and jurisdictions to sustain the NCDE grizzly bear population through time. This section addresses the cumulative impacts of (1) management by state agencies, tribes, and private landowners on NCDE-wide habitat quality, (2) grizzly bear-human conflicts on lands not managed by the Forest Service, and (3) the effects of land management on connectivity between the NCDE and adjacent grizzly bear ecosystems.

When finalized, the conservation strategy will become the post-delisting management plan for NCDE grizzly bears and their habitat. The management of grizzly bears and the habitats they require for survival are dependent upon the laws, regulations, agreements, and management plans of the state, tribal, and federal agencies in the NCDE. Laws, regulations, and agreements provide the legal basis for coordinating management, controlling mortality, providing secure habitats, managing grizzly bear/human conflicts, regulating hunters and hunting seasons, limiting motorized access where necessary, controlling livestock grazing, regulating oil and gas development, mitigating large-scale mining operations, maintaining education and outreach programs to prevent conflicts, monitoring populations and habitats, and requesting management and petitions for relisting when necessary.

Delisting of the grizzly bear would remove the regulatory certainty provided by the Endangered Species Act that prohibits the take of grizzly bears and the requirement that federal agencies consult with the USFWS on projects that may affect grizzly bear habitat. In the absence of this regulatory framework, the USFWS must demonstrate that

3. Adequate regulatory mechanisms are available for protecting grizzly bears after delisting;
4. These mechanisms will be effective in maintaining the recovered status of the grizzly bear; and
5. Any selected mechanisms will be carried forward into the foreseeable future with reasonable certainty.

The conservation strategy documents the regulatory mechanisms and conservation framework that would maintain a recovered grizzly bear population in the NCDE. Regulatory mechanisms relevant to grizzly bears consist primarily of federal laws, regulations, USFS and BLM resource management plans, Glacier National Park's Superintendent's compendium, Montana Department of Natural Resources and Conservation's *Habitat Conservation Plan*, and state laws. Other conservation mechanisms include tribal and state grizzly bear management plans and other guidelines that coordinate management, population monitoring, and mortality control.

National forest and BLM resource management plans, the Glacier National Park Superintendent's compendium, the Montana Department of Natural Resources and Conservation's *Habitat Conservation Plan*, tribal forest management plans, Montana Code Annotated (MCA), and Administrative Rules of Montana (ARM) are regulatory mechanisms that are legally enforceable. These dictate how grizzly bear population and habitat management will occur, and, in doing so, they serve to ensure against excessive grizzly bear mortality by minimizing human-caused mortality risk. Signatories of the NCDE Grizzly Bear Conservation Strategy (USFWS, 2013c) represent the land management agencies that have incorporated the habitat management direction described in the conservation strategy into their respective management plans, based upon each agency's rules, regulations, and requirements.

At one time, a cumulative effects model was completed for BMUs in the NCDE. A cumulative effects model baseline was completed in 1998 and a comparison was completed in 2008 using 2005 land imagery. The cumulative effects model results reflect changes in greenness of vegetation brought about by fire or other vegetation management, changes in access management, and changes in human facilities. The cumulative effects model is no longer updated, but this biological assessment provides updated information on the environmental baseline for fire and other vegetation management, changes in access management, and changes in human facilities. As described in the monitoring section of the preferred alternative for the revised forest plan for the Flathead National Forest, as well as the monitoring section for the amendment forests, monitoring of changes in access management and human facilities will continue to be required across the NCDE. Changes in vegetation will be monitored through use of the Forest Inventory and Analysis (FIA) database and through updated mapping using classifications such as VMap.

Cumulative effects

Montana Department of Natural Resources and Conservation

Montana Department of Natural Resources and Conservation lands comprise about 3.6 percent of the primary conservation area and 6.2 percent of zone 1. In 2011, the Montana Department of Natural Resources and Conservation in conjunction with the USFWS completed a habitat conservation plan, which has a 50-year term (MTDNRC, 2011). This is a comprehensive program to conserve federally listed species and minimize incidental take during ongoing forest management activities in western Montana. Within the area delineated as the primary conservation area, zone 1 and zone 2, the Montana Department of Natural Resources and Conservation manages about 574,000 acres of state trust lands. Of this, approximately 204,000 acres are located within the primary conservation area.

Since 1995, the Swan River State Forest has been a party to the Swan Valley Grizzly Bear Conservation Agreement along with Plum Creek Timber Company, the Flathead National Forest, and USFWS. This agreement coordinated timber harvest activities and associated road management across the multiple land ownerships in the Swan Valley in a manner that contributed to the recovery of the grizzly bear population. Under this agreement, three years of rest (during which low-intensity administrative activities may occur but public access is restricted) must be provided after three years of management activities; areas with open road density > 1 mi/mi^2 must not exceed 33 percent of each bear management subunit; road closure devices are maintained; and seasonal road closures are implemented (Plum Creek et al., 1997).

Recently, a land transfer known as the Legacy Project was completed in the Swan Valley. The Nature Conservancy and the Trust for Public Land agreed to purchase lands from Plum Creek Timber Company and then sell or donate these lands to federal, state, and private owners. The vast majority of these lands have become federal (USFS) or state (Montana Department of Natural Resources and Conservation). 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 "fiber agreement" that was part of the Legacy Project and necessitated coordination of timber harvest on Legacy lands has now ended. In the foreseeable future, the Montana Department of Natural Resources and Conservation may be managing their lands in the Swan Valley using their *Habitat Conservation Plan* rather than the conservation agreement.

On lands under the habitat conservation plan, the Montana Department of Natural Resources and Conservation is committed to minimizing construction of new open roads in riparian area wetlands and avalanche chutes. Motorized activities are suspended within 0.6 mile of a known active grizzly bear den. Visual cover is retained in riparian and wetland areas. Information is provided to contractors, and training is provided to employees about living and working in bear habitat.

Within the primary conservation area and zone 1 (zone 1 is called "non-recovery occupied habitat" in the habitat conservation plan), the Montana Department of Natural Resources and Conservation agreed to minimize new open roads; prohibit commercial forest management activities, pre-commercial thinning, and heavy equipment slash treatments April 1–June 15 in spring bear habitat; minimize helicopter operations requiring flights lower than 500 meters in seasonally important grizzly bear habitat; limit the number of active gravel pits; and discourage new domestic sheep grazing allotments. Restrictions are implemented on spring habitat in the Stillwater, Coal Creek, and Swan State Forests. Currently, the Montana Department of Natural Resources and Conservation has very few grazing licenses on very limited ownership in the NCDE. Fewer than 9,000 acres within the primary conservation area and about 30,700 acres in the non-recovery occupied habitat are grazed by livestock. Information and education programs and other measures are being taken to avoid and minimize the risk of human-bear conflicts. Prompt removal of livestock carcasses also minimizes risk of bear-livestock conflicts.

Additional protective measures apply to the primary conservation area, including capping the miles of open and restricted roads in the Stillwater block of lands managed by Montana Department of Natural Resources and Conservation and Swan River State Forest. The Stillwater Block will maintain 22,007 acres of security zones where management and administrative uses are prohibited during the non-denning season. The Swan Habitat Conservation Plan strategy is that 4 years of activity must be followed by 8-year rest periods across 5 management subzones. The impacts to important grizzly bear habitats are minimized; all primary road closure devices are examined and repaired annually; and no new grazing licenses for sheep and other small livestock will be authorized. The transportation plan for the Stillwater and Coal Creek State Forests capped road construction at 19.3 more miles of permanent road, and reduced the miles of road open year-round by 15 percent.

Under the *Habitat Conservation Plan* and the transportation plan for the Swan River State Forest, new permanent roads would be capped at 70 miles (none open to the public) and an additional 41 miles of road would be restricted to commercial forest activities during the spring season. The Montana Department of Natural Resources and Conservation has no commitments to manage secure core habitat for grizzly bears on the Swan River State Forest.

Food and attractant storage programs for Montana Department of Natural Resources and Conservation staff and contractors reduce the risk of human-bear conflicts. On Department lands within the NCDE recovery zone/primary conservation area, contract language requires the removal of garbage from work sites daily. Outside the NCDE recovery zone/primary conservation area, but in known occupied grizzly bear habitat, timber sale contract language requires the removal of garbage from work sites daily. For Department lands outside the recovery zones and outside known occupied grizzly bear habitat, precautions are taken on a case-by-case basis if known bear activity occurs. Recreationists are expected to pack out their trash. Montana Department of Natural Resources and Conservation, in cooperation with others, has placed bear-resistant dumpsters at state land locations where bear-attractant conflicts have been known to occur. The Department provides its cabin lessees a brochure that explains measures that should be taken to minimize bear-human conflicts. Montana Department of Natural Resources and Conservation employees or contractors have not been involved in a grizzly bear-human conflict that resulted in a management action or death of a grizzly bear.

Although there could be some short-term adverse effects on a few individual bears, implementation of the habitat conservation plan is not likely to cause cumulative adverse effects on the NCDE grizzly bear population.

Montana Department of Fish, Wildlife, and Parks

A very small proportion of the land within the primary conservation area (0.6 percent) and zone 1 (1.2 percent) is managed by the Montana Department of Fish, Wildlife and Parks. Montana's wildlife management areas are managed with wildlife and wildlife habitat conservation as the primary concern, along with providing for enjoyment by the public. Some wildlife management areas are open for hunting or camping, and others are not. Several are closed to the public during the winter and spring periods. The Montana Department of Fish, Wildlife and Parks is very active in providing public information and education about conserving grizzly bears and their habitat.

Given the agency's mission to conserve wildlife and its small holdings with the primary conservation area and zone 1, no adverse cumulative effects on the NCDE grizzly bear population are anticipated due to habitat management actions of the Montana Department of Fish, Wildlife and Parks.

Grizzly bear management plans establish goals and strategies to manage and enhance grizzly bear populations and to minimize the potential for human-grizzly bear conflicts. The Department completed a

grizzly bear management plan for western Montana in 2006 and a grizzly bear management plan for southwestern Montana in 2013. These documents establish goals and strategies to manage and enhance grizzly bear populations and to minimize the potential for human-grizzly bear conflicts. A long-term goal is to allow the populations in western and southwestern Montana to reconnect through the intervening, currently unoccupied habitats.

The Department also employs several bear management specialists to work with landowners and educate the public in an effort to avoid or resolve grizzly bear-human conflicts and to reduce grizzly bear mortalities. Food storage guidelines are in place in some state parks and wildlife management areas, and bear-resistant dumpsters are in place in most state parks.

The State of Montana allows regulated hunting for black bears and other wildlife species. There is a potential for grizzly bear mortality by hunters to occur as a result of mistaken bear identification or self-defense, especially in proximity to the carcasses of harvested animals. Montana Department of Fish, Wildlife and Parks provides a variety of public information and education programs, including a mandatory black bear hunter testing and certification program to help educate hunters in distinguishing species, which are aimed at reducing human-caused mortalities. Black bear hunting seasons have also been shortened in recent years, reducing the potential for mistaken identity. These efforts have helped to decrease legal and illegal shooting mortalities.

Hunting of grizzly bears has not been allowed in Montana since 1991. In a recovered, delisted population of grizzly bears, the Department would assume management responsibility for the grizzly bear population. Management could include regulated hunting in the future, when and where appropriate. If this occurs it would result in mortality of individual grizzly bears but could potentially increase support for grizzly bears among some segments of the public. The Department would monitor the level of mortality due to hunting and its effects on the NCDE grizzly bear population.

Tribal lands

The Blackfeet Indian Reservation represents about 4.5 percent of the primary conservation area and about 5.6 percent of zone 1. Within the Blackfeet Indian Reservation, there are about 175,000 forested acres. These are managed under the Blackfeet Nation Forest Management Plan, which is expected to be in effect until 2030. Nearly all of the acres under the forest management plan occur within the primary conservation area or zone 1. Under the forest management plan, no net increase in overall road density levels is allowed. The Blackfeet Nation with the Bureau of Indian Affairs are currently soliciting interest in the Land Buy-Back Program. Purchase offers have been generated for nearly 7,000 landowners with fractional interests at the Blackfeet Indian Reservation through the Land Buy-Back Program for Tribal Nations (formerly called the Cobell Land Consolidation Program). The Land Buy-Back Program is part of the Indian Trust Settlement resulting from the Cobell v. Salazar class action lawsuit. If successfully completed, the purchases could transfer a substantial amount land from private to tribal ownership.

All lands within the primary conservation area on the Blackfeet Indian Reservation are currently allotted for livestock grazing. A bear management specialist(s) works with livestock producers to minimize and manage bear-livestock conflicts. Existing sheep allotments will be monitored, evaluated, and phased out if the opportunity arises with willing permittees. Although there has been a history of grizzly bear mortalities related to livestock on the Blackfeet Indian Reservation, the rate of increase of the grizzly bear population indicates that the level of mortality has been sustainable. The Blackfeet Indian Reservation has a food storage order in in place under the Blackfeet Fish and Wildlife Code of Regulations (chapter 3, section 17) that applies to all lands within the exterior boundaries of the reservation that are designated as normally occupied by bears. The regulations govern food storage and sanitation in camping and nonresidential situations and also govern the removal of livestock carcasses that may attract bears into

conflict situations. In addition, beekeepers in bear country are encouraged to install electric fencing around beehives.

On the Flathead Indian Reservation, there is a food storage order for backcountry areas in the primary conservation area. As warranted, residents are notified of bear activity and precautionary measures that should be taken to reduce bear-human conflict. Tribal biologists provide assistance in mitigating situations where food and attractant storage is an issue.

Lands managed by the Confederated Salish and Kootenai Tribes comprise about 2.5 percent of the primary conservation area and nearly 11 percent of zone 1. Of the acreage that is within the primary conservation area, about 91 percent of reservation lands are in the Mission Mountains Tribal Wilderness Area or the South Fork Jocko Primitive Area. No commercial forest activities occur in these areas. There will be no permanent increase in open or total road densities and no permanent decreases in secure core within the wilderness area. In the South Fork Jocko Primitive Area, there will be no net increase in open roads. The forest management plan (CSKT, 2000) provides the following guidance for motorized access management on the remaining lands: open road densities shall not exceed 4 mi/mi^2; total road miles shall remain at or below what existed in 1999; total road densities will be reduced over the life of the plan by removing 15 percent of road spurs; and roads in timber sale areas shall be closed after timber harvest is completed. Vegetation management direction in the primary conservation area restricts the locations and methods of harvest in some areas; hiding cover is retained along major highways near identified crossing areas; and during the duration of a timber sale and for two years afterward, adjacent drainages must remain undisturbed. On the Flathead Indian Reservation, there is no livestock grazing within the primary conservation area. Under the conservation agreement, the standards for management of livestock grazing would be the same as for the federal agencies.

The Blackfeet Nation and the Confederated Salish and Kootenai Tribes have taken actions, such as hiring bear management specialists and providing information and education, to reduce grizzly bear-human conflicts. Existing management direction on tribal lands has been in place during the period when the NCDE grizzly bear population was stable to increasing. There may be some adverse effects on individual grizzly bears, for example, due to high road densities outside of tribal wilderness areas. However, the overall suite of management direction along with efforts of tribal bear management specialists will minimize adverse effects. Cumulative adverse effects to the NCDE population are not expected as a result of management actions on tribal lands.

Private lands

Privately owned lands comprise about 10 percent of the 5.7-million-acre primary conservation area, nearly 48 percent of zone 1. Privately owned lands occur within and adjacent to NFS lands throughout the NCDE.

The human population in northwest Montana has grown at a relatively high rate during the past few decades, and growth is expected to continue. Increasing residential development and demand for recreational opportunities can result in habitat loss, habitat fragmentation, and increases in grizzly bear-human conflicts. These impacts are likely to intensify, although appropriate residential planning, outreach about how to minimize adverse effects, and assistance in resolving conflicts can help mitigate these impacts.

Increasing development on private lands has the potential to have cumulative adverse effects on the NCDE grizzly bear population. Monitoring of population status will provide a mechanism to identify areas of concern so that appropriate preventive or corrective actions can be taken. Private lands continue to account for a disproportionate number of conflicts and grizzly bear mortalities in the NCDE. These

impacts are likely to intensify, although appropriate residential planning, outreach and information about how to avoid conflicts, tools such as bear-resistant containers, electric fencing, and assistance in resolving conflicts can help mitigate these impacts. Walters and Holling (1990) stated that managing human-caused mortality, monitoring both population and habitat parameters and responding when necessary with adaptive management are the best ways to ensure a healthy grizzly population.

The USFS does not have authority to manage grizzly bear-human conflicts or human-caused mortality on private lands. Population monitoring and management of human-grizzly bear conflicts is under the authority of Montana Fish Wildlife and Parks and the tribes. Montana Fish Wildlife and Parks, the Confederated Salish and Kootenai Tribes, and the Blackfeet Nation employ bear specialists who work with private landowners in an effort to reduce risks to grizzly bears and humans on private, public, or tribal lands. Bear specialists provide information and assistance to landowners on appropriate ways to secure food and attractants from grizzly bears, and respond to reports of conflicts with nuisance black and grizzly bears. These programs have been successful in informing the public, reducing the availability of attractants to grizzly bears on private and public lands, and reducing human-caused mortalities of grizzly bears. These programs and their positive results are expected to continue for the foreseeable future.

Effects of management and development on connectivity with adjacent grizzly bear ecosystems

State lands

Under the habitat conservation plan, maintenance of eight security zones comprising 22,007 acres in the Stillwater Block and adherence to seasonal restrictions in that transportation plan would facilitate important linkage between the Whitefish and Salish Mountain Ranges (including the Salish demographic connectivity area). Between the Swan and Mission Ranges, the Swan Valley Grizzly Bear Conservation Agreement provides a framework for cooperative management, and it would continue to facilitate effective linkage across the valley while it is in effect. The Montana Department of Natural Resources and Conservation's habitat conservation plan also has provisions that help to maintain the integrity of linkages in the Swan valley to provide for movement between suitable habitats and recovery zones, if it goes into effect in this area. Thus, under either strategy into the future, effective linkage is likely to be maintained on state trust lands.

The sale or other disposal of some state lands is allowed. However, under the *Habitat Conservation Plan*, removal of lands is capped at 5 percent of the baseline acreage of certain areas including the grizzly bear NCDE recovery zone/primary conservation area.

The Department management direction contributes to maintaining or improving connectivity, and adverse cumulative effects are not anticipated.

Montana Department of Fish, Wildlife and Parks

Grizzly bear management plans establish goals and strategies to manage and enhance grizzly bear populations and to minimize the potential for human-grizzly bear conflicts. A long-term goal is to allow the populations in western and southwestern Montana to reconnect through the intervening habitats. No adverse cumulative impacts on connectivity are anticipated.

Tribal lands

On the Flathead Indian Reservation lands within the Ninemile demographic connectivity area, the above-mentioned requirements under the forest management plan also apply. A tribally designated wilderness, Sleeping Woman, and tribally designated roadless areas, Burgess and the Ravalli Valley complex, help to facilitate grizzly bear occupancy and movements within the demographic connectivity area. In a 54-mile stretch of Highway 93 between Evaro and Polson, more than 50 wildlife crossing structures have been

constructed. Hiding cover is retained on the reservation adjacent to Highway 93 at Evaro and in the Ravalli Corridor to provide conditions that facilitate movement of wildlife. No adverse cumulative impacts on connectivity are anticipated as a result of tribal actions.

Canada

Grizzly bear populations in the lower 48 states are not separated biologically from grizzly bears in Canada. However, there are distinct differences in population status, habitat management, and regulatory mechanisms between the two countries. Overall, Canada supports approximately 27,000 grizzly bears in relatively contiguous populations (Ross, 2002). Grizzly bears are listed as a species of "special concern" under the Canadian Species at Risk Act, but this designation is given to any species that is sensitive to human activities, and does not indicate an extinction risk (USFWS, 2011c). The Forest has a boundary along the Canadian border and some grizzly bears use the area along this boundary (R. D. Mace & Roberts, 2012).

In contrast to the United States, there is no national land management agency that establishes and implements habitat management programs across Canada. The national parks and provincial parks have uniform habitat protections in place for grizzly bears. Provincial management plans have been developed for grizzly bears in British Columbia and Alberta. In Canada immediately north of the NCDE, the main human activities that have impacted grizzly bears and their habitat are timber harvesting, oil and gas exploration and development, coal mining, and the proliferation of roads and other human developments related to these industries. On February 18, 2010, the premier of British Columbia announced that mining, oil, gas, and coal development were no longer permissible land uses in the Canadian portion of the North Fork of the Flathead River Basin, removing a substantial threat to the NCDE population (USFWS, 2011c).

There is no evidence to suggest that adverse impacts to the NCDE grizzly bear population are now occurring or will occur due to management activities in Canada.

Grizzly bear determination of effects and rationale

The proposed action may affect and is likely to adversely affect the grizzly bear.

Rationale for Determination

The proposed action has the potential to adversely affect the grizzly bear because not all subunits in the recovery zone/primary conservation area provide habitat security conditions that are supportive of individual female grizzly bears and their offspring. In addition, there could be temporary increases in OMRD and TMRD or secure core due to projects (particularly in the general forest management area) that have the potential to adversely affect individual grizzly bears due to increased human disturbance/displacement and habitat alternation. The amendments would establish consistent definitions and direction in the forest plans relative to temporary use of roads for projects, administrative use, temporary use by the public outside of secure core, and limits on project duration. Implementation of these standards may also result in short-term adverse effects to individual bears. The proposed action would incorporate direction to maintain baseline levels, which would support continued recovery of the grizzly bear population as a whole. At the project level, activities would be subject to plan components, including standards and guidelines, designed to avoid or minimize adverse effects to individual grizzly bears and the habitats they occupy on federal lands.

Plan components for terrestrial and aquatic ecosystems on the Forest would benefit the grizzly bear by providing for habitat diversity and ecological conditions to sustain the NCDE population. Given that we cannot predict the exact locations of future projects and that there are not restrictions on the distribution

of effects spatially, we cannot discount the potential for localized, short-term adverse effects to individual grizzly bears.

In summary, available information documents increases in grizzly bear distribution, population size, and genetic diversity. The estimated population size was 765 bears in 2004 (Kendall et al. 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al. 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al. 2016).This has occurred even though there have been and would continue to be some short-term adverse effects to individual bears.

The proposed action would add desired conditions in zone 1 and a standard requiring no net increase from the baseline in motorized routes (roads and trails) open to public motorized use in the Salish demographic connectivity area and no net increase from the baseline in roads open to public motorized use on NFS lands in the rest of zone 1. These forest plan components would help to limit mortality risk in zone 1, support occupancy by female bears, and support movement to the Cabinet-Yaak recovery area.

The proposed action adds plan components for recreation that would be supportive to grizzly bear conservation in light of increases in population and increased recreational use of the Forest. The proposed action limits the risk of disturbance and mortality of grizzly bears. Although the Forest has very little livestock grazing or mineral exploration and development, the proposed action also limits the risk of future adverse effects to the NCDE grizzly bear population.

Wolverine

When the Forest's assessment was published (April 2014), the USFWS had published a proposed rule to list the North American wolverine distinct population segment (DPS) in the contiguous United States (USFWS, 2013a). However, on August 13, 2014, the USFWS withdrew its previous proposal (USFWS, 2014b). On April 14, 2016, the Court remanded the matter to the U.S. Fish and Wildlife Service for further consideration consistent with order CV 14-246-M-DLC (Consolidated with Case Nos.14-247-M-DLC and 14-250-M-DLC). The wolverine is now listed as a proposed threatened or endangered species for the Flathead National Forest, pending completion of a status review by the USFWS. The USFWS is currently preparing a Species Status Assessment (SSA) report that will incorporate additional information about the species from several new studies, as well as new climate modeling results for Glacier National Park (adjacent to the Forest) that includes a fine-scale assessment of snow extent and depth.

Affected environment

Population, life history, and distribution

Wolverines are year-round residents across Alaska and Canada. The southern portion of the species' range extends into high-elevation alpine portions of Washington, Idaho, Montana, Wyoming, California, and Colorado. Wolverines occur at low densities, range widely, inhabit remote and rugged landscapes away from human populations, and are difficult to detect, so conducting research on wolverines is challenging (IDFG, 2014). Wolverine populations in Montana were heavily trapped in the early 1900s and were near extinction by 1920. However, numbers increased in the western part of the state from 1950 to 1980 (Hornocker & Hash, 1981). Wolverine population growth and expansion has been documented in the North Cascades and northern Rocky Mountains (USFWS, 2013a). The Western Association of Fish and Wildlife Agencies is currently conducting a multi-state occupancy study to address conservation of the wolverine including restoring, connecting, and monitoring wolverine populations and their habitat in the U.S. Rocky Mountains and Cascade Mountains. Preliminary results for the 2016/17 monitoring season

indicate there were 157 detections of wolverine in grid cells across Montana, Idaho, Wyoming, and Washington, but genetic identification of individuals has not yet been completed.

According to the USFWS (2013a), "Wolverine records from 1995 to 2005 indicate that wolverine populations currently exist in the northern Rocky Mountains and that the bulk of the current population occurs here. Within the area known to currently have wolverine populations, relatively few wolverines can coexist due to their naturally low population densities, even if all areas were occupied at or near carrying capacity. Given the natural limitations on wolverine population density, it is likely that historic wolverine population numbers were also low" (p. 7868).

Wolverine populations fluctuate in response to prey availability, juvenile dispersal, and mortality of adult females. The USFWS stated that the northern Rocky Mountains portion of the North American wolverine distinct population segment is thought to be the largest subpopulation and the most genetically resilient of the current subpopulations within the United States (USFWS, 2013a). Inman and others (2013) estimated the current population as well as the population capacity for regions of the western U.S. The Forest is in the Northern Continental Divide region. Inman and others (2013) estimated that current population in the Northern Continental Divide region is at its capacity, with the highest capacity in the Bob Marshall Wilderness.

Current information for wolverine occurrence on the Forest is based on (1) reported trapping records; (2) non-invasive monitoring, including remote cameras and DNA analysis of hair or scat; and (3) observations/sightings of either the species or tracks recorded in Forest or State databases (USDA, n.d.). Wolverine detections are distributed across suitable habitats on the Forest (USDA, n.d.). No recent research that would estimate population levels has been conducted for wolverine on the Forest. The Forest and other cooperators detected a minimum of 13 individual wolverines within Forest geographic areas (based upon genetic analysis of samples collected during non-invasive carnivore monitoring in areas accessible by snowmobile from 2012-2015) (Curry et al., 2016; Pilgrim & Schwartz, 2015; Ruby et al., 2016; Swanson, 2017; SWCC, 2014, 2015).

Hornocker and Hash conducted telemetry research on 24 individual wolverines over a five-year period within a study area making up about 1,300 square kilometers of the Flathead National Forest (Hornocker & Hash, 1981). Their study area was primarily located in the South Fork of the Flathead River watershed and, secondarily, portions of the Sun, Swan, and Middle Fork of the Flathead River watersheds. About one half of the study area had timber harvest and a wide variety of types of recreation, and the other half was wilderness. Hornocker and Hash found wolverines at relatively high densities in the South Fork of the Flathead River watershed, and they concluded the population was stable (Hornocker & Hash, 1981). Research on wolverines has been conducted in the last decade or so in Glacier National Park (adjacent to the Forest)(Copeland & Yates, 2006; J. R. Squires, Copeland, Ulizio, Schwartz, & Ruggiero, 2007). Wolverines are constantly on the move and are known to make long-distance movements that are not impeded by topography or deep snow (Copeland & Yates, 2006; J. R. Squires et al., 2007). Copeland and Yates estimated that adult female wolverines have home ranges averaging 55 square miles. Adult males ranged over an even larger area, including lands outside the park, with home ranges that averaged 193 square miles (Copeland & Yates, 2006). Home range boundaries are dynamic, as are population demographics.

Habitat

For wolverine habitat across the western U.S., Inman and others reported that in general, wolverines are distributed in areas of higher elevation, where there is steeper terrain, more snow, fewer roads, less human activity, and in areas closer to high elevation talus, tree cover, and snow cover persisting to April 1 (Inman et al. 2013). Year-round habitat includes rocky alpine habitats, glacial cirque basins, and avalanche chutes

that provide food sources such as marmots, voles, and carrion (Copeland et al., 2007; Hornocker & Hash, 1981; Robert M. Inman et al., 2007; Magoun & Copeland, 1998). Wolverines appear to rely on the cold and snow to cache carrion (Robert M. Inman, Magoun, Persson, & Mattisson, 2012). Wolverines also travel through the area where snow persists and they minimize travel through low-elevation habitat (McKelvey et al., 2011). Persistent spring snow cover is also correlated with gene flow because this is where the wolverine's within-home-range movements and dispersal occurs year-round (M. K. Schwartz et al., 2009). The area modeled by Inman and others (2013) as providing for male dispersal encompasses the whole Forest, while the area modeled as providing for female dispersal is more limited.

Magoun and Copeland (1998) described two types of reproductive dens: natal dens where young are born and maternal dens where the mother may move the kits if conditions are no longer suitable at the natal den. Abandonment of natal and maternal dens may be a preemptive strategy that confers an advantage to females if prolonged use of the same den makes a den more evident to predators (USFWS, 2013a). Sites used for maternal dens are often close to the natal den and have a similar structure. Prior to the Glacier National Park study, not much was known about the den sites of reproductive female wolverines in Montana because den sites are often in remote terrain that is very difficult to study. During the first three years of the study, data was collected for 19 wolverines, and information about reproductive dens was obtained for two adult females that raised four offspring (kits). Copeland and others found that dens were excavated in the snow and were on upper slopes in sparse timber beneath downed woody debris or rocks. Dens are typically used through late April or early May. Females used two to three different dens prior to the weaning of kits at six to seven months of age. Kits gather at rendezvous sites that are primarily in boulder, talus, and cliff areas (Copeland et al., 2010). Survival of young was low, even in the national park setting where trapping is not allowed and motorized disturbance does not occur in winter or spring. Wolverine den sites may not occur in the same exact spot year after year, and specific maternal and/or natal den sites on the Forest are unknown.

Primary wolverine habitat is also characterized by low levels of human development (Copeland, 1996; Hornocker & Hash, 1981; Krebs, Lofroth, & Parfitt, 2007; USFWS, 2013a). This negative association with frequent human presence is sometimes interpreted as active avoidance of human disturbance, but it may reflect the wolverine's preference for cold, snowy, and high-elevation habitat that humans do not often develop. The USFWS assessed the effects of a variety of human activities that can affect wolverines and their use of habitat. The USFWS stated:

> Few effects to wolverines from land management actions such as grazing, timber harvest, and prescribed fire have been documented. Wolverines in British Columbia used recently logged areas in the summer and moose winter ranges for foraging (Krebs et al., 2007, pp. 2189-2190). Males did not appear to be influenced strongly by the presence of roadless areas (Krebs et al., 2007, pp. 2189-2190). In Idaho, wolverines used recently burned areas despite the loss of canopy cover (Copeland, 1996). . . .
>
> Intensive management activities such as timber harvest and prescribed fire do occur in wolverine habitat; however, for the most part, wolverine habitat tends to be located at high elevations and in rugged topography that is unsuitable for intensive timber management. . . . Wolverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat to the conservation of the species. (USFWS, 2013a, p. 7879)

The USFWS also stated that it is unlikely that wolverines avoid the type of low-use forest roads that generally are found in wolverine habitat. Based on the best available science, the USFWS concluded that wolverines do not avoid human development of the types that occur within suitable wolverine habitat and

that there is no evidence that wolverine dispersal is affected by infrastructure development (USFWS, 2013a).

Krebs and others (2007) modeled male vs. female wolverine habitat selection in British Columbia, hypothesizing that food, predation risk, and human disturbance affected habitat selection. Krebs and others based their model on 39 adult wolverines (23 females and 16 males) that were located a total of 2,125 times within two study areas. These authors modeled selection in two time periods: winter and nonwinter. The winter season was defined as the period when there was persistent snow cover at treeline. Human use variables included in the models they tested included those associated with winter recreation activity, roads, and timber harvesting. Winter recreation data included estimates of snowmobile primary use sites, locations of runs for two helicopter skiing companies in the Columbia Mountains study area, and backcountry ski use centered on the Trans-Canada Highway corridor within and adjacent to Mount Revelstoke and Glacier National Parks. These authors stated that extensive timber harvesting had occurred within a large portion of the study area. Krebs and others (2007) concluded that male wolverines were most closely associated with food availability in both summer and winter. Moose winter ranges, valley bottom forests, and avalanche terrain were positively associated with winter male wolverine use. The authors stated:

> Habitat associations of females were more complex; combinations of variables supporting food, predation risk, or human disturbance hypotheses were included in most supported models from both summer and winter in both study areas. Females were associated with alpine and avalanche environments where hoary marmot and Columbia ground squirrel prey are found in summer. Roaded and recently logged areas were negatively associated with female wolverines in summer. In the Columbia Mountains, where winter recreation was widespread, females were negatively associated with helicopter and backcountry skiing. Moose winter ranges within rugged landscapes were positively associated with females during winter. Our analysis suggests wolverines were negatively responding to human disturbance within occupied habitat. The population consequences of these functional habitat relationships will require additional focused research. Our spatially explicit models can be used to support conservation planning for resource extraction and tourism industries operating in landscapes occupied by wolverines. (abstract)

Recreational use in wolverine habitat

The threshold for the amount of human activity that can occur before it affects male and female wolverine habitat selection is unknown. Some scientists have expressed concern about the effects of human activities on female wolverines with young kits during the mid-February to mid-May time period because food resources are scarce for foraging females. As the kits mature, the mother will leave them for longer periods of time to find food, but until the kits are at least 10 weeks old, they cannot travel with their mother. If a female needs to move kits to a new location, or to another den, she must carry them in her mouth. If the female needs to move the kits very far, the probability of kits dying increases. Reproductive females and kits are at risk of predation (Magoun & Copeland, 1998), and, according to Persson in 2005, females are most vulnerable to energetic pressures due to the high cost of lactation during this period (Krebs et al., 2007). The predominant activity in some portions of wolverine habitat during this time period is backcountry recreation.

Winter backcountry recreation opportunities in the northern Rocky Mountains include snowshoeing, snowboarding, skiing, snowcat- or trackster-assisted skiing and snowboarding, snow bikes, and snowmobiling. Heinemeyer and Squires (2015) are investigating winter recreational use (primarily skiing, snowboarding, and snowmobiling) in wolverine habitat in central Idaho and the Yellowstone region of Idaho, Montana, and Wyoming. Heinemeyer and Squires stated that wolverines appear to tolerate many types of winter recreation in their home ranges. Wolverines have been documented to persist and

reproduce in habitats with high levels of human use and disturbance, including developed alpine ski areas and areas with motorized snowmobile use (Heinemeyer, 2012; Heinemeyer & Squires, 2013). Heinemeyer and Squires (2014) stated, "Wolverines appear to tolerate winter recreation in their home ranges, including denning females. Based on our preliminary findings, potential wolverine habitats that have even high levels of winter recreation may support resident wolverines despite the potential human disturbance" (p. 4). This suggests that wolverines can survive and reproduce in areas that experience human use and disturbance; however, there is uncertainty with respect to the amount, type, and timing of human recreational use and its effects on female wolverines.

Heinemeyer and Squires (2014) indicated there may be increasing avoidance of winter recreation areas as the amount of an individual wolverine's home range affected by winter recreation increases. They also noted that the reproductive status of the females may affect their potential response to winter recreation, with reproductive females having higher movement rates when in a high-use recreation zone. In their 2015 annual report, Heinemeyer and Squires (2015) stated that the field data collection for the wolverine winter recreation project was completed and they were focused on analyzing the responses of wolverines to winter recreation (p. 12). The response of individual wolverines to human disturbance is still being analyzed.

The Flathead National Forest has approximately 1.4 to 1.7 million acres of modeled wolverine habitat, depending upon which model is used (USFWS, 2013a, 2014b; Woods, Morey, & Mitchell, 2014). The majority of the modeled habitat occurs in the Bob Marshall Wilderness Complex in the South Fork and Middle Fork geographic areas, with lesser amounts in the Swan and Mission Mountain portions of the Swan Valley geographic area as well as the Whitefish Range portion of the North Fork and Salish Mountains geographic areas. On the Forest, about 59-64 percent of modeled wolverine habitat is in designated wilderness, where motorized uses (including snowmobiling, helicopter-assisted skiing or snowboarding, and trackster-assisted skiing or snowboarding) are not allowed. Nonmotorized uses such as backcountry skiing are not restricted, but because much of the wilderness area on the Forest is large and remote, it is also difficult to access for nonmotorized winter recreation. Wilderness areas provide habitat where the risk of human disturbance to wolverines is very low during the time period when females have dependent young. In addition, about 25 percent of modeled wolverine habitat is in inventoried roadless areas, where road building is not allowed and timber harvest is restricted. Glacier National Park, adjacent to the Forest, provides over 1 million acres that is closed to motorized over-snow vehicle use. In combination with wilderness areas on the Forest to the south, there are over 2 million acres of habitat available to wolverines where there is no motorized over-snow vehicle use allowed and where ungulates are present to provide sources of carrion. I

Some of the modeled wolverine habitat on the Forest has developed recreation and motorized access. Much of Whitefish Mountain Resort is in modeled wolverine habitat and skiers riding the lift observed a wolverine as it fed on carrion. Outside wilderness areas, restrictions on motor vehicle and motorized over-snow vehicle use provide habitat for wolverines with a low risk of human disturbance during time periods when wolverines may be sensitive—particularly in the North Fork geographic area, where use of motorized over-snow vehicles is restricted to specific routes in much of the area (Figure B-31 and Figure B-32). In areas open to motorized over-snow vehicle use, the amount of use has likely increased over the last few decades due to technical advances in motorized over-snow vehicles and human population growth in the Flathead Valley. Backcountry skiing has also increased in popularity.

Connectivity and wolverine habitat:

Inman and others (2013) reported that the Northern US Rockies include most of the major core areas, the majority of the current population, and connections to larger populations in Canada. They identified six regions that can likely function as major population cores where primary habitats exist as large blocks of

relatively contiguous, publically-owned lands that include significant portions of designated wilderness or national park and are capable of supporting 50 or more wolverines; these were the Northern Cascade, Northern Continental Divide, Salmon-Selway, Greater Yellowstone, Southern Rockies, and Sierra-Nevada Regions. Recent research in Glacier National Park has demonstrated that habitat connectivity between Glacier National Park, the Forest, and Canada currently provides for wolverine movement (Copeland & Yates, 2006).

Effects of the Framework Programmatic Action

For assessing effects to wolverine habitat, we used models which incorporated the work of two groups of scientists (Copeland et al., 2010; R. M. Inman et al., 2011)for wolverine habitat across the United States (USFWS, 2013a, 2014b) (Figure B-19), as refined by Inman and others (2013).

As described in the affected environment section above, research results suggest that wolverines are generally tolerant of human disturbance associated with recreation developments and activities (Heinemeyer & Squires, 2014, p. 4). The thresholds for the amount of development or human recreational use that individual wolverines will tolerate in their home ranges is unknown but is being investigated. Plan components would support key ecosystem characteristics for wolverines because about 59-64 percent of modeled wolverine habitat is in designated wilderness (the range varies based upon which model is used). In designated wilderness, the risk of human disturbance is low because motorized uses and mechanized transport such as snowmobiling, helicopter-assisted skiing or snowboarding, and snow bikes are not allowed. Nonmotorized and non-mechanized transport on the Forest are not restricted, but because much of the designated wilderness area on the Forest is remote, it is difficult to access for nonmotorized and nonmechanized winter recreation.

To assess effects of the risk of human disturbance to female wolverines with young, the Forest used the model developed by Copeland and others to model maternal denning habitat (2010). Modeled maternal denning habitat encompasses about 655,000 acres or about 27 percent of all Forest lands. In comparison with the environmental baseline, there would be a slight net decrease in modeled maternal denning habitat that is suitable for motorized over-snow vehicle use. The proposed action, alternative B modified, would change an area in Big Creek to suitable for motorized over-snow vehicle use, but the majority of the area added is not in modeled maternal denning habitat. An area in Sullivan Creek would become unsuitable and is in modeled maternal denning habitat.

The revised forest plan also includes guidelines that would benefit the wolverine by limiting the risk of human activities that might cause disturbance in modeled maternal denning habitat in the future. FW-GDL-WL-04 states, “New projects or activity authorizations involving low-altitude helicopter flights or landings in areas of modeled wolverine maternal denning habitat (identified in cooperation with USFWS and the USFS Rocky Mountain Research Station) should not occur from February 15 to May 15 unless they include strategies or design features to mitigate disturbance to wolverines. Exceptions to this guideline may occur for public health and safety, emergency activities, or other approved administrative activities, such as site maintenance.” FW-GDL-REC-04 states, “To limit the risk of cumulative impacts to female wolverines with dependent young, there should be no net increase in percentage of modeled wolverine maternal denning habitat where motorized over-snow vehicle use would be suitable on NFS lands at a forestwide scale. Specific locations of routes or areas suitable for motorized over-snow vehicle use are specified in figure B-11.”

Under alternative B modified, about 15 percent of modeled wolverine maternal denning habitat is in recommended wilderness (management area 1b) and it would not be suitable for motorized uses or mechanized transport. In summary, scientific information about the effects of human disturbance indicates that wolverines are generally tolerant of many types of human recreational developments and use, as

described in the affected environment section. The thresholds for levels of human disturbance in habitats where female wolverines give birth to and raise dependent offspring are unknown at this time, but plan components for all alternatives would limit the risk of human disturbance.

Plan components support habitat connectivity for the wolverine by: 1) designating management areas that form large contiguous blocks of habitat with low levels of human development to provide for potential range shifts of this species, 2) providing for ecological conditions that meet subsistence and movement needs in connectivity areas, 3) limiting mortality risk through management of motorized access, 4) working with adjacent landowners and other interested parties to improve connectivity and linkage opportunities across multiple jurisdictions (e.g., cooperative agreements, highway approaches/ crossings, and land consolidations, exchanges, acquisitions, easements). Some of the key plan components include:

- Infrastructure standard FW-STD-IFS-02 limits increases in motorized access, and guideline FW-GDL-IFS-12 specifies that 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.

- Energy and minerals standards FW-STD-E&M-08 and 09 contribute to connectivity. For example, new leases for leasable minerals in the grizzly bear recovery zone/primary conservation area shall include a no surface occupancy stipulation and development is not allowed in areas withdrawn from mineral entry.

- 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 lands 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, in cooperation with other land managers, such as by mitigating threats or stressors, providing for wildlife and fish habitat connectivity, and providing social, economic, and ecological conditions that contribute to mutual objectives.

- Several geographic area plan components provide for connectivity, incorporating areas where connectivity across highways is emphasized in several models: GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06 and 07, GA-SM-DC-03, and GA-SV-DC-09, GA-MF-OBJ-01, GA-NF-OBJ-03, and GA-SM-OBJ-04.

- Management area suitability also contributes to connectivity. For example, management areas 1a, 1b, 2a, 2b, 4a, 5a, and 5c are not suitable for permanent road construction, wheeled motor vehicle use, or timber production (see revised forest plan table 34 for more details).

Cumulative effects on the wolverine

Cumulative effects under the Endangered Species Act include state, tribal, local, or private actions that are reasonably certain to occur in the action area. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in the cumulative effects analysis in this biological assessment.

The wolverine trapping harvest during the 30 years prior to 2007 was considered stable, with a statewide average of 10.5 wolverines taken annually during this time period (Giddings, 2009, pp. 35-39). Then, based on research findings by Squires and others (J. R. Squires et al., 2007), wolverine trapping quotas were adjusted downward for the two large ecosystems in the state; the Northern Continental Divide Wildlife Management Unit (WMU 1) and the Greater Yellowstone (WMU 3). Further analysis tied to the genetic make-up of the Montana wolverine population, the issue of maintaining population connectivity, and recognizing the core population areas of three major ecosystems (now including the central Idaho wilderness area) led to additional regulation changes in 2008. These adjustments included delineating four wildlife management units and reducing quotas to a statewide total of five animals, with a central Montana wildlife management unit quota of 0, to promote population connectivity among the three major ecosystems in the state where harvest is allowed (Giddings, 2009, pp. 35-39). In December 2012, a state district court judge in Helena granted a temporary restraining order that blocked the opening of Montana's 2012–13 wolverine trapping season, and it remained closed with a quota of "0" in 2013–14 and 2014–15. The future of wolverine trapping is unknown. The Forest is within wolverine management unit 1 (WMU 1) (northwest Montana), which had a quota of three wolverines (with a maximum of one female) in 2010 and has had a quota of 0 since then (MTFWP, 2015). Since trapping was suspended in 2011, there has been one wolverine trapped accidentally (T. Thier, MFWP, personal communication, 2016). Glacier National Park, encompassing about one million acres adjacent to the Forest, is closed to trapping. Any cumulative effects to the wolverine resulting from trapping and winter recreation access on all lands are highly uncertain at this time, but investigations are ongoing. Management on the Forest has supported wolverine populations in the past and is expected to continue to do so in the future.

Lands managed by the Confederated Salish and Kootenai Tribes include the Mission Mountains Tribal Wilderness Area and the South Fork Jocko Primitive Area. Cumulative adverse effects to the wolverine are not expected as a result of management actions on tribal lands.

Private lands do not generally occur in modeled wolverine habitat on the Flathead National Forest. The human population in northwest Montana has grown at a relatively high rate during the past few decades, and growth is expected to continue. Increasing residential development along highways that cross wolverine habitat and demand for recreational opportunities can result in disturbance or habitat fragmentation,

With respect to connectivity and highways on the Forest, there is one high-elevation paved highway along the border between the Forest and Glacier National Park. Since 2011, there have been two wolverines killed by vehicles in MFWP Region 1 (T. Thier, MFWP, personal communication, 2016). Squires and others concluded that wolverine movements are unpredictable and are not well suited for planning structural highway mitigation projects. They suggested that connectivity for wolverines may be facilitated by limiting permanent developments through conservation easements and land purchases (J. R. Squires et al., 2007). The Forest and Montana DNRC recently completed the Legacy land acquisition in the Swan Valley geographic area of the Forest. This acquisition and other conservation easements on private lands may benefit wolverines in the future by limiting the density of permanent human developments and facilitating movement between mountain ranges.

Wolverine determination of effects and rationale

The proposed action may affect and is not likely to jeopardize the wolverine.

Rationale for Determination

The wolverine is proposed for listing. Five factors are utilized to determine if a species should be listed under the Endangered Species Act (Federal Register at 7874):

A. the present or threatened destruction, modification, or curtailment of its habitat or range;
B. overutilization for commercial, recreational, scientific, or educational purposes;
C. disease or predation;
D. the inadequacy of existing regulatory mechanisms; and
E. other natural or man-made factors affecting its continued existence.

Factor A is the primary factor relevant to the proposed programmatic action. Under factor A, the USFWS recognized the following categories of impacts to wolverine habitat: (1) climate change, (2) habitat impacts due to human use and disturbance, (3) dispersed recreation activities, (4) infrastructure development, (5) transportation corridors, and (6) land management. Effects of climate change and human use and disturbance are described in the affected environment section. As detailed in previous sections, the set of plan components in the revised forest plan limit potential impacts due to human use and disturbance, dispersed recreation activities, infrastructure development, and land management, considering anticipated future climates.

The northern Rocky Mountains portion of the North American wolverine distinct population segment is thought to be the largest subpopulation and the most genetically resilient of the current subpopulations (USFWS, 2013a). Key ecosystem characteristics for the wolverine include high elevations with persistent spring snow, habitat for dispersal, and features such as rocky alpine areas, glacial cirque basins, and avalanche chutes that provide food sources such as marmots, voles, and ungulate carrion. Maternal and natal denning habitat with relatively low levels of human development are important, although the thresholds are unknown. The proposed action has plan components, including standards and guidelines, to maintain, improve, and restore ecological conditions within the plan area to contribute to conservation of the wolverine. In their concurrence letter for the programmatic biological assessment on the North American wolverine for the USDA Forest Service Northern Region, the USFWS (2014e) concurred that potential projects routinely conducted on National Forest Service lands are not likely to jeopardize the wolverine. The proposed action for the Flathead National Forest includes specific plan components for the wolverine that would reduce the risk of future adverse impacts due to recreation activities on the Forest in light of a changing climate and uncertainty of future climate effects. Plan components beneficial to grizzly bear and Canada lynx would also benefit the wolverine. Monitoring items MON-WL-14 and 17 address the wolverine and its habitat (see chapter 5 of the revised plan for more details).

Aquatic Species

This section of the programmatic biological assessment addresses the effects of implementing the revised forest plan for the Flathead National Forest on bull trout.

Bull Trout

Habitat and Life History

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

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

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

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

Status and Distribution

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

Relatively widespread, though not spatially ubiquitous, populations that have declined in overall range and numbers of fish represent the Columbia River bull trout distinct population segment. A majority of Columbia River bull trout occur in isolated, fragmented habitats that support low numbers of fish and are inaccessible to migratory bull trout. The few remaining bull trout ‘‘strongholds’’ in the Columbia River Basin tend to be found in large areas of contiguous habitats in the Snake River Basin of the central Idaho mountains, upper Clark Fork and Flathead Rivers in Montana, and several streams in the Blue Mountains in Washington and Oregon (USFWS, 1998a).

According to Lee et al. (1997), bull trout are widely distributed across the Columbia River Basin, although their current range is about 60 percent of historic distribution. Although many populations of native aquatic species are stable or improving, bull trout are considered to be in decline across their range. Migratory life histories have been lost or are limited throughout the current range due to the introduction of non-native species and intensive land management activities such as road construction and timber harvest that have affected habitat conditions for the species (USFWS, 1998a).

Bull Trout Critical Habitat and Primary Constituent Elements (PCEs)

The USFWS designated bull trout critical habitat on current knowledge of the life history, biology, and ecology of the species. The extent of bull trout designated critical habitat within the activity area includes 596 stream miles across the Forest, within the three core areas identified in the recovery plan (USFWS, 2015c). The Service determined the characteristics of the habitat necessary to sustain the essential life history functions of the species and identified the following primary constituent elements (PCEs) for bull trout critical habitat (USFWS, 2010).

Within the designated critical habitat areas, the PCEs for bull trout are those habitat components that are essential for the primary biological needs of foraging, reproducing, rearing of young, dispersal, genetic exchange, or sheltering. Based on current knowledge of the life history, biology, and ecology of this species and the characteristics of the habitat necessary to sustain its essential life-history functions, the following PCEs are essential for the conservation of bull trout and may require special management considerations or protection:

The relationship between the matrix of pathway indicators (MPIs) (USFWS, 1998b) and PCEs is provided for in Appendix E.

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

(2) Migratory 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 with features such as large wood, side channels, pools, undercut banks and substrates to provide a variety of depths, gradients, velocities, and structure.

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

(6) Substrates 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 (e.g., less than 12 percent) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.

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

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

(9) Few or no non-native predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.

Bull Trout Status

The following discussion is taken from the *Western Montana Bull Trout Conservation Strategy* (USDA-USFWS, 2013). The strategy for was been created in response to ongoing bull trout population declines occurring on and near National Forests in Western Montana, despite efforts to improve habitat quality. The strategy provides a standard process to update bull trout population and habitat status, a structured and consistent assessment of fish habitat conditions including stressors on populations, and prioritized needs by core area on National Forest Lands to give line officers the best available information prior to making decisions on bull trout restoration opportunities.

Flathead Lake Core Area Discussion

The Flathead Lake watershed is one of the largest, most complex, and best-documented bull trout core areas in the upper Columbia River watershed, encompassing 125,000-acre Flathead Lake (the largest freshwater lake in the United States west of the Mississippi River) and a large portion of northwest Montana extending into British Columbia, Canada. The Flathead Lake Core Area includes all of Flathead Lake and the North Fork of the Flathead River, Middle Fork of the Flathead River, and South Fork Flathead River (up to Hungry Horse Dam) and all tributaries within these described areas. The South Fork above Hungry Horse Dam forms the separate Hungry Horse Core Area. The Whitefish and Stillwater River systems are separate core areas and are currently insignificant contributors of bull trout to the Flathead Lake Core Area, due in part to low current population densities of fish that are restricted primarily to their headwaters, although they may have been more important historically. The Swan River is a separate core area from the outlet of Swan Lake upstream (Swan Lake Core Area) and also was apparently historically isolated due to the warm thermal regime of the lower Swan River. The conservation strategy only addresses bull trout populations on the Flathead National Forest and does not include populations within Canada and Glacier National Park.

The South Fork of the Flathead (upstream of Hungry Horse Dam) was a naturally important contributor to Flathead Lake. Zubik and Fraley (1987) estimated that potential habitat for about 2,100 spawning adult bull trout (and 65,287 migratory juvenile cutthroat trout) was lost annually to Flathead Lake in the South Fork of the Flathead (38 percent of the drainage basin) with the closure of Hungry Horse Dam in 195 3. Based on comparative population levels of spawning bull trout in the North Fork and Middle Fork, the loss statement (Zubik & Fraley, 1987) estimated that between 4,844 and 6,966 adult bull trout would have spawned in the Flathead River forks in the early 1980s without the dam.

Some biologists believe current bull trout densities in the Flathead Lake Core Area are approximately 10 percent of what they were historically, and other biologists believe current populations may be as much as 50 percent of what they were historically. The distribution of populations throughout the core area is

likely similar to historic patterns. 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, as most populations are currently and were historically primarily adfluvial.

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. Beginning in the late 1800s, however, European settlement in the area increased, which brought more fishing pressure and intensive land uses that directly affected bull trout and their habitats. Bull trout were commonly viewed as "trash fish" for decades and indiscriminately killed (until the 1950s, when tributaries were closed to fishing for bull trout—it is not clear whether these closures were due to observed population declines or were a proactive measure to protect vulnerable spawners). Logging by the 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. These practices resulted in both direct mortality to bull trout inhabiting the river and also long-term simplification of habitat that negatively affected the productivity and carrying capacity of the system for decades. Construction of the transcontinental railroad caused significant impacts along the Middle Fork of the Flathead River, and road construction practices of the time paid little concern to important riparian habitat and access to spawning grounds. The mainstem Flathead River upstream of Flathead Lake was subjected to intensive snag removal and channel clearing to clear the way for steamboat traffic upstream from Flathead Lake.

Beginning around 1905, another long-term impact to the system arrived with the stocking of lake trout in Flathead Lake (lake whitefish were also planted around this time, but their impact on bull trout has been minimal, so far as is known). In 1910, other non-native fish were planted in the lake and throughout many tributaries. Yellow perch, brook trout, Yellowstone cutthroat trout, rainbow trout, and kokanee were all stocked in the system between 1910 and 1916. The effects of these species have not all been the same. As mentioned, lake trout likely had the largest long-term negative effect on bull trout through direct predation and competition for similar food resources in Flathead Lake. Brook trout have colonized much of the valley habitat (though less common in the Middle Fork and North Fork tributaries) and in so doing may have had effects on formerly productive bull trout populations. Kokanee, on the other hand, likely had a neutral or positive effect on bull trout populations by providing an abundant high-calorie food source in the lake and in the rivers where the larger fish migrated and spawned when they matured. It is thought that kokanee, an obligate planktivore, largely replaced formerly abundant native westslope cutthroat trout, but they may have bolstered bull trout populations by creating an unnaturally elevated prey base.

In the 1950s-1960s, another era of extensive logging in the three forks of the Flathead River headwaters of the core area began. This time, extensive road networks were constructed to access timber, which resulted in increased erosion and a proliferation of small-scale fish barriers at road/stream crossings throughout the watershed. These roads not only affected habitat but also facilitated increased fishing and harvest or poaching of spawning bull trout in many tributaries. These impacts occurred on both Flathead National Forest and state forest lands as well as Plum Creek Timber Company and other private lands throughout most of the Flathead Lake Core Area.

The 1964 flood was a record-breaking event that took out large portions of Highway 2 and the railroad along the Middle Fork of the Flathead River. Many streams were scoured to bedrock and large wood was flushed from the system, which simplified habitat. Streams may still be recovering from the effects of the flood.

On the fisheries front, Mysis shrimp were introduced into several Flathead Valley lakes in 1967, which ultimately spread to Flathead Lake (1981) and disrupted the food web interactions in the system. The establishment of Mysis was determined to be responsible for the collapse of a formerly strong population of kokanee salmon and fueled major increases in lake trout and lake whitefish populations (Spencer, McClelland, & Stanford, 1991). Predation, competition, or other forms of negative interaction with lake trout is widely believed to be the single factor most responsible for the currently depressed condition of bull trout in this core area (MFWP-CSKT, 2000). However, these complex interactions and the specific role of each in the Flathead Lake Core Area remain unsettled and are a source of major disagreement and ongoing concern.

Ongoing summary and discussion of recent (MFWP and CSKT) fish management program direction indicates that Flathead Lake anglers have harvested between 45,000 and 70,000 lake trout annually from 2008 through 2011 (roughly equal to the management goal of 60,000). Catch per unit effort and species composition of lake-wide gill net catch were similar in recent years, and indicators suggest the lake trout population remains stable (B. Hansen & Evarts, 2008) and bull trout and cutthroat trout populations remain stable but lower than pre-Mysis levels. Pike numbers, inhabiting primarily the mainstem Flathead River also appear relatively stable. Recent bioenergetics modeling (Muhlfeld, Bennett, Steinhorst, Marotz, & Boyer, 2008) indicated that northern pike consume nearly 3,500 bull trout annually in the core area and are likely contributing to the predator trap. Monitoring programs indicate that bull trout redd numbers were at or below secure levels prescribed my managers in the mid-1990s but exceeded secure levels since the late 1990s (Deleray & Hansen, 2002).

In the mid-1990s, with the threat of ESA listing impending, greater angling restrictions were instituted on bull trout harvest. 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 in the lake.

At the current time, many of the past direct habitat impacts associated with logging and road construction have been reduced or eliminated, and therefore some potential stressors on the population no longer play as large a role as they did historically. In addition, much of the habitat where bull trout spawn and rear is protected by Wilderness, National Park, or National Wild and Scenic River corridors. Private land ownership in the three forks of the Flathead is limited. On National Forest lands where bull trout exist, there has been minimal development of new roads or timber sales and a strong emphasis on road decommissioning and application of BMPs, in large part due to grizzly bear security concerns. Potential for significant negative impacts due to sediment production and other wide-scale effects of recent large fires has been largely mediated by favorable precipitation and runoff patterns in the vulnerable post-fire periods. The full implementation of the selective withdrawal system at Hungry Horse Dam has restored more normative flow and temperature regimes to the mainstem Flathead River.

Though Hungry Horse Dam on the South Fork Flathead River removed a substantial portion (an estimated 38 percent) of the spawning and rearing habitat, the integrity and connectivity of the remaining habitat in the North and Middle Fork 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.

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 2012, index redd counts ranged from 130 to 251 redds, averaging 195. 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 the 30 survey years, representing "all 31 stream sections known to be used by Flathead Lake spawners" (T. Weaver, 2008, 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.

Thus, there is considerable uncertainty regarding bull trout status and trends in the Flathead Lake Core Area, but recent Basin-wide counts would seem to indicate an adult bull trout population of at least 1,600 fish in this core area (3.2 adults per redd conversion factor), perhaps as high as nearly twice that (adding in non-spawning adults that remained behind in the lake or river).

Currently, the main threats to bull trout in the Flathead Lake Core Area are (1) introduced species/fisheries management, (2) Forest management practices and Forest roads, and (3) angling or harvest (legal or illegal). The USFWS convened a bull trout scientific review team in 2008 that agreed with 100 percent consensus that these three threats, in this order, currently represent the greatest threats to bull trout in the Flathead Lake Core Area. Given that threat (2) is currently being mitigated by BMPs and other actions and that active forest management activities are much reduced in scope, and also that the overall habitat trend is improving, they concluded that the non-native species threat (especially lake trout and Mysis but also northern pike and other warm-water fish) poses the greatest ongoing risk to bull trout in the Flathead Lake Core Area. The Forest Service will continue to play a leading role in facilitating appropriate habitat improvements for bull trout on Forest Service lands. Similarly, the Forest Service will continue to engage with partners, including the MFWP, USFWS, and the Confederated Salish and Kootenai Tribes, on native and non-native fish management issues in the core area, needs, and recovery planning.

Flathead Lake Core Area—Flathead National Forest

There are thirteen local populations within the core area on the Flathead National Forest, eight of which are index reaches. Ole, Park, and Nyack Creek are not included here 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 in this conservation strategy because 90 percent or more of the land base is under state ownership. 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 Basin.

Flathead Lake Core Area Summary

Table 39 summarizes relevant information from each of the 6th field HUC local populations. This summary provides an overall assessment of the importance of restoration activities for the entire Flathead Lake 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. 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 39. Summary of important local population attributes and conservation recommendations for the Flathead Lake Core Area.

Local Population	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Trail Creek	Upper Trail Creek	Low	Low	Conserve
	Lower Trail Creek	High	Low	Conserve
Whale Creek	Upper Whale Cr	Low	Low	Conserve
	Shorty Creek	High	Low	Conserve
	Lower Whale Creek	High	Low	Conserve
Red Meadow Creek	Red Meadow Creek	Low	Low	Conserve
Coal Creek	Upper Coal Creek	Low	Low	Conserve
	South Fork Upper Coal Creek	High	Low	Conserve
Big Creek	Hallowat Creek	High	Moderate	Active
	Upper Big Creek	High	Moderate	Active
	Lower Big Creek	Moderate	Low	Active
Strawberry Creek	Strawberry Creek	High	Low	Conserve
Bowl Creek	Bowl Creek	High	Low	Conserve
Clack Creek	Clack Creek	High	Low	Conserve
Schafer Creek	Schafer Creek	High	Low	Conserve
	Dolly Varden Creek	High	Low	Conserve
Morrison Creek	Morrison Creek	High	Low	Conserve
Granite Creek	Granite Creek	High	Low	Conserve
Long Creek	Long Creek	High	Low	Conserve
Bear Creek	Bear Creek	High	Low	Conserve
Frozen Lake*	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. 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.

Hungry Horse Core Area Discussion

The Hungry Horse 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 1954, isolates the South Fork Flathead River drainage from its former connectivity with Flathead Lake, cutting off about 38 percent of the spawning and rearing habitat for the Flathead Lake core area (Zubik & Fraley, 1987). The Hungry Horse 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 Core Area was considered "strong" and "stable" based on information available at the time of listing (USFWS, 1998a). This was the only Montana core area accorded 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 then, the population has continued to remain stable and even increase, suggesting that the status and trend calls were accurate. The distribution of bull trout populations throughout the 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 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., rainbow trout and 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 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 1954 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. 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 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 & 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 & 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 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 large 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). There are few current threats to bull trout in the core area. Currently, the greatest threats are angling (legal or illegal) and reservoir operations, in that order (USFWS, 2008).

The recreational bull trout fishery on Hungry Horse Reservoir has continued since 2004 and is being closely monitored (Hensler & Benson, 2007; Rosenthal, 2009, 2010; Rosenthal & 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, bull trout populations have not 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. In recent years, logging activities have been minimal with the exception of some post-fire salvage. Rain-on-snow events heavily impacted westside 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.

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. Bull trout redd numbers in the eight index reaches throughout the Hungry Horse Core Area from 1993 through 2015 can be found in appendix F of this BA. 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.

Hungry Horse Core Area—Flathead National Forest

There are ten local populations within this core area on the Flathead National Forest. These are:

1. Danaher Creek
2. Youngs Creek
3. Gordon Creek
4. White River
5. Little Salmon Creek
6. Bunker Creek
7. Spotted Bear River
8. Sullivan Creek
9. Wheeler Creek
10. Wounded Buck

Two simple core areas are also discussed below: Big Salmon and Doctor Lake.

All ten local populations in the core area support adfluvial bull trout spawning; 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.

Hungry Horse Core Area Summary

Table 40 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 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 40. Summary of important local population attributes and conservation recommendations for the Hungry Horse Core Area.

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

Local Population	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Little Salmon Creek	Little Salmon Creek	High	Low	Conserve
Bunker Creek	Lower Bunker Creek	High	Low	Passive
	Upper Bunker Creek	High	Low	Passive
	Gorge Creek	High	Low	Conserve
Spotted Bear River	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	Sullivan Creek	High	Moderate	
Wheeler Creek	Wheeler Creek	High	Moderate	
Wounded Buck Creek	Wounded Buck Creek	High	Low	
Doctor Lake	Upper Gordon Creek –	High	Low	
Big Salmon Lake	Big Salmon Lake	High	Low	

[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 Discussion

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 always limited the degree of bull trout movement between Flathead Lake and the Swan system. This observation is supported by genetic evidence. The Swan Lake Core Area has therefore likely always functioned primarily as a separate core area from the Flathead.

Swan Lake is recognized as a bull trout stronghold. USFS and USFWS biologists believe that 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. The distribution of populations throughout the core area is likely similar to historic patterns as well, with populations still relatively widespread where suitably sized streams exist. Life form expression (dominated by adfluvial adults) is probably also similar, as no major barriers exist. Bigfork Dam is the only large barrier, and its impact on bull trout movement is probably minimal due to natural water temperature issues described above. There is a barrier near the mouth of Cooney Creek, but the degree of impact this may have on bull trout is not clear.

Bull trout populations in the Swan Lake Core Area were likely first exposed to significant human-caused impacts in the late 1800s. Prior to this time, bull trout were harvested by native Salish and Pend d'Oreille peoples for thousands of years and maintained relatively robust and widespread populations throughout the Swan Lake Core Area. Beginning in the late 1800s, however, 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 the Kalispell and Flathead Company and the Forest Service in the early 1900s was directly and indirectly responsible for much of the change in habitat as large drainages important for adfluvial bull trout were roaded and harvested.

Beginning in 1910, another major change to the watershed began to take place as non-native fish were planted in the lake and throughout many tributaries. Yellow perch, brook trout, Yellowstone cutthroat trout, rainbow trout, and kokanee were all stocked in the system between 1910 and 1936. The effects of these species have not been uniform. Brook trout had perhaps the biggest long-term negative effect on bull trout, bringing threats of both competition and hybridization that continue to this day. In several major bull trout spawning tributaries over half the *Salvelinus* biomass is composed of brook trout and bull trout X brook trout hybrids. Kokanee, on the other hand, likely had a positive effect on bull trout populations by providing an abundant high-quality food source in the lake where the larger fish matured. Although kokanee 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.

In the 1950s-1960s, however, another era of extensive logging in the core area began. This time, roads were constructed to access the timber, which resulted in increased erosion and a proliferation of small-scale fish barriers at road and stream crossings throughout the watershed. 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 Plum Creek Timber Company lands throughout most of the Swan Lake Core Area.

On the fisheries front, the same time period saw the introduction of Mysis shrimp in 1967 and the introduction of northern pike in approximately 1970 into Swan Lake. Mysis actually had a beneficial effect on bull trout populations because they supplemented the food chain, but pike had the opposite effect by becoming not only a predator to juvenile bull trout but also a potential competitor for available food 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 pike recruitment combined with robust productivity of bull trout in the system. The combined impacts of non-native species, angling/poaching, and land management activities appear to have caused a marked decline in the bull trout population from about 1950 to the mid-1990s.

In the mid-1990s, with the threat of Endangered Species Act listing impending, greater angling restrictions were instituted on bull trout harvest. Angler harvest was gradually restricted over time, and now no harvest of bull trout is permitted upstream of Swan Lake. Perhaps most significantly, the four most important spawning streams (Lion, Goat, Squeezer, and Elk) allow no recreational fishing at all, thus eliminating any incidental mortality. This action, along with cumulative effects of improved 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 population was considered strong enough to permit a limited recreational fishery on the lake itself. It is now a catch-and-release fishery.

The last several years, however, have seen a reversal in redd counts, suggesting that the population is again declining, and there may be several reasons for this decline. The recent increase in lake trout in Swan Lake is most likely partially responsible for the decrease in bull trout, as they are both top-level

predators competing for the same resources and predation on bull trout by lake trout does occur to some degree. In addition, the intense effort at lake trout removal in 2007-2012 (over 30,000 lake trout gillnetted and removed) resulted in a by-catch of approximately 1,500 bull trout and the projected mortality of nearly half these fish. The inherently high variability in bull trout populations may also be expressing itself. In any case, bull trout in the Swan Lake Core Area, although not currently represented at the levels they were historically, are still stronger than most core areas and likely represent a population that will remain strong if the lake trout threat can be successfully mitigated.

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. 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. Streamside buffers appear to adequately protect fish habitat during ongoing timber harvest. Recent federal acquisition of Plum Creek lands through the Montana Legacy Project and 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.

Bull trout redds in many of the index reaches throughout the Swan Lake Core Area are relatively stable over the time period prior to lake trout establishment in Swan Lake, but overall redd numbers are down recently due to the significant declines in Elk and Lion Creeks. These two streams produce a large portion of the overall redds in the basin and therefore influence cumulative counts.

Currently, the main factors limiting bull trout populations in the Swan Lake Core Area are probably the lake trout and other non-native fish communities throughout the system (mainly northern pike in the lake and brook trout in tributaries), combined with the legacy of past land management actions that resulted in impacts to stream habitat. Other impacts, such as fishing mortality and poaching, also remain a concern.

Although none of these impacts is easy to address, it is important that we begin to address them while there are still relatively healthy bull trout populations to work with in the Swan Lake Core Area. It is likely that the impacts from any one of these sources cannot be eliminated entirely, but persistent improvement in each will contribute synergistically to a stronger population over the long term, which will move the bull trout closer to delisting and ultimately to recovery.

For example, it is unlikely that non-native fish can be completely eliminated from the watershed. However, the Forest service should continue to coordinate with MFWP on management that reduces the numbers and distribution of non-native trout if it would benefit bull trout recovery in the watershed. Similarly, with the recent large-scale change in land ownership associated with the Montana Legacy Project, there will be opportunities to manage tributary watersheds more for the long-term productivity and resilience of aquatic ecosystems rather than strictly for timber production. The transportation system could also be addressed more comprehensively due to these changes.

Swan Lake Core Area: Flathead National Forest

There are nine local populations within this core area on the Flathead National Forest. They are as follows:

1. Elk Creek
2. Cold Creek

3. Jim Creek
4. Piper Creek
5. Lion Creek
6. Goat Creek
7. Woodward Creek
8. Soup Creek
9. Lost Creek

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 basin. There are two disjunct populations (Holland and Lindbergh Lakes) that are considered separate core areas and are also monitored on an annual basis. Unfortunately, both Holland and Lindbergh Lake have been recently invaded by lake trout. So far as is known, limited interchange of bull trout occurs amongst the three Swan core areas. Discussions of these two simple core areas are also included in this chapter.

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.

Swan Lake Core Area Summary

Table 41 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 Forest has no ownership that may be critical for overall restoration of the bull trout population in the core area.

Table 41. Summary of important local population attributes and conservation recommendations for the Swan Lake Core Area.

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

Local Population	6th level HUC Name	Significance to Local Pop.	Contribution of Habitat in Limiting Pop.	Conservation Strategy[a]
Holland Lake	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.

INFISH Standards and Guidelines

The Inland Native Fish Strategy (INFISH) (USDA, 1995c), 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 the INFISH amendment, the 1986 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 (USDA, 1995c, pp. 1-2). 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, the intensity and risks associated with new and ongoing land management activities have been greatly reduced compared to the decades prior to the 1986 plan.

INFISH has been implemented considerably longer than its intended 18 months. The strategy has been documented to be effective in protecting aquatic resources through ongoing PACFISH/INFISH biological opinion (PIBO) effectiveness monitoring (M. P. Meredith et al., 2011); however, the one component identified as lacking in INFISH is active restoration. The absence of a clearly stated aquatic restoration goal in the existing plan was one of the many items identified as needing to be changed in the plan revision process, so the revised forest plan includes direction for restoration.

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 would also help move projects and activities towards the desired conditions and improve aquatic habitats. Table 42 provides a conceptual crosswalk between INFISH and the revised plan.

Table 42. Crosswalk of Plan Components under INFISH to ARCS

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 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	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

1995 INFISH Component	Comparable INFISH component/strategy In 2017 Flathead Plan	Differences between 1995 INFISH and 2017 Flathead Plan	Rationale for Changes
		analysis, which compares populations of managed conditions against populations of unmanaged conditions	planning rule require a completion date, which would be difficult to predict for riparian instream conditions.
Riparian habitat conservation areas (RHCAs)	Component carried forward with Name change Riparian Management Zone, to be consistent with Planning Rule	Some adjustments to widths for wetlands (Increase), otherwise draft plan components do require minimum widths same as 1995 Infish.	Changes made between proposed action and DEIS to 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.	

Refer to appendix D for plan components related to bull trout.

Effects of the Proposed Action

General effects at the forestwide scale

Healthy riparian areas stabilize stream channels, provide storage for sediment, serve as nutrient sinks for surrounding watersheds, improve the quality of the water leaving the watershed (DeBano & Schmidt, 1989; Platt, 1991), reduce the energy associated with high flow events, and therefore provide the best conditions for bull trout and their habitats. Riparian areas are dynamic and are susceptible to effects from management activities but are resilient and can recover quickly when managed correctly (DeBano & Schmidt, 1989); riparian areas are also resistant to those effects if in a healthy condition.

Nearly all activities allowed within the different management area categories in the revised forest plan have the potential to indirectly affect bull trout and their habitats in a beneficial or negative manner. Land management activities that disturb the soil surface or require added use of already disturbed features such as road prisms have 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, and recreation. Because the cause-and-effect relationships from land management activities are typically indirect, it is difficult to predict exactly what would happen to bull trout habitat and populations as a result of implementing the proposed action, especially with the protective measures outlined above under plan components.

The proposed forestwide 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, forestwide 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 and critical habitat 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.

General effects of typical management activities

Vegetation management

Managing vegetation on forest lands can impair water quality by routing runoff and sediment onto bottomland stream areas. Over the last planning period under the 1986 plan forest as amended by INFISH, the Forest addressed these impacts by regulating the extent of upland timber harvest, applied best management practices to limit stream connection from impervious surfaces, and minimized entries into riparian habitat conservation areas to provide protection from upslope activities and filter runoff. These best management practices were instituted in the 1980s to control non-point source pollution (Binkley & Brown, 1993), and the riparian habitat conservation areas were established by the 1995 INFISH amendment. According to results from the State of Montana audits of BMPs, the Forest Service BMPs were effective 96 percent of the time (Ziesak, 2015).

Forest management disturbs uplands through removal of tree canopy and the yarding of the material to a central processing facility. Site preparation historically reduced groundcover by broadcast burning remaining vegetation to bare soil for planting and to clear remaining fuels. The practice in the 1980s produced higher-severity fire because the purposeful clearing of this vegetation also removed protective groundcover. The Flathead National Forest has largely moved away from this practice, instead using either mechanical piling/burning or prescribed fire as primary methods for reducing hazardous fuels. A change in contemporary timber practices to whole tree yarding has further reduced remaining vegetation while preserving protective groundcover covering at least 85 percent of the area, based on soil monitoring data (Milner, 2015).

Studies have documented increased sediment erosion associated with timber harvest, but the primary agent is sediment from roads (Bilby, Sullivan, & Duncan, 1989; Luce & Black, 1999; Sugden & Woods, 2007). Management controls non-point delivery of sediment within harvest areas through the use of water and soil conservation practices and best management practices (USDA, 2012b), focused on stabilization of log skidding and landing networks where erosion is most probable. Otherwise, forests generally have very low erosion rates, with chronic erosion after disturbance lasting typically 1 to 3 years (Elliot, Hall, & Scheele, 2000). After timber harvest and site preparation, regrowth of vegetation covers the soil surface with plant litter, soils armor, and potential erosion hazard becomes low (Elliot et al., 2000).

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

The loss of forest canopy on harvest sites changes the water balance; studies in the Pacific Northwest have documented cases where excess water from harvest areas influence the peak and timing of stream flows (Keppeler & Ziemer, 1990; Moore & Wondzell, 2005; Stednick, 1996). In reviews, these cases depended largely on the extent of harvest and the climatic regime (Grant, Lewis, Swanson, Cissel, & McDonnell, 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, Bilby, Brown, Holtby, & Hofstra, 1987; Gomi, Moore, & Dhakal, 2006; J. S. Macdonald, Beaudry, MacIsaac, & Herunter, 2003).

Watershed yield studies have specifically targeted timber harvest activities that would generate a response and might not necessarily mimic current forest practices. Beschta et al. (2000) found a weak relationship between forest harvest and increased peak flows and reported “mixed messages” about the relationship between forest harvest and peak flow responses. Numerous studies documented the effects of forest canopy removal on peak flows in the Pacific Northwest (Beschta et al., 2000; Hubbart, Link, Gravelle, & Elliot, 2007; J. A. Jones & Grant, 1996; Kuras, Alila, & Weiler, 2012; Thomas & Megahan, 1998; Tonina

et al., 2008), but, surprisingly, very few demonstrated a direct link between water yield/peak flow changes and measured channel impacts in forested environments. In the latest review of studies in the Pacific Northwest, Grant et al. (2008) suggested that if degradation were to occur, channels most sensitive to peak flow changes are low gradient with gravel bed and sand bed substrates.

Forest Service analysis techniques rely on relationships between canopy cover area and generalized recovery trends to evaluate risks associated with harvest. One of these approaches uses equivalent clearcut acres (ECA) to equilibrate area harvested to runoff potential (Ager & Clifton, 2005) to evaluate potential effects on streams. However, establishing a direct relationship between ECA metrics and channel conditions is difficult. Schnackenberg and MacDonald (1998) found no correlation between ECA and stream channel characteristics in forested catchments in Colorado. MacDonald and Hoffman (1995) studied the relationship between WATSED-predicted water yield/peak flow increases and channel characteristics on the Kootenai National Forest. WATSED similarly equilibrates the area harvested to potential sediment. None of the channel types (pool riffle or colluvial step-pool) showed any increase in bankfull width or width/depth ratio with more intensive management. In addition, there was no apparent correlation between the amount of timber harvest and the magnitude of peak flows, and climatic differences are the dominant control on the size of peak flows in the study area (L. H. MacDonald & Hoffman, 1995). These studies highlight the difficulty in associating size of harvest to effects at the reference scale of a watershed.

The concern over changes to peak flow from timber harvest was raised when timber was harvested on a larger scale than current. The Forest no longer harvests timber at the rate seen in the 1970s. Average annual harvest rates were 11,000 acres in the 1980s compared to roughly 2,000 acres currently. In addition, many of the classic watershed studies could not disentangle the effects from roads, where at least 2 percent of the study areas had roads and skidding networks (Grant et al., 2008). Forest management has somewhat alleviated these effects by establishing streamside zones (riparian habitat conservation areas with INFISH), reducing road construction, and implementing BMPs. Plan components limit further road construction within the primary conservation area for grizzly bears and within the conservation watershed network that applies to 87 watersheds out of a total of 220 watersheds.

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 7 are suitable for scheduled timber production. The revised forest plan would continue to limit timber harvest in RMZs through riparian standards and guidelines, since the primary objective of such management would either be for the direct benefit of riparian and stream (inner RMZs) or not retard riparian and stream condition (outer portion of the RMZs).

Sedimentation 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 since temporary roads were not addressed under INFISH.

Restoring soil productivity on previously impacted areas is a forestwide objective (FW-OBJ-SOIL-01), and existing sedimentation issues would therefore continue to improve under the revised forest plan.

Project-level design criteria contain direction to protect soils during vegetation treatment such as timber harvest and prescribed fire (FW-GDL-SOIL-01, 02, 03, 04), and 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.

With regards to vegetation management within RMZs, inner and outer zones are being established. For fish-bearing and perennial streams, the inner zone is 150' and 50' for intermittent streams. FW-STD-RMZ-06 applies to the inner RMZ, and vegetation management shall only occur to restore or enhance aquatic and riparian resources. In other words, entry into the inner zone will be limited, and this is due to the critical role the inner zone provides for shade, large woody debris recruitment, bank stability, and sediment control. It is the intent of this standard to provide for riparian and aquatic processes and functions and protect them.

The outer zone for fish-bearing streams is 300' and 150' for perennial streams (essentially perennial streams' outer and inner zone are the same as riparian functions, and processes function the same regardless of fish presence). The outer zone for intermittent streams is 100'. Guideline FW-GDL-RMZ-15 is designed to allow management within the outer zone with a priority of avoiding ground disturbance so as to not create sediment and ultimate transport to streams. In addition, additional guidelines (FW-GDL-RMZ 08-11) restrict clearcutting in the outer RMZ and require 350' cover distance, which will limit management activities within the outer RMZ. Lastly, FW-GDL-RMZ-13 prohibits road and landing construction in an RMZ unless needed to cross a stream.

Fuels Management

Fire effects vary according to fire intensity, severity, and frequency, which are the primary factors that define fire regimes. Wildfires can affect water chemistry, water quantity, and stream channel structure through changes in transpiration, infiltration, groundwater recharge, erosion and mass wasting, riparian shading, and the recruitment and delivery of coarse debris (Benda & Dunne, 1997; Gresswell, 1999; Moody & Martin, 2001a, 2001b; Wondzell, 2001). Potential post-wildfire risks from floods, landslides, and debris flows to human life, property, and/or municipal supply watersheds are an increasing concern across the western United States (Moody & Martin, 2001a).

Climatic events following wildfire can trigger surface erosion or mass failures (landslides), which in turn can deposit sediment that alters stream channel structure and function. Severe wildfire can result in large expanses of blackened area that has high potential for generating runoff and delivering sediment to streams when intense rainstorms occur. When wildfire burns through a riparian area, the outcome may leave the riparian area with no shade, which increases water temperatures. This effect may be offset by cooler groundwater from adjoining slopes.

Long-term fire suppression causes forest successional processes to continue, which can increase evapotranspiration and interception, potentially resulting in less water available for wetlands. In many cases, lack of fire can lead to the encroachment of woody species (primarily shrubs) into peatland habitats, which could lead to competitive exclusion of herbaceous species. Suppression of natural fire regimes causes fuel loads to accumulate. When wildfire does occur, the intensity and severity are often higher than they would be with more natural levels of fuels. This can result in higher rates of fuel consumption and availability of ash and nutrients that can be delivered to aquatic environments. Suppression of natural fire regimes results in forests that have more leaf area. This results in higher

evapotranspiration and interception levels, which leaves decreased amounts of water available for surface and subsurface flow. Lower levels of stream flow can affect aquatic species because of warmer water temperatures and changes in water chemistry. In addition, fire suppression can allow fuels to accumulate above natural levels, which can cause wildfires to burn more severely. This process can change infiltration characteristics of the soil and change hydrologic characteristics. Fire suppression activities, such as retardant use and drafting water from streams, can also affect bull trout.

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

Wildfire suppression tactics can affect watershed resources through the building of firelines and large fuel breaks and use of fire retardant, which cause soil disturbance and remove vegetation. Ground disturbance from wildfire suppression, in addition to the baring of ground caused by wildfire, can cause a net decrease in effective groundcover so that it no longer resists rainfall runoff. These activities can route sediment to streams from compacted machine paths and linear features, which channels runoff. Post fire rehabilitation attempts to mitigate these effects across the fire area. The action alternatives would mitigate these effects by limiting fire suppression activities away from the most sensitive areas, the RMZs. The preferred alternatives carries forward forest plan components to locate fire camps away from riparian areas where risk of sedimentation and degradation to water quality is highest (FW-GDL-RMZ 3). The preferred alternative would have stronger language to avoid degrading water quality from suppression activities by minimizing suppression activities in RMZs (FW-GDL-RMZ 5), with specific direction to avoid fuel storage in RMZs that could drain runoff into streams (FW-GDL-RMZ 4).

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

Other fire suppression effects to water quality occur from fire retardant drops. Large quantities of retardant can kill fish, and indirectly fire retardant can kill stream invertebrates and cause eutrophication of downstream reaches (Spence, Lomnicky, Hughes, & Novitzki, 1996). The preferred alternative 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 2). 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. 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 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.

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, Roelofs, & Yee, 1991).

Natural drainage patterns are affected long-term by the mere presence of roads. 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 (R. Al-Chokhachy et al., 2016; Robert Al-Chokhachy, Roper, & Archer, 2010). In general, roads lacking surface rock, those with steep grades and steep sideslopes, 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 hill 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.

Vehicular traffic also contributes to sediment delivery from roads, particularly if ruts develop in the road and if traffic is heavy during the shoulder seasons 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 (R. Al-Chokhachy et al., 2016; Cissel, Black, Nelson, & Luce, 2014).

The location and design of valley bottom roads also create long-term effects on water resources. Poorly placed roads can encroach on stream channel and floodplain areas. Many older roads were constructed very close to stream channel areas, often in the floodplain. Often, 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, this can set forth a chain reaction of channel adjustments that can result in accelerated bed and streambank erosion, which produces excessive sediment (R. 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. Good 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 these 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 & 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 and leading to culvert blockage and failure. 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 result from the construction of roads, road grading, ditch cleaning, culvert replacement, road ripping or decompaction, and the installation of waterbars due to the heavy equipment excavation that these activities require. Minor amounts of fine sediment would 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 are 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 would improve the quality of riparian and aquatic habitats in presently impacted stream reaches by reducing chronic sediment sources. If relocation is not possible, seasonal restrictions could limit road damage and subsequent sedimentation.

The potential risk of detrimental effects exists as long as the road is retained. The continued use and existence 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 some sediment is expected to be delivered to streams during culvert removal and decommissioning processes, the amount of sediment delivered to streams is 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. How much water or stream temperature improves depends on the existing stream shade that blocks solar radiation and water temperature, the stream's size, and how much riparian road is removed or closed.

Under the existing 1986 forest plan as amended by INFISH, activities have helped to improve soil and aquatic resource conditions through changes in road and travel management. Forest roads that are

maintained on an annual basis are typically those roads that have the most administrative and visitor use. Roads that have been closed or receive limited visitor use have revegetated to some degree or have been decommissioned. During the last several years, many roads that are graded have had new surfacing, such as gravel or oil, to reduce the rate of road deterioration and subsequent erosion from road surfaces. Several roads have been moved out of riparian areas or decommissioned, and culverts were installed or removed at stream crossings that were contributing sediment directly to the aquatic ecosystem or impeding passage of aquatic organisms. Although there have been improvements to the overall road network from the decommissioning and restoration of stream crossings, some crossings will continue to affect bull trout migration into historical habitats due to improperly designed structures from past management. Maintenance, closure, and decommissioning of roads, as well as restoration efforts at crossings, are expected to continue at similar or slightly increased levels compared to recent levels.

Existing roads will be routinely improved, upgraded, or decommissioned as determined by project-level planning efforts; new road construction will be limited due to grizzly bear standards which set the baseline at the 2011 level; and road decommissioning activities will offset the overall environmental effects of new road construction.

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 or roads into intermittent storage as an annual average over a 5-year period (FW-OBJ-IFS- 01). These efforts are most likely to occur in management area 6, where active restoration opportunities present themselves through the implementation of site-specific projects. With the application 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 native fish would continue with implementation of the revised forest plan (FW-STD-IFS-7, FW-GDL-IFS- 3-11, 14, and 15. 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 that they should be treated to assure that they are hydrologically disconnected from the stream network and in a stable condition. The Forest has developed a monitoring plan in cooperation with USFWS that rolled previous terms and conditions from project Biological Opinions into the plan. The monitoring plan develops a rotating panel to survey and correct problems that may be identified.

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.

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

Livestock Grazing

Livestock grazing near streams can result in changes in channel morphology (Belsky & Gelbard, 2000; Platt, 1991). Livestock trailing and general soil displacement along stream bank areas can result in collapse of undercut bank areas and an overall increase in bank angle, loss of bank cover, and stream widening along the entire stream reach. Over long periods of time, grazing can lead to an entire channel

becoming downcut to the point that gully erosion is initiated and a new channel is formed at the bottom of the gully. This type and extent of downcutting results in an entire channel type change. Livestock trampling streambanks can increase ground exposure, surface erosion, and sedimentation. Concentrated livestock waste can cause eutrophication of lakes and ponds. Livestock grazing directly in wetlands or immediately adjacent to them can cause soil compaction, hummocking, and loss of vegetation, ultimately inhibiting subsurface water flow.

Removal of riparian vegetation through livestock management can influence the amount of solar radiation and water temperature regimes. These changes can ultimately lead to shifts in dissolved oxygen and pH. In addition, removal of riparian vegetation can increase nitrate levels, which can increase the biological production in water. Loss of riparian vegetation can influence the amount of solar radiation reaching a water body and increase water temperatures. Greater temperature fluctuations (diurnal and seasonal) can also occur when riparian vegetation is removed or decreased. Livestock grazing has the potential to cause increased sediment delivery through trampling of stream banks and removal of riparian vegetation.

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.

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

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

available energy stores may also reduce their effectiveness in competing for food, defending territories, or spawning.

Streambank trampling, camping along the stream's edge, heavy fishing, and off-road vehicle use usually result in the loss of vegetation within riparian areas. Loss of vegetation from shorelines, wetlands, or steep slopes can cause erosion and pollution problems (Burden & Randerson, 1972; Quigley & Arbelbide, 1997).

Trail maintenance can affect large wood recruitment and function that influences stream channel morphology and aquatic habitat. Bucking out fallen trees can reduce the tree's length and sever the bole from its root wad. Smaller tree lengths are not likely to contribute as much to stream channel stability and are more likely to be washed out during high stream flow events. Smaller instream wood will also delay the recovery of channel features needed to maintain habitat for aquatic species, including overhead cover and low-velocity refugia during high-flow events.

Recreational impacts may include rutting, erosion, and loss of groundcover from user trails, trampling of vegetation, vegetation removal, and soil compaction of streamside and upland sites. Rutting may increase surface erosion associated with heavily used hiking or horse trails and off-road vehicles. High-use campsites may cause root damage in trees, resulting in reduced vigor and mortality.

In general, people who recreate in national forests participate in activities such as driving, hiking, horseback riding, hiking, and camping in the vicinity of lakes and streams. Protection of water quality, quantity and riparian habitat near these recreationally important water bodies is achieved through the implementation of watershed conservation practices.

Recreational activities can degrade aquatic, riparian, and wetland environments. Because many existing trails and developed and dispersed recreation sites on the forest are located adjacent to wetlands and riparian areas or, in some cases, within the flood-prone areas of streams, these sites have been subjected to the following impacts: damage to and displacement of riparian vegetation; soil compaction and soil erosion; increased rates of overland flow; sedimentation; and pathogenic contamination of potable and non-potable waters. Often, the aforementioned impacts tend to be localized, but in areas that experience substantial recreational use, the cumulative impacts to aquatic and riparian ecosystems can be both observable and measurable.

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

Most dispersed and developed sites are located within riparian areas; the ground is often hardened and ground vegetation may be removed, but areas have not been identified where excessive sediment from these sites is a concern. Dispersed sites typically do not have toilet facilities, and concentrations of human waste have been found at some locations. Impacts are isolated, and no monitoring has been performed to identify impacts to water-quality parameters. Trees have been felled for safety reasons in campgrounds and will continue to be felled for safety reasons. Under current direction, these trees would be removed or chopped up for use as firewood and would not contribute to instream bank stability, thermal regulation, or fish habitat needs. Once again, this impact is limited to developed recreation site. Generally, PIBO monitoring does not show that large wood is limited in forest streams.

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 forest plan 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 meet the intent to protect and improve water quality and aquatic habitats.

Mining

Locatable minerals

Locatable or hard rock minerals include deposits of gold, silver, copper, etc. There were approximately 63 patented and unpatented mining claims on the Forest, according to the Montana Bureau of Mines and Geology. A 2002 Montana Bureau of Mines and Geology report found that the Big Four Mine on the Swan Lake Ranger District near West Fork Dayton Creek was the only site identified on the Flathead National Forest that had potential impacts on Forest-administered land. Water-quality samples collected in 2000 upstream and downstream of the site indicated no adverse impacts. That mine is no longer active, and the only active mining claim located within the planning area is the Mary Dee II lode claim, which is located on the Hungry Horse Ranger District. None of these mines is within bull trout habitat.

There are no existing mining operations on the Forest. Recreational mining, such as suction dredging, may occur, although the Forest has not received requests for special-use permits for recreational mining. Suction dredging is regulated by federal and state mining laws and regulations. Montana Department of Environmental Quality has closed many of the Forest's bull trout and 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 preferred alternative in the revised forest plan would require remedial action and protection of soil and water resources if permits are approved.

Leasable minerals (oil and gas)

The Flathead River Basin contains federally owned subsurface mineral estate under NFS lands that the federal government has leased for oil and gas development. When legislation was initially proposed in 2010, there were 115 oil and gas leases in the North Fork watershed that the BLM had issued between 1982 and 1985. The leases, which cover over 238,000 acres, are inactive and under suspension as part of the 1985 court case Conner v. Burford. At the request of Senators Max Baucus and John Tester of Montana, leaseholders have voluntarily relinquished 76 leases, totalling almost 182,000 acres. The BLM has not offered any other leases in the Flathead National Forest since the Conner v. Burford litigation suspended the existing leases in 1985.

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 watershed from all forms of location, entry, and patent under mining laws and from disposition under all laws related to mineral or geothermal leasing. H.R. 2259 does not affect valid existing rights, including the 39 leases in the North Fork watershed that are suspended under the Conner v. Burford litigation.

Salable minerals

Salable minerals include common varieties of sand, stone, gravel, and decorative rocks. The Forest Service salable mineral material policy (Forest Service Manual 2850) states that disposal of mineral material will occur only when the authorized officer determines that the disposal is not detrimental to the public interest and the benefits to be derived from proposed disposal will exceed the total cost and impacts of resource disturbance. The Forest 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 come from Forest Service pits and quarries. 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. Usually about 75 permits are issued each year.

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

Effects to Bull Trout and Designated Critical Habitat

The *Recovery Plan for the Coterminous United States Population of Bull Trout* (USFWS, 2015c) identified the bull trout core area as the closest approximation of a biologically functioning unit for bull trout. By definition, a core area includes a combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population that constitutes the basic unit on which to gauge recovery. A core population is a group of one or more local populations that exist within core habitat.

Core areas require both habitat and bull trout to function, and the number and characteristics of local populations inhabiting a core area provide a relative indication of the core area's likelihood to persist (USFWS, 2015c). A core area is a system of watersheds within a larger basin. Each watershed is the habitat for a local population that interacts with other local populations throughout the larger basin. Local populations within a core area have the potential to interact because of connected aquatic habitat. A local population is defined as a group of bull trout that spawn within a particular stream or portion of a stream system. A local population is considered the smallest group of fish that is known to represent an interacting reproductive unit. In most areas, a local population is represented by a single headwater tributary or complex of headwater tributaries where spawning occurs. Gene flow may occur between local populations (i.e., those within a core population), but is assumed to be infrequent compared with that among individuals within a local population. The Flathead National Forest supports 38 local populations and three core areas with bull trout.

Flathead Lake Core Area

The majority of the Flathead Lake Core Area on the Forest is allocated to management areas 1a and 1b (62 percent) and management area 6 (19 percent) (table 43). NFS lands designated management area 6 across this core area will be foreseeably affected by scheduled timber harvest, recreation, prescribed fire, and access management that may result in sedimentation, substrate embeddedness, and other direct or indirect effects from project-level activities. An additional 16 percent of the activity area in this core area is allocated to management area 5 (table 43). 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 nonmotorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would mostly be temporary. 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. The allocation of 80 percent of this 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.

In Big, Coal, and Red Meadow Creeks, the majority of acres are allocated to management areas 5 and 6. As described above, the risk of adverse 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 on bull trout that could result from Forest management activities would be minimized through implementation of RMZ standards and guidelines as well as standards to hold roads within the primary conservation area for grizzly bears to the 2011 baseline. Restoration such as stormproofing roads in these watersheds may result in additional short-term adverse effects related to sedimentation or in-stream activities. These short-term effects would be partially offset by long-term improvements in habitat conditions.

Frozen Lake and Trail and Whale Creeks have the majority of their acres in management area 1b, with recommended wilderness in the headwaters that would be beneficial to bull trout as potential sediment-producing activities would be below bull trout spawning. Management areas 6a and 6b are designated lower within the watersheds and primarily below bull trout spawning, which reduces the likelihood of sediment generated from management activities to affect bull trout spawning and embryonic survival.

Trail and Whale Creeks are prioritized for upgraded culverts and reducing road-related effects as part of the conservation watershed network and as such may have short-term effects that will result in long-term benefits by stormproofing 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, which provides additional protections within a ¼-mile corridor.

Bear, Morrison, and Granite Creeks are in a mix of management areas 5, 6a, 6b, and 1b and currently designated wilderness. 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. Soils in this area are erosive when compared to other areas on the Forest and, unlike other bull trout watersheds in the Middle Fork Flathead, the headwaters are outside of wilderness. 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, and coordination with the Montana Department of Transportation and BNSF will continue to ensure that maintenance operations are consulted on with the Forest 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. Potential impacts to bull trout can still occur from outfitter and guide operations, and the Forest has terms and conditions from previous consultations to provide measures in special-use permits to reduce impacts to bull trout.

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, minor improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7 through natural processes. Substantial changes in PCEs 6, 8, and 9 are not expected in the Flathead Lake Core Area.

Table 43. Flathead Lake Core Area (FLCA)—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)							18,428
Clack Creek	37,595 (100)							37,595
Schafer Creek	16,136 (100)							16,136

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
Dolly Varden Creek	16,465 (100)							16,465
Long Creek	14,078 (100)							14,078
Basin	11,720 (100)							11,720
Trail (Middle Fork)	12,495 (100)							12,495
Frozen Lake	5,922 (69)				2,654 (31)			8,576
Total acres (%) in core area	260,099 (62)	8,874 (2)	0	0	65,150 (16)	81,211 (19)	0	418,299

Table 44. Flathead Lake Core Area (FLCA)—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

The majority (67 percent) of the Hungry Horse Reservoir Core Area is allocated to existing wilderness, management area 1a (table 45). National Forest lands designated management area 6 (15 percent), mainly along Hungry Horse Reservoir tributaries across this core area, will be foreseeably affected by scheduled timber harvest, recreation, prescribed fire, and access management that may result in sedimentation, substrate embeddedness, and other direct or indirect effects from project-level activities. The largest percentage of management area 6 in bull trout watersheds occurs in Wheeler (44 percent), Wounded Buck (34 percent), Sullivan (24 percent), Quintonkon (48 percent), Bunker (9 percent) and Spotted Bear River (7 percent). As described above, the risk of adverse effects on bull trout may be the greatest in this allocation, but may occur in association with recreational trail improvements and moderate intensity timber harvest and general forest activities would occur. Effects in management area 6 would be greater than management area 5 primarily due to road management activities however, effects on bull trout that could result from forest management activities would be minimized through implementation of RMZ

standards and guidelines. Restoration in these watersheds may result in additional short-term adverse effects related to sedimentation or in-stream activities. These short-term effects would be partially offset by long-term improvements in habitat conditions. Additionally, there are no grazing allotments that encompass bull trout occupied streams.

MA6a and 6b are designated lower within the watersheds and primarily below bull trout spawning which reduces the likelihood of sediment generated from management activities to affect bull trout spawning and embryonic survival. Headwaters tend to be protected by management allocation areas that will have less forest management.

An additional 10 percent of the activity area in this core area is allocated to management area 5 (Table 45). 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 nonmotorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would be restricted due to grizzly bear conservation and frozen at the 2011 baseline level. 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 and Sullivan Creek are identified as the highest priorities for stormproofing within the Conservation Watershed Conservation Network which 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.

Spotted Bear River would receive additional protection due to being recommended as a Wild and Scenic River which provide additional protections within a ¼ mile corridor.

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. 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 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 through natural processes. Substantial changes in PCEs 6, 8, and 9 are not expected in the Hungry Horse Reservoir core area.

Table 45. 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
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 46). 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 that may result in sedimentation, substrate embeddedness, and other direct or indirect effects from project-level activities. The largest percentage of management area 6 in bull trout watersheds occurs in Goat/Squeezer (26 percent), Piper (49 percent), Cold (54 percent), and Jim Creeks (63 percent). As described above, the risk of adverse effects on bull trout would be reduced in this allocation but may occur in association with recreational trail improvements, and moderate-intensity timber harvest and general forest activities would occur. Effects in management area 6 would be greater than in management area 5, primarily due to road management activities, but effects on bull trout that could result from forest management activities would be minimized through implementation of RMZ standards and guidelines. Restoration in these watersheds

may result in additional short-term adverse effects related to sedimentation or in-stream activities. These short-term effects would be partially offset by long-term improvements in habitat conditions. Additionally, there is one grazing allotment in Piper Creek that has five cow-calf pairs and an allotment below bull trout habitat at the outlet of Holland Lake. Thus, very little effects on bull trout occur from grazing in the Swan Lake Core Area.

An additional 14 percent of the activity area in this core area is allocated to management area 5 (table 46). 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 nonmotorized recreation opportunities. Trails would be the primary improvements constructed and maintained for recreation users, and roads would be restricted due to grizzly bear conservation and would be frozen at the 2011 baseline level. Management area 1 is a wilderness designation and has the greatest restriction on all uses. The allocation of 62 percent of the Swan Lake Core Area to management areas 1 and 5 would limit the likelihood of adverse effects on bull trout in these areas. The combined allocation of management areas 1a, 1b, and 5 in the Swan Lake Core Area is the lowest on the Forest. Former Plum Creek lands primarily in the valley floor were largely allocated to management area 6c, which would have the greatest potential for possible affects due to increased forest management.

Streams that drain from the west along the Mission Mountains—Elk, Jim, Cold and Piper—have their headwaters protected within the Mission Mountain Wilderness, whereas Lion Creek's headwaters are protected within recommended wilderness management area1b. Potential impacts from management activities would be less in these bull trout streams due to the headwater protection, but impacts to Goat, Squeezer, Soup, and Woodward Creeks might be greater due to a higher percentage in general forest management areas 6b and 6c. 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.

Goat and Lion Creeks are identified as the highest priorities for stormproofing within the watershed conservation network, which 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, which provides additional protections within a ¼-mile corridor.

Critical habitat has been designated for each of the local populations 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 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, minor improvement in the baseline condition for critical habitat is expected for PCEs 1, 3, 4, 5, and 7 through natural processes. Substantial changes in PCEs 6, 8, and 9 are not expected in the Swan Lake Core Area.

Table 46. Swan Lake Core Area (SLCA)—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
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
Woodward 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

Bull Trout Critical Habitat

The USFWS published a final critical habitat designation for the coterminous United States population of bull trout on October 18, 2010 (USFWS, 2010); the rule became effective on November 17, 2010. Designated bull trout critical habitat is of two primary use types, (1) spawning and rearing and (2) foraging, migration, and overwintering, and it includes both reservoirs/lakes and stream/shoreline miles.

The conservation role of bull trout critical habitat is to support viable core area populations. 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. Critical habitat units (CHUs) generally encompass one or more core areas and may include foraging, migrating, and overwintering areas outside of core areas that are important to the survival and recovery of bull trout.

The primary function of individual CHUs is to maintain and support core areas that (1) contain bull trout populations with the demographic characteristics needed to ensure their persistence and contain the habitat needed to sustain those characteristics (B. Rieman & McIntyre, 1993); (2) provide for persistence of strong local populations, in part by providing habitat conditions that encourage movement of migratory fish (MBTSG, 1998; B. Rieman & McIntyre, 1993); (3) are large enough to incorporate genetic and phenotypic diversity but small enough to ensure connectivity between populations (Hard, 1995; Healy &

Prince, 1995; MBTSG, 1998; B. Rieman & McIntyre, 1993); and (4) are distributed throughout the historic range of the species to preserve both genetic and phenotypic adaptations (Hard, 1995; MBTSG, 1998; B. Rieman & McIntyre, 1993; B. E. Rieman & Allendorf, 2001).

Critical habitat includes the stream channels within the designated stream reaches and has a lateral extent as defined by the bankfull elevation on one bank to the bankfull elevation on the opposite bank. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge that generally has a recurrence interval of 1 to 2 years on the annual flood series.

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

Critical Habitat in the Flathead Lake Core Area

A total of 283 miles of streams/rivers and 126,474 acres of lakes—Flathead (122,318 acres), Cyclone (141), Frozen (22), Upper Stillwater (593), Upper Whitefish (80), and Whitefish (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 on lands formerly owned by Plum Creek, affecting PCEs 3, 4, 6, and 8.

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 would occur from the proposed action. Any direct effects would occur later, during individual project implementation when site-specific decisions are made. All project-level activities would undergo their own environmental analyses and section 7 consultation. An analysis of the anticipated effect of management activities on the primary constituent elements (PCEs) for bull trout is given below, followed by the expected impacts on each core area.

Effects from Forest Management Activities

Vegetation management may have temporary impacts on PCE 1 (permanent water with low levels of contaminants) and PCE 4 (appropriate substrates) when harvest activities generate increases in sediment. Revised forest plan standards and guidelines would minimize many effects of vegetation management by providing a buffer where management is prohibited and riparian vegetation develops under natural processes. Thus, vegetation management is not expected to impact PCE 2 (appropriate water temperatures), PCE 3 (complex stream channels), and PCE 8 (abundant food base). PCEs 5 (natural hydrograph), 6 (subsurface water connectivity), 7 (migratory corridors), and 9 (non-native species) are not affected.

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, fuel and fire management activities may indirectly affect the potential to impact hydrologic characteristics on the watershed scale (PCE 5). Changes in the revised forest plan that emphasize fuel treatments to reduce the risk of stand-replacing fires should result in benefits to PCE 5 by reducing the risk of wildfires that may open stand canopies.

Access management and recreation affect bull trout critical habitat primarily through the delivery of sediment (PCE 4) and through stream crossings that may block fish passage (PCE 7). Where existing roads are in close proximity to streams and riparian vegetation is reduced, ongoing impacts to PCEs 2, 3, and 8 may occur. 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. Forestwide 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 these impacts.

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 (PCEs 1 and 4) and, with heavy use, channelization and an increase in the width-depth ratio (Belsky et al. 1999) (PCE 2,3, and 8). Reduction of riparian vegetation through consumption or physical impacts from trampling affects the function of PCE 2 and 8 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 with the 1995 INFISH forest plan amendment and continues with revised direction, 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 activities would be expected to result in a temporary impact to PCEs 1 and 4 with the potential for long-term benefit to PCEs 1 through 8, depending on the specifics of the project. As with all project-level decisions, separate consultation looking at design and site-specific impacts would occur prior to any project implementation.

Cumulative Effects

The cumulative effects area for bull trout is the Flathead Basin which includes the Whitefish, Stillwater, Swan, and Flathead rivers as well as Flathead Lake. Flathead Lake and its fishery influences cumulative effects upon bull trout due competition and predation by lake trout. Cumulative effects under the Endangered Species Act include state, tribal, local, or private actions that are reasonably certain to occur in the action area. Past actions have been included in the environmental baseline. Future site-specific Forest Service activities are subject to future section 7 consultation requirements and are not included in the cumulative effects analysis in this biological assessment.

Non-federal land management policies are likely to continue affecting riparian and aquatic resources. The cumulative effects in the Flathead River Basin are difficult to analyze, considering the broad geographic landscape covered, the uncertainties associated with government and private actions, and ongoing changes to the region's economy. Whether those effects will increase or decrease in the future is a matter of speculation; however, based on the growth trends and current uses identified in this section, cumulative effects are likely to increase.

State-owned school trust lands managed by the Montana Department of Natural Resources in the Stillwater, Coal, and Swan State Forests will continue to support a variety of uses from livestock grazing to mining, timber harvest, and recreational fishing and hunting. Montana law requires that school trust lands be managed to maximize income for the school trust. Management impacts may be greater on these lands than on other state or federal lands but may not result in loss of fish populations.

Numerous smaller private landowners within the boundaries of the Flathead National Forest 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.

For the most part, the stream systems originate on-Forest in protected headwaters, eventually flow downstream onto lands owned or administered by entities other than the Forest Service, and ultimately flow into Flathead Lake. Many fish populations, whether they move off-Forest as part of their life cycle or remain entirely within a localized area, require the interconnectivity of these streams to survive as a population. For almost all species, genetic interchange between subpopulations is necessary to maintain healthy fish stocks. The more wide-ranging the species, the more critical interconnectivity may be in order for the fish to access important habitat components. Thus, activities off-Forest that disrupt fish migration corridors can have significant impacts to fish populations upstream.

A host of activities that have the potential to riparian and aquatic resources occur on private lands within the Flathead River Basin. These include water diversion, irrigation, livestock grazing, farming of varied

cash crops, timber harvest, water-based hunting, outfitted and non-outfitted angling, establishment of subdivisions, housing and commercial development, building and stocking of private fish ponds, chemical treatment of noxious weeds, flood control and stream channel manipulation, and hydropower management.

Harvesting and poaching by anglers has been identified as one reason for bull trout decline (USFWS, 2002). Recreational fishing will likely increase as the general residential population in western Montana increases. In addition, misidentification of bull trout has been a concern because of the similarity of appearance with brook trout. Although the harvest of bull trout is illegal, incidental catch does occur. The fate of released bull trout is unknown, but some level of hooking mortality is likely due to the associated stress and handling.

The potential for introduction of disease and aquatic nuisance species exists on all lands within the cumulative effects analysis area. The extent of influence exerted by disease or exotic species is often determined by an area's suitability. If conditions are favorable enough to promote and perpetuate them, then effects are determined by the fishery's susceptibility to influence. The effects of these introductions could range from extreme to negligible, based upon the species. Quagga or zebra mussels introduced into Flathead Lake could have a devastating effect upon the entire ecosystem.

MFWP is the responsible agency for managing fish populations. Regulations will most likely continue to allow the angling and harvest of fish, with variations on fishing limits and times when angling can occur and some gear restrictions. Flathead Lake and Swan Lake are critical to maintaining bull trout and westslope cutthroat trout populations in tributaries within the North and Middle Forks of the Flathead River and Swan River. Fish populations within the lakes are interconnected to upstream ecosystems. How non-native fish, i.e., lake trout, are managed within these lakes will largely determine the viability of migratory bull trout and westslope cutthroat trout populations (USFWS, 2015b).

The most complex cumulative effects relate to the restoration of bull trout and westslope cutthroat trout within the project area. The complexity of these life histories exposes them to many factors affecting their abundance and viability. Cumulative effects to native fish include (1) predation, hybridization, and competition with non-native fish; (2) destruction or degradation of spawning and rearing habitat from logging, grazing, road construction/maintenance, and urban development on private and other non-federal lands; (3) degraded water quality as a result of polluted runoff from urban and rural areas; and (4) migration barriers that result from roads on private or other non-federal lands.

Bull trout determination of effects and rationale

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

Rationale for Determination

Populations of bull trout will be maintained in their existing status and are likely to increase as stream and riparian conditions are improved, based on the restoration activities and protective measures that are provided. Stochastic events such as disease, climatic changes, natural disturbances, or increases in non-native species such as lake trout will continue to have population effects beyond the control of the Forest.

The proposed federal action represents a programmatic decision that would change management area designation and, therefore, would have no direct effects on bull trout or their habitats. Any direct or indirect effects would occur later, during project level implementation, when site-specific decisions are made based on revised forest plan direction and direct, indirect, and cumulative effects of proposed actions are evaluated. The revised forest plan provides the direction under which future management decisions are made. All project-level activities will undergo separate site-specific environmental analyses,

and section 7 consultation will occur when effects to threatened or endangered species or their habitats are anticipated.

There are likely to be improvements to bull trout and bull trout designated critical habitat from the implementation of revised forest plan direction and natural ecological successional processes, but the environmental baseline for the activity area is not likely to change as the plan does not make any on-the-ground decisions and any changes to the environmental baseline would result from natural processes. Conversely, the Forest does not anticipate a downward trend in the environmental baseline for populations in these core areas as a result of land management activities because of the limited amount of allowable uses that could negatively affect the species as well as the protective measures and direction in the revised forest plan.

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

Meltwater stonefly

The meltwater Lednian stonefly is a small, dark-colored species that inhabits extremely cold glacier-fed streams, primarily at high elevations in Glacier National Park. Little else is known about its habits or ecology except that the adults hatch by mid-summer (July-August) and are presumably mating during this time. The meltwater stonefly was found on the Flathead National Forest in the headwaters of Tunnel Creek below Grant Glacier in 2010 and above Sunburst Lake in 2015. This species could possibly be found in other glacier meltwater areas, although this habitat type is rare on the Forest.

The larvae are found in small alpine, mountain streams (Newell & Minshall, 1976), but only those closely linked to glacial runoff (Treanor, Giersch, Kappenman, Muhlfeld, & Webb, 2013). Ecologically, this species is a cold-water stenotherm that is unable to tolerate warm water temperatures (greater than 10 °C) and is generally collected within a few hundred meters of the base of glaciers or snow melt-derived streams.

The greatest concern related to this species is climate change, which will continue to shrink glaciers that the species is dependent on for survival. Estimates are that all glaciers will be gone from Glacier National Park by 2030, essentially the life of this plan. The Forest does not conduct activities in this species habitat, and thus the proposed action will have no effect on the meltwater stonefly.

Plant Species

Spalding's Catchfly

Spalding's catchfly (*Silene spaldingii*) is a perennial herb in the pink family (Caryophyllaceae). It was listed as threatened under the Endangered Species Act by the USFWS on November 9, 2001 (FR 66(196): 51598-51606) (USFWS, 2001a). Although the USFWS intends to identify critical habitat for this species, critical habitat designation was precluded at the time of listing due to a lack of funding. The recovery plan for Spalding's catchfly (USFWS, 2007c) outlines the recovery strategy, recovery goals, objectives, and delisting criteria. A five-year review was conducted by USFWS (2009b). No change in listing was recommended due to lack of changes in the species status.

Affected Environment

Habitat

Spalding's catchfly habitat is primarily dry grasslands and grassland inclusions typically dominated by rough fescue (*Festuca campestris*) or Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), and other bunchgrasses. There may be scattered ponderosa pine trees, forming an open canopy. Plant communities dominated by these grass species are exceedingly rare on the Forest. A few patches of suitable habitat exist along the North Fork of the Flathead River floodplain from the Canadian border to Polebridge, in the Swan Valley, and in larger open fescue bunchgrass prairies in the South Fork of the Flathead and Danaher Creek Drainages within the Bob Marshall Wilderness. However, these areas have been surveyed extensively in the past, and Spalding's catchfly was not found. There may be suitable grasslands in the Hog Heaven Range west of Flathead Lake and on the south slopes near Ashley Lake, as well. None of these areas are specifically mapped; even so, they would comprise less than 1 percent of the land base of the Forest.

Occurrence

Spalding's catchfly is a Palouse Prairie endemic that is currently known from 107 populations across its range in Montana, Idaho, Oregon, Washington, and British Columbia. The populations are often small and isolated. Sixty-four occurrences are known from Montana, all in grassland plant communities located in the northwestern portion of the state. The numbers of individuals at most of these occurrences are very low. No populations are known from the Forest, although four occurrences are within three, 10 and 15 air miles from the Forest.

Threats

This species has suffered considerable habitat loss and fragmentation due to agricultural and urban development, grazing, herbicide treatment, and exotic weed invasion (Lichthardt, 1997; Schassberger, 1988). Disturbances such as grazing or fire may be important to the long-term persistence of this species in northwest Montana as a result of reduced competition with the large, litter-producing native bunchgrasses, primarily rough fescue, with which it co-occurs (Lesica, 1997a). Invasion by exotic species threatens nearly all populations. The threat of herbicide drift is a factor affecting Idaho populations, although this is not a threat in Montana as the few known Montana occurrences are geographically removed from agricultural treatments.

Trends

Populations of Spalding's catchfly have been extirpated in some portions of its range and are stable in others, depending on the particular threats to each population (USFWS, 2007c). Due to the nature of the

species' life history, population numbers vary from year to year. Many plants go dormant, depending on climatic conditions (Lesica, 1997a; Lesica & Crone, 2007). Some years exhibit tens of thousands of plants, and other years only a few hundred plants are observed (USFWS, 2007c).

Environmental Consequences

Because there are no known occurrences of Spalding's catchfly on the Forest, the following discussion only evaluates how the proposal could potentially impact habitat that may be suitable for the plant.

Programmatic Effects of the Flathead National Forest Plan Revision

Forest plan components comply with the requirements of the Endangered Species Act of 1973. All federally recognized threatened, endangered, and candidate species would continue to be managed and protected across the Forest in accordance with Forest Service policy, recommended protection measures in recovery plans (if available), and all applicable state and federal laws. Project-level analysis will evaluate site-specific impacts to these species, and consultation with the USFWS will take place for all projects potentially affecting threatened and endangered species. Additional design features or mitigation measures at the project level may be developed if it is determined that they are needed.

Although there are no known populations of Spalding's catchfly on the Forest, the dry grassland habitats where this species might occur would have a low likelihood of notable impact from human activities. Timber harvest would not occur within this type; recreational use, such as hiking, may occur but has low likelihood of impact to the integrity of the plant community. Risk of invasive plant species poses the greatest threat to integrity of the dry grassland communities. Plan components that emphasize protection of high-priority areas (including native grasslands) and treatments that focus on these areas provide protection to these rare plant communities that serve as potential habitat for Spalding's catchfly (refer to FW-DC-NNIP-01, FW-OBJ-NNIP-01).

Determination of Effects and Rationale

Given the protection provided to potential habitat for Spalding's catchfly and the conservation measures that include evaluation of potential site-specific impacts during project planning, the programmatic revised forest plan would have no effect on potential habitat for Spalding's catchfly. Because the proposed action would have no effect to Spalding's catchfly, there would not be any cumulative impacts.

Water Howellia

Water howellia (*Howellia aquatilis*) is a vascular plant species in the family Campanulaceae. The USFWS drafted a recovery plan for the species (Shelly & Gamon, 1996), but it has not been finalized. Therefore, there are no recovery goals officially identified for the species. A conservation strategy for water howellia on the Forest was completed (USDA, 1996), incorporating strategies from the draft recovery plan and providing management direction to guide the conservation of the species. This strategy was incorporated into the current forest plan (amendment 20) and will be carried forward into the revised plan.

The Service completed a year review on water howellia (USFWS, 2013f). Existing federal regulatory mechanisms have protected water howellia habitat from adverse human-caused impacts. Due to these actions and continuing existing conservation practices, water howellia is recommended for delisting (USFWS, 2013f).

Affected Environment

Habitat

Water howellia is an aquatic plant restricted to small pothole ponds or oxbows long since isolated from the flowing surface waters of the adjacent river. These wetland habitats are generally shallow (approximately 20-40 inches deep during the early summer months). All of the howellia occurrences in the Swan Valley are in glacially formed ponds or retired river oxbows, usually surrounded in part by deciduous trees and a diverse matrix of coniferous forests (Lesica, 1990).

Occurrence

Currently, there are 220 known populations of water howellia in the Swan River Valley (MNHP-MTFWP, 2016). Of these, 191 (87 percent) occur wholly (183) or partially (8) on Flathead National Forest lands. These 220 populations represent 73 percent of the known 302 global occurrences.

General surveys for water howellia in the Swan Valley have been conducted since 1987 and have continued to the present. The Flathead National Forest, with the cooperation of Montana Natural Heritage Program and the Nature Conservancy, has surveyed the majority of identifiable potential water howellia ponds in the Swan Valley. Many ponds that contain suitable habitat but are unoccupied by water howellia have been found in the Swan River Valley. Some initially identified suitable but unoccupied ponds have been later found to contain water howellia. Other identified suitable unoccupied ponds could harbor water howellia at some point in the future.

Threats

The Natural Heritage Program Network has ranked this species as G3, meaning that it is at a moderate risk of extinction due to its restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors (NatureServe, 2015). The Montana Natural Heritage Program has ranked the species as S3, which means potentially at risk in the state because of limited and/or declining numbers, range and/or habitat, even though it may be abundant in some areas. Water howellia is currently listed as threatened by the Service.

Water howellia habitat has been subject to various management activities, including road construction, logging, and grazing (Shelly, 1988; USDA, 1997). These activities could alter hydrological conditions by the removal of vegetation or impacts on soils adjacent to occupied ponds. Resulting increased pond evaporation, changes in interception and transpiration of water by plants, and alteration of water flow in soils may influence water levels in ponds. This may be detrimental or beneficial to water howellia depending on the site-specific situation and annual variations in precipitation and temperature, since sufficient drying of ponds is required in the fall for water howellia seed germination to take place (Lesica, 1990).

The non-native variety of reed canarygrass (*Phalaris arundinacea*) has threatened some populations across its range but not affected other populations (Lesica, 1997b; USFWS, 2013f). One howellia site in Montana, the Swan River Oxbow (a Nature Conservancy preserve) does have documented encroachment of reed canarygrass that is likely an introduced cultivar from the adjacent national wildlife refuge, and impacts to that site have been documented by Lesica (1997b). The small isolated populations of reed canarygrass that occur in many of the howellia ponds in the Swan Valley may be native (Merigliano & Lesica, 1998), and a 10-year monitoring study (USDA, 2010a) did not show much expansion of reed canarygrass in these ponds.

Additional human-caused threats to water howellia include potential drift from chemical spraying of invasive species near ponds. The effects of chemical controls conducted by state and private lands near

water howellia ponds are unknown. The effects of herbicides at or near water howellia ponds on the Forest were analyzed in the *Flathead National Forest Noxious and Invasive Weed Control Environmental Assessment and Decision Notice* (USDA, 2001b). No chemical controls have been conducted at or near howellia ponds on the Forest. Surveys for at-risk plant species are required before conducting chemical control of invasive weeds on the Forest.

Natural disturbances that may affect water howellia include climate change, aquatic vegetation succession, and wildland fire. Changing climate patterns may affect the seasonal fluctuations in pond water levels that influence water howellia populations. Successive years of either dry, hot growing seasons or very wet, cool growing seasons could affect the annual filling and drying regime that is important to the persistence of the populations. Vegetation succession in ponds could lead to extirpation of a population, e.g., if the plant community in a pond shifts to a sedge meadow or eventually to forest. Wildland fire could have beneficial and detrimental effects to water howellia, depending on the situation. A hot fire late in the season could burn over seeds that are in shallow soil. Fire's removal of trees and other vegetation surrounding ponds could have hydrological effects that alter water levels, with site-specific effects similar to the discussion on logging above.

Trends

In 1998, a 10-year monitoring plan was initiated by the Forest to detect changes in water howellia distribution and abundance and was completed in 2007 (USDA, 2010a). This study assisted in evaluating whether current management prescriptions for water howellia were sufficient for continued viability of the Swan Valley metapopulation. Approximately 65 occupied ponds were monitored annually over the 10-year period. Although population levels were reduced in 2 of the 10 years due to yearly variations in precipitation and temperature, the species is adapted to such fluctuations, and overall the monitored populations in both disturbed and undisturbed settings were stable throughout the study (Shelly, Mantas, Pipp, & Hahn, 2016). Additional survey work has increased the total number of documented populations in the Swan Valley, including the discovery of occurrences of water howellia in previously unoccupied yet suitable ponds. Population levels of water howellia are primarily influenced by annual fluctuations in precipitation and pond drying, with reduced population sizes often occurring during years following cooler, wetter summers. This is because the latter conditions inhibit fall seed germination (Lesica, 1990, 1992).

The Service concluded their 5-year review of water howellia in 2013 (USFWS, 2013f). Their conclusion was that the threats identified at the time of listing have been mitigated through regulatory mechanisms such as the conservation strategy and the incorporation of project design features that remove or minimize disturbance to populations, such as the 300-foot minimum management buffer around ponds for project-level decisions. Other regulatory direction, such as buffers that limit ground-disturbing activities around wetlands not occupied by water howellia, have also contributed to the conservation of water howellia habitat. Reed canary grass threatening ponds has been successfully treated in some states (USFWS, 2013f) and does not seem to be invading other habitat as previously thought (USDA, 2010a). Grazing has been removed from water howellia habitat, as well.

In addition to management changes to water howellia habitat, there have been almost 200 additional populations documented range-wide since the time of listing, including sites previously believed to be extirpated in Oregon and California. Because of all of these factors, the Service is recommending delisting water howellia while maintaining current conservation measures (USFWS, 2013f).

Environmental Consequences

Programmatic Effects of the Flathead National Forest Plan Revision

Forest plan components comply with the requirements of the Endangered Species Act of 1973. All federally recognized threatened, endangered, and candidate species would continue to be managed and protected across the Forest in accordance with Forest Service policy, recommended protection measures in the recovery plans (if available), and all applicable state and federal laws. Project-level analysis would evaluate site-specific impacts to these species, and consultation with the USFWS would take place for all projects potentially affecting threatened and endangered species. Additional design features or mitigation measures at the project level might be developed if it is determined that they are needed.

The Condon Creek Botanical Special Area is recognized for its importance in protecting known populations of water howellia, and this special designation is retainedwith management area 3B designation (special areas). Forest plan components provide protection for the wetland habitat as well as the adjacent upland forested habitat within the Condon Creek Botanical Special Area (refer to MA3b-Special Area-DC-01, 02, 03, and 04). Components emphasize retaining the natural condition of these areas, supporting sustainable and healthy populations of water howellia, and providing educational and research opportunities as appropriate.

The conservation strategy for water howellia (USDA, 1997) would be retained, and represents the primary guidance for maintenance of suitable habitat for the species. The strategy requires a 300-foot minimum management buffer around all ponds that provide habitat for water howellia, including both occupied and suitable but unoccupied ponds (FW-DC-PLANT-02; FW-GDL-PLANT-01, 02). A 300 foot riparian management zone is also established around howellia ponds in plan direction (FW-STD-RMZ-01). Forest plan components that address desired conditions and limitations on management activities within all riparian management zones (RMZs) would also apply to ponds providing water howellia habitat, wherever the RMZ direction is more restrictive than the conservation strategy direction. These components address maintaining desired vegetation composition, structural diversity, patterns, and ecological processes within RMZs, appropriate to the natural disturbance regimes of the area (FW-DC-RMZ-01 through 06). Standards and guidelines limit vegetation management or other activities (such as timber harvest or gravel extraction), and the use of herbicides, pesticides and other toxic chemicals within RMZs (FW-STD-RMZ-02 through 05; FW-GDL-RMZ-01, 04, 06, 08 through 15). Limits on activities within RMZs associated with fire management, such as aerial application of chemical retardant, locations of fire-suppression facilities, and refueling stations, are also incorporated into revised forest plan direction (FW-GDL-RMZ-02, 03 and 05; FW-GDL-PLANT-03). Direction related to protection of riparian management zones and associated aquatic resources for management activities associated with grazing, recreation, roads, and other infrastructure is provided in the revised forest plan as well. Refer to appendix D for the list of all plan components.

Consequences to water howellia from forest plan components associated with other resource programs or management activities

Effects from access (motorized and nonmotorized) and recreation use

Water howellia could potentially be affected by recreation activities that could cause ground disturbance, such as hiking/trampling, biking, dispersed camping, and off-road vehicle use, particularly during periods when pond water levels are low and the habitat is more vulnerable to disturbance. Roads and trails for recreational use can contribute to the spread of noxious weeds.

Effects from vegetation management and fire

Under the natural disturbance regimes of the Forest, large, stand-replacing wildfires have occurred in the past and are likely to continue to occur across portions of the landscape in the future. Although plant species in the northern Rockies have evolved in this fire-dominated ecosystem, there might be cases where severe and extensive stand-replacing wildfire events could alter hydrological conditions relative to water levels in water howellia ponds.

Vegetation management treatments can have impacts to plants and plant habitat through canopy removal and soil disturbance. Vegetation treatment may require road building or maintenance. Roads increase access and provide an avenue for invasive plant species. The revised forest plan incorporates the conservation strategy for howellia and has plan components associated with vegetation management that protect habitat and contribute to conservation of the species, as described earlier in this section.

Effects from non-native invasive plants and control treatments

Introduced, invasive plant species can displace native plants through competition. Impacts may also result from treatments that include herbicide spraying and mechanical ground disturbance to control noxious weeds once they gain a foothold. Competition from invasive non-native species and noxious weeds can result in the loss of habitat, loss of pollinators, and lowered viability of rare plant species viability. Roads, trails, livestock, and canopy reduction can provide ideal pathways for the introduction of exotic and non-native species. Indirectly, herbicide spraying can affect populations of native pollinators by contaminating nesting materials and pollen resources, further decreasing the viability and reproductive success of rare species. The revised forest plan incorporates direction that guides the treatment of invasive species based on the forestwide analysis and decision for noxious weeds that was incorporated into the existing and revised forest plan direction. Under this direction, treatments would be designed to avoid or minimize impacts to plant species at risk in order to support their persistence over the long term. Special areas and riparian areas (particularly those associated with water howellia ponds) would be recognized as high-priority areas for the management and treatment of invasive species (FW-DC-NNIP-01 and FW-OBJ-NNIP-01). An integrated management approach to weed control would be applied (FW-DC-NNIP-04).

Determination of Effects and Rationale

The proposed action may affect, but is not likely to adversely affect, water howellia. The conservation strategy for water howellia (USDA, 1997) will be retained in the revised forest plan, and includes direction to maintain both occupied and suitable but unoccupied pond habitats for the species. In addition, the standards and guidelines for riparian management zones also apply to the pond habitats of the species. All of these plan components are designed to protect water howellia and improve its habitat on the Flathead National Forest. Although all project-level activities will undergo separate site-specific environmental analyses, and Section 7 consultation will occur where effects to water howellia or its habitat are possible, incorporation of these forest plan protective measures during project implementation is expected to result in insignificant or discountable effects to the species and its habitat. Although cumulative effects of past management activities in the Swan Valley have affected water howellia and its habitat, the forest plan measures provide for protection and improvement of occupied and suitable but unoccupied habitat. Stochastic events such as climate change and natural disturbances will continue to have population effects beyond the control of forest management.

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

Date	Consultation
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 wildlife biologists Reed Kuennen and Nancy Warren; fisheries biologist Pat Van Eimeren; silviculturist Heidi Trechsel; USFWS consultation biologists Ben Conard, Katrina Dixon, and Kevin Aceituno; and planning team leader Joe Krueger and staff officer Rob Carlin to discuss consultation strategy, timelines, roles, and responsibilities.
July-August, 2016	USFS and USFWS sign consultation agreement
September 23, 2016	USFS sends draft BAs to USFWS 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	USFWS and USFS meet to discuss draft BAs; sections on grizzly bear and development of a preferred alternative
December 8, 2016	USFWS and USFS meet to discuss draft BAs; sections on lynx, bull trout, critical habitats, Howellia, proposed and candidate species
January 10, 2017	USFS and USFWs discuss aquatic plan components; Pat Van Eimeren, Joe Krueger, and Kevin Aceituno.
January 25, 2017	USFWS and USFS meet to discuss proposed actions and their effects; sections on grizzly bear, lynx, critical habitats, proposed and candidate species. Ben Conard, Katrina Dixon, Jennifer Fortin-Norris, Wayne Kasworm, Nancy Warren, Reed Kuennen, Pat Van Eimeren Joe Krueger. USFS lets USFWS they will be submitting draft BAs in mid-February due to need for USFS RO review.
February 21, 2017	USFS submits draft BAs, version 2, to USFWS.
March 6, 2017	Phone call to discuss updates to timeline for formal consultation; Ben Conard, Kevin Aceituno, Joe Krueger, Reed Kuennen, Nancy Warren, Pat Van Eimeren. USFS agrees to submit BAs to USFWS by mid-March, 2017. USFWS agrees to discuss draft T & C's, conservation measures, and reporting requirements, related to grizzly bear during April, 2017. Due to litigation, regional level priorities, and additional complexity of the Flathead's BA, USFWS expresses their concern that they may need 90 days (until mid-June) to complete consultation on Flathead BA.
March 13, 2017	Forest Service submits the Biological Assessment for Threatened, Endangered, and Proposed Species: Forest Plan Amendments incorporating management direction for the NCDE grizzly bear population into the Helena, Lewis and Clark, Kootenai, and Lolo Forest Plans.
March 17, 2017	Forest Service submits the Biological Assessment for Threatened, Endangered, and Proposed Species: Revised Land and Resource Management Plan for the Flathead National Forest.
August 29 and September 8, 2017	USFWS meets with USFS to discuss draft biological opinions.

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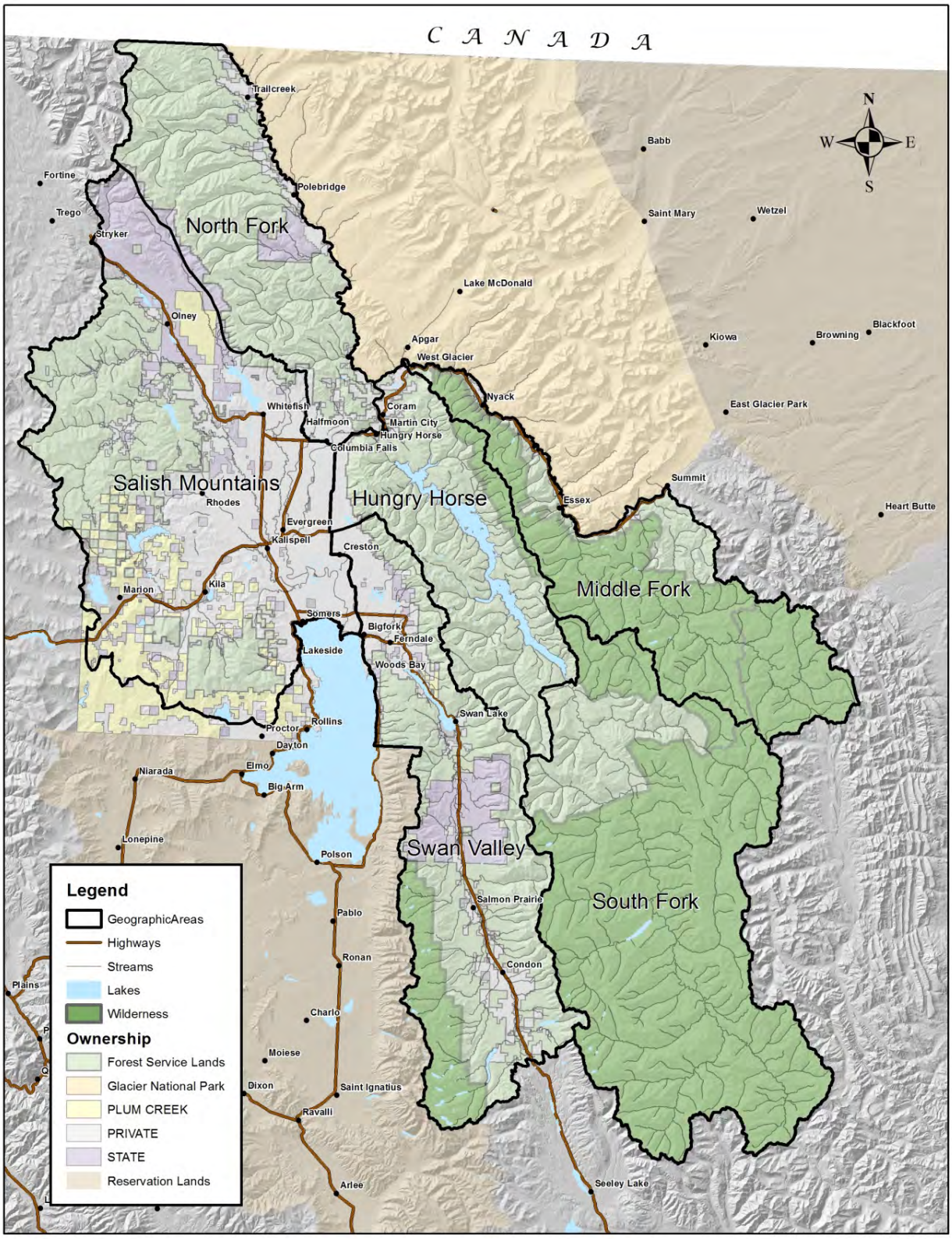


Figure B-1. Flathead National Forest geographic area (GA) boundaries and land ownership.

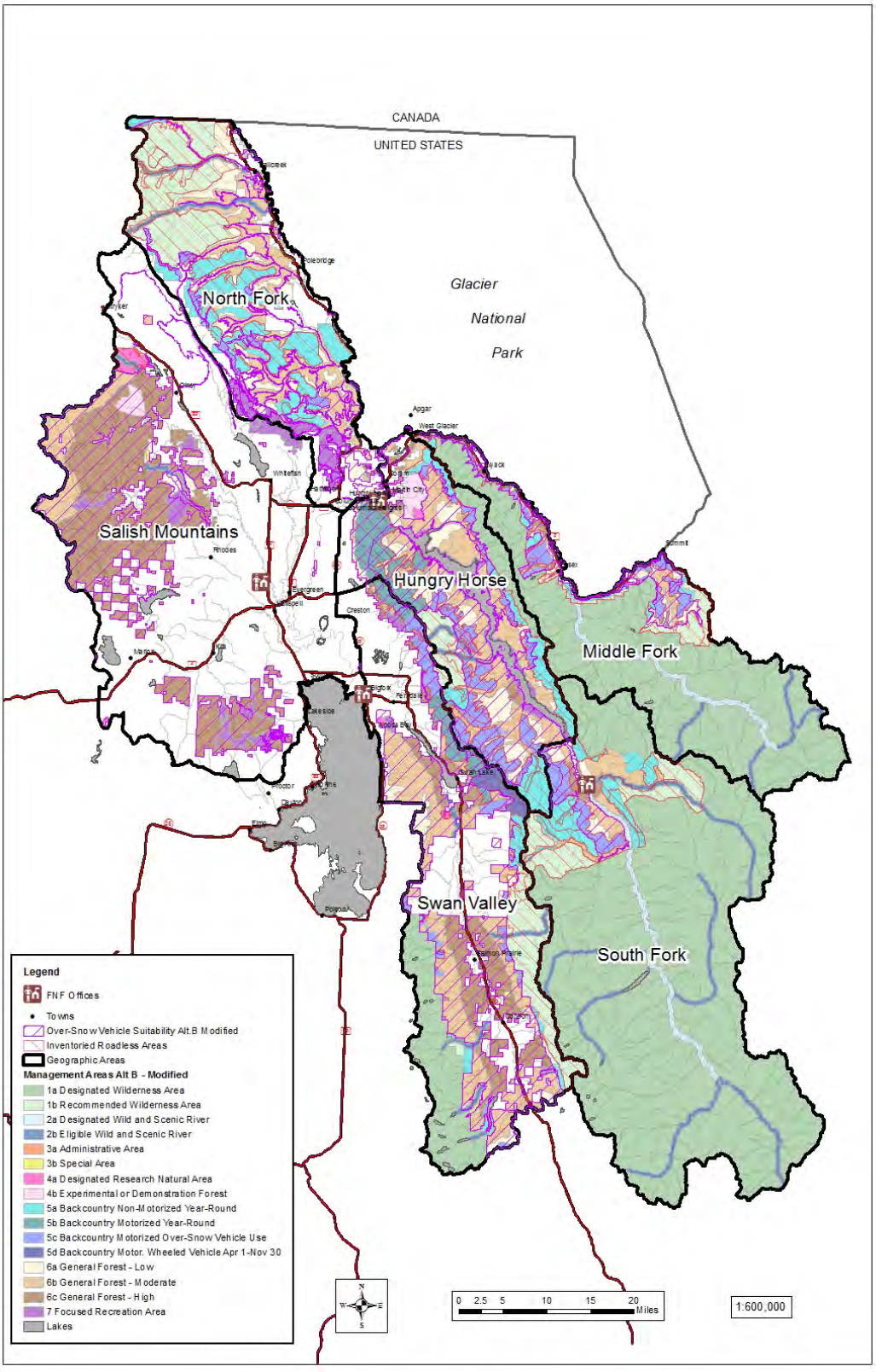


Figure B-2. Proposed action (alternative B modified) management areas.

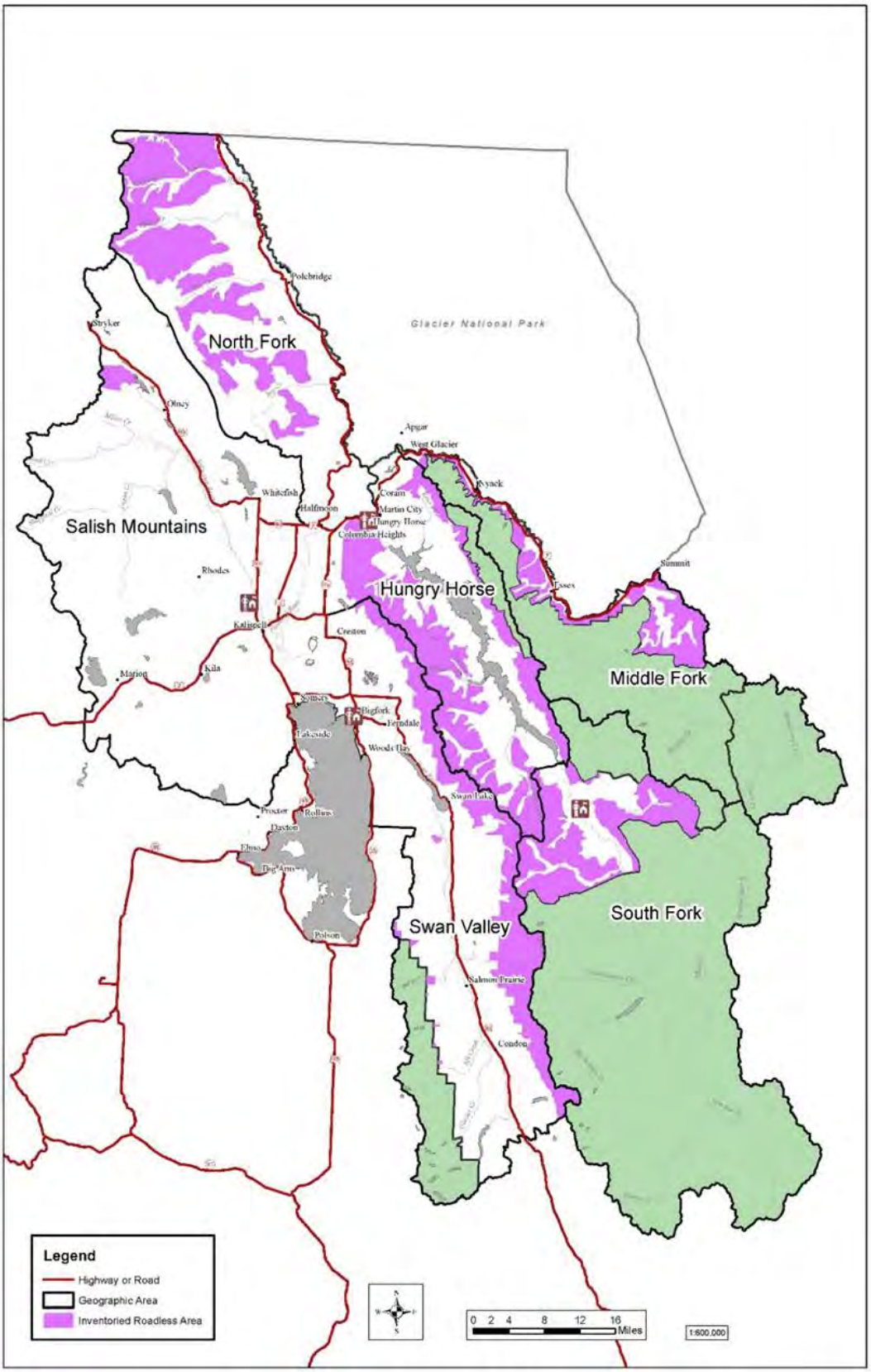


Figure B-3. Inventoried roadless areas on the Flathead National Forest.

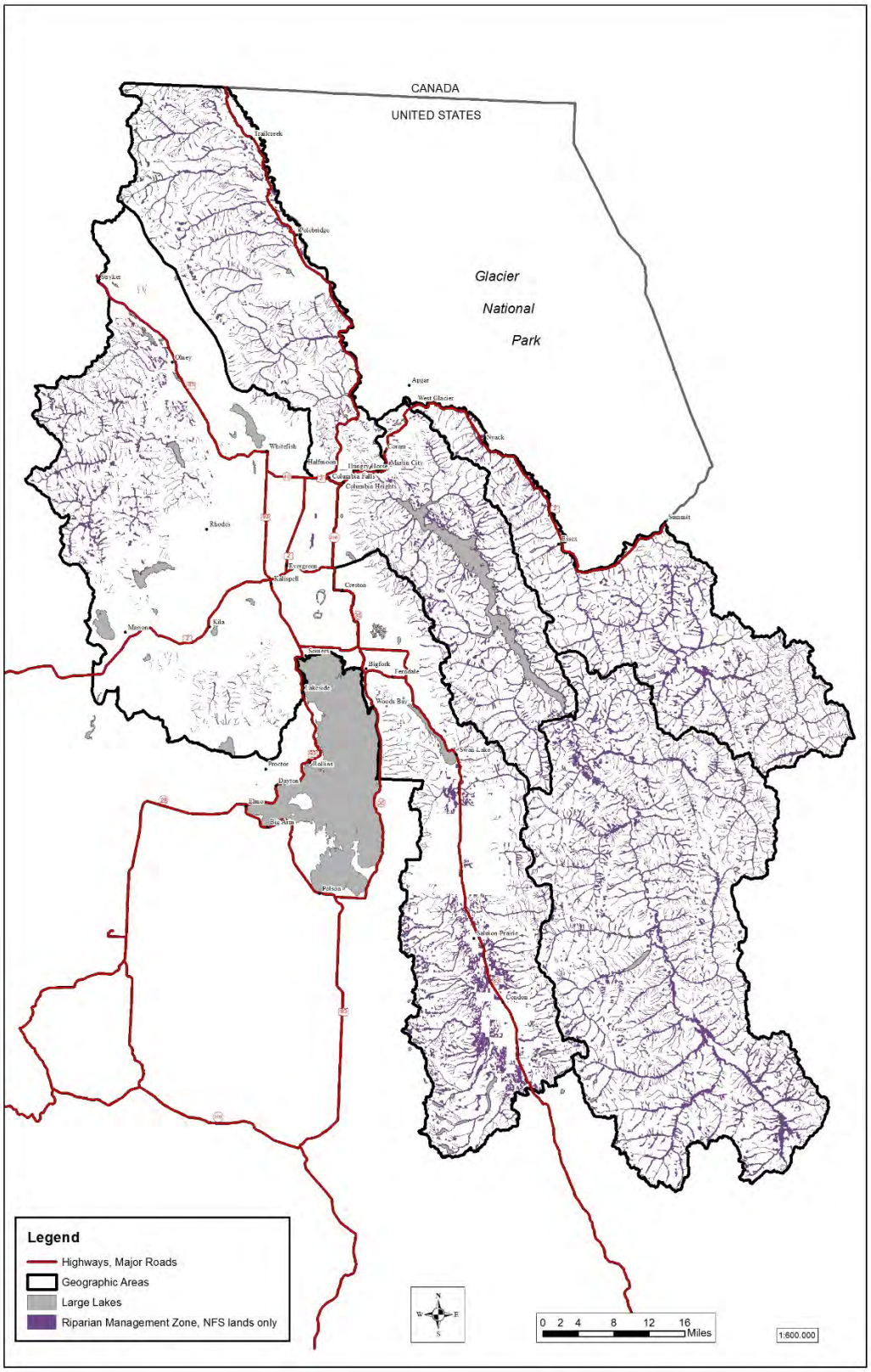


Figure B-4. Riparian management zones on NFS lands.

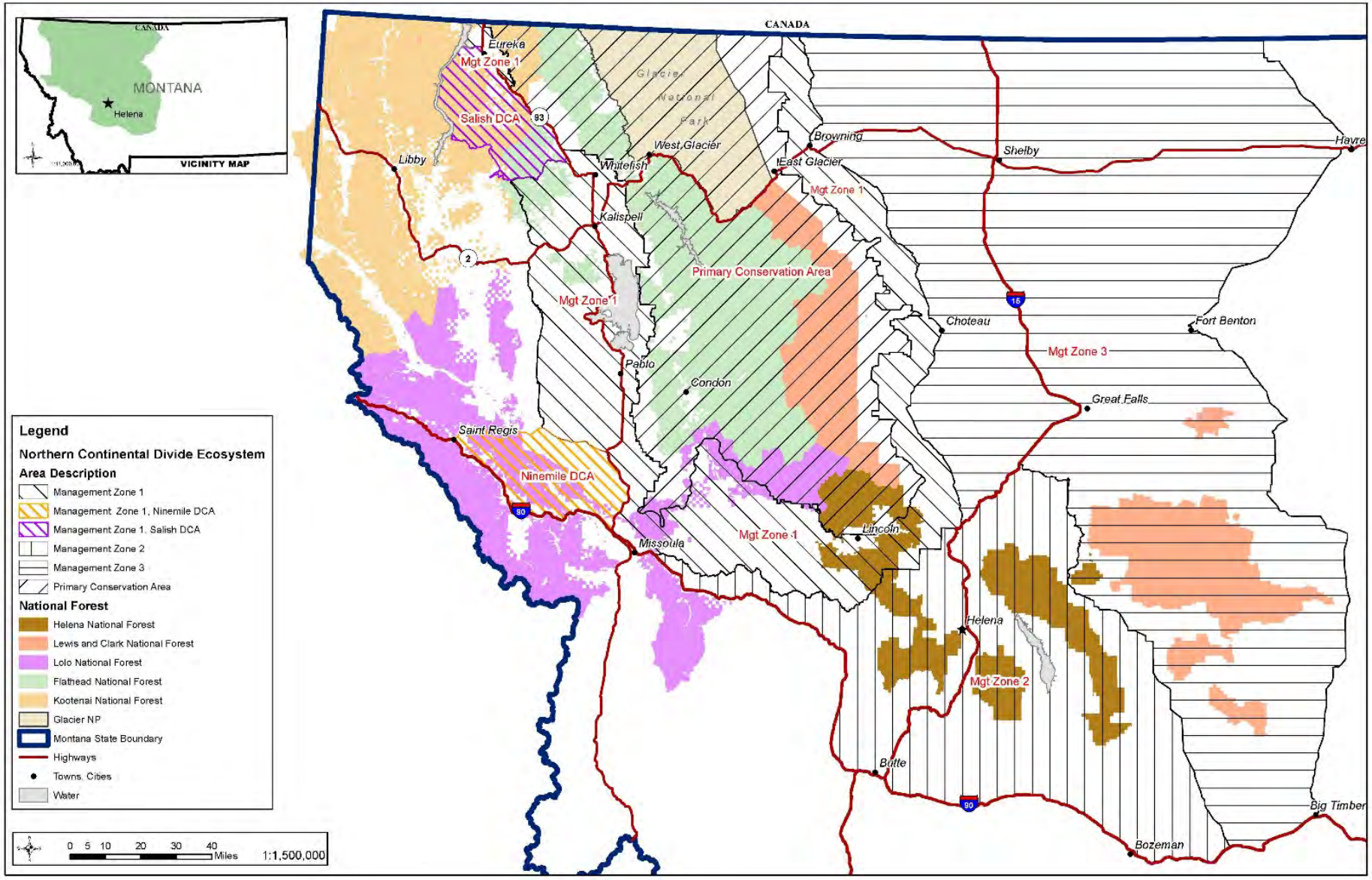


Figure B-5. NCDE grizzly bear management zones.

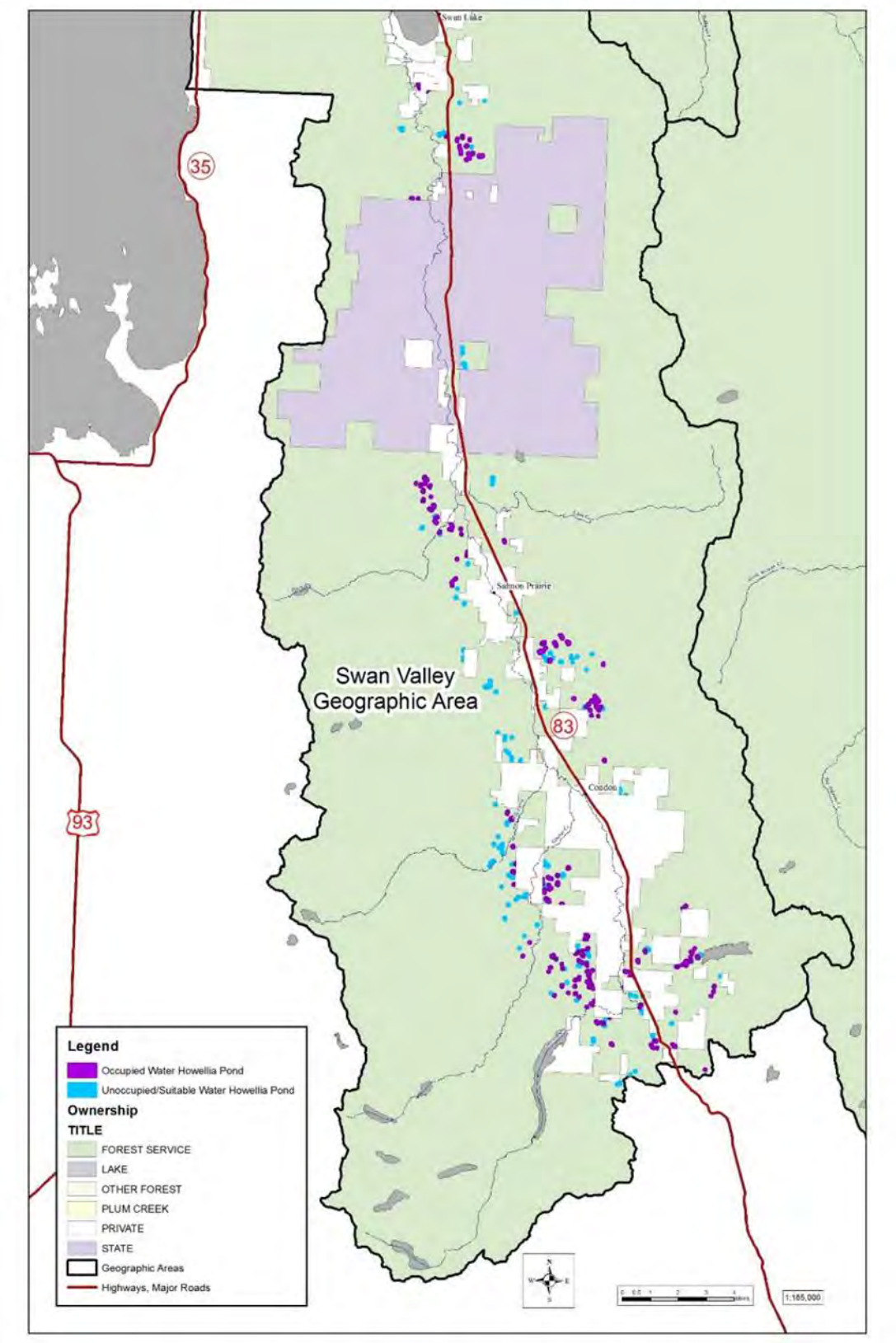


Figure B-6. *Howellia aquatilis* sites in Category 4 riparian management zones of the Swan Valley.

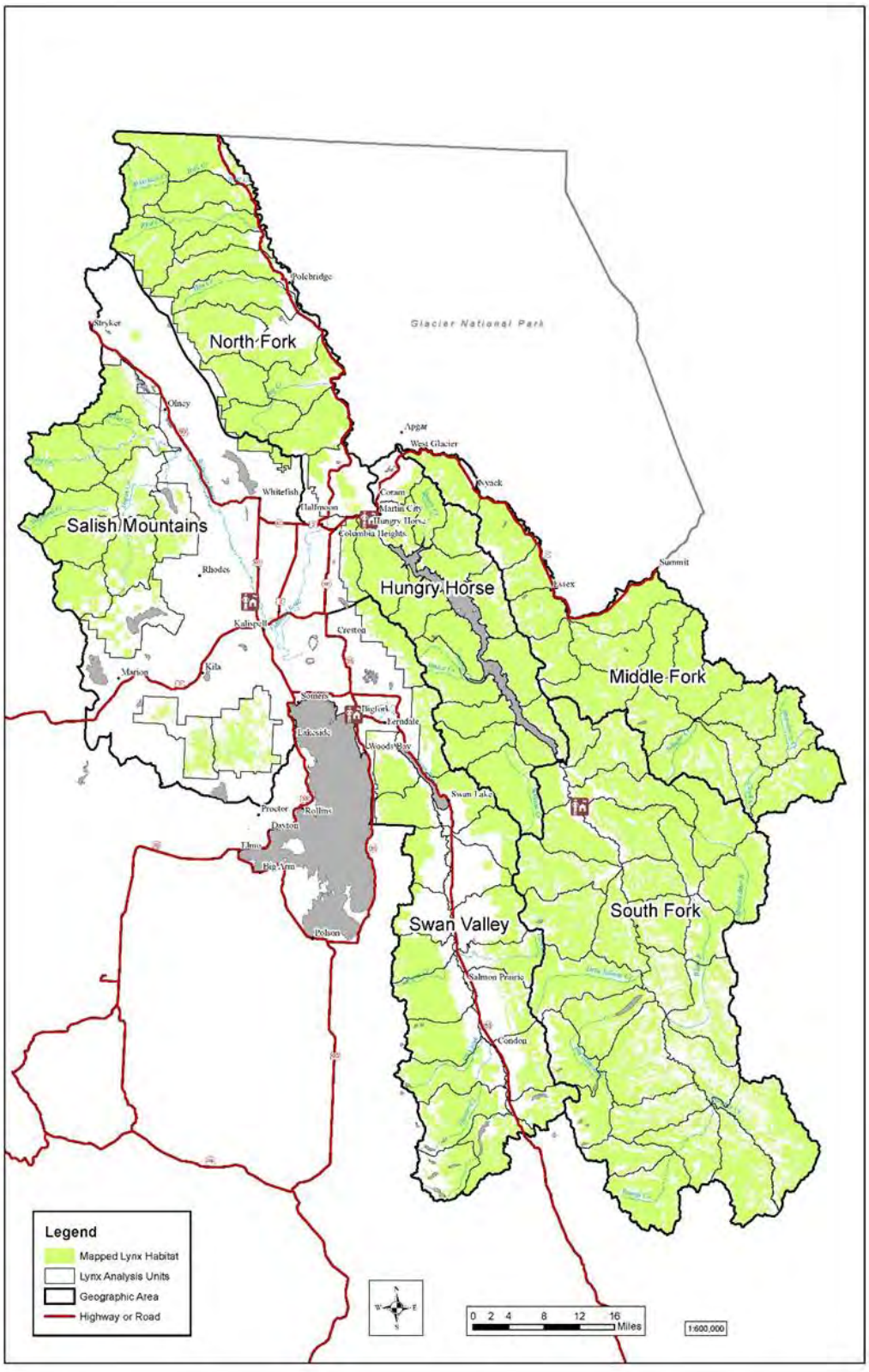


Figure B-7. Lynx analysis units on the Flathead National Forest.

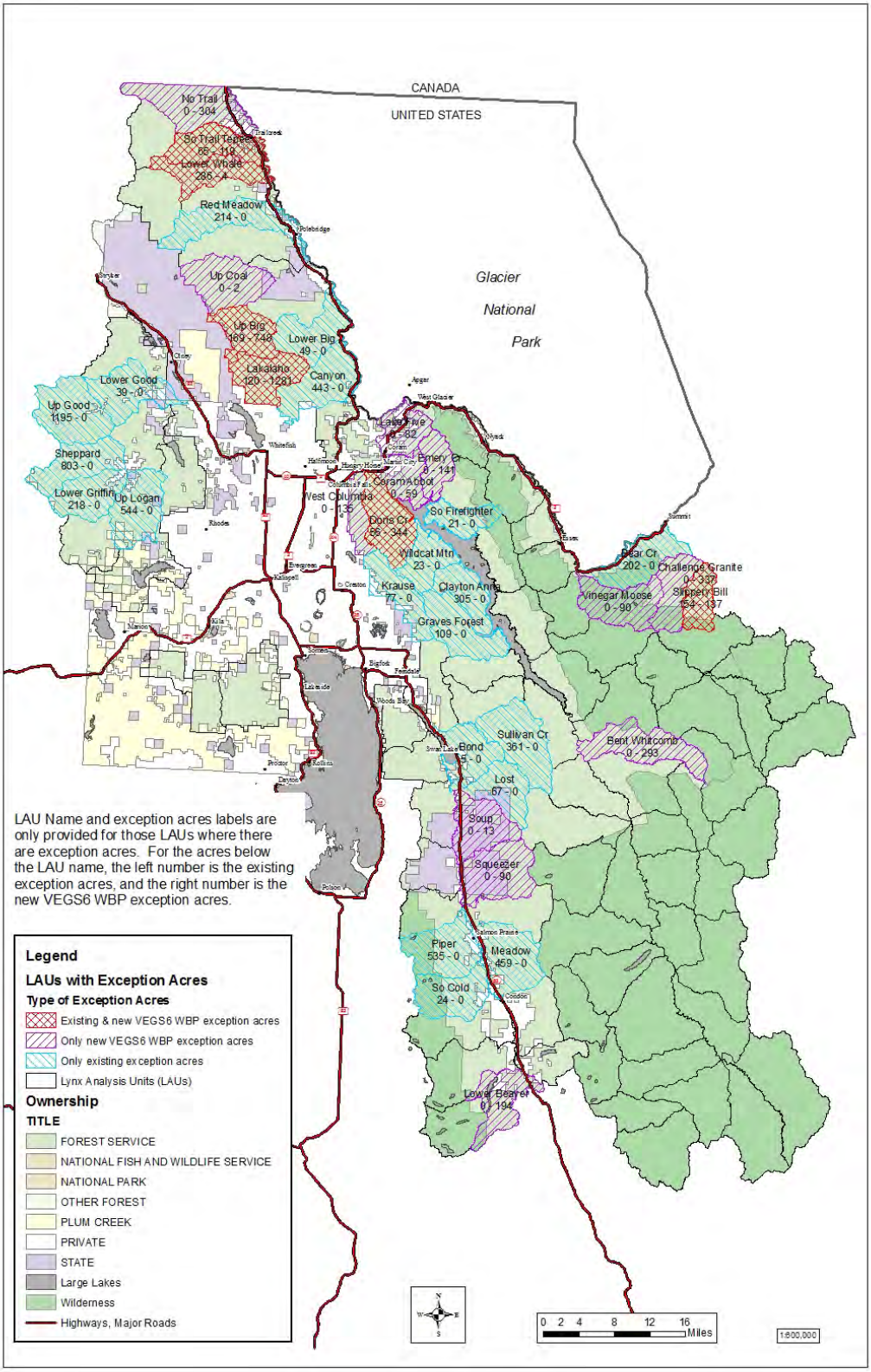


Figure B-8. Lynx analysis units with exception acres; alternative B modified.

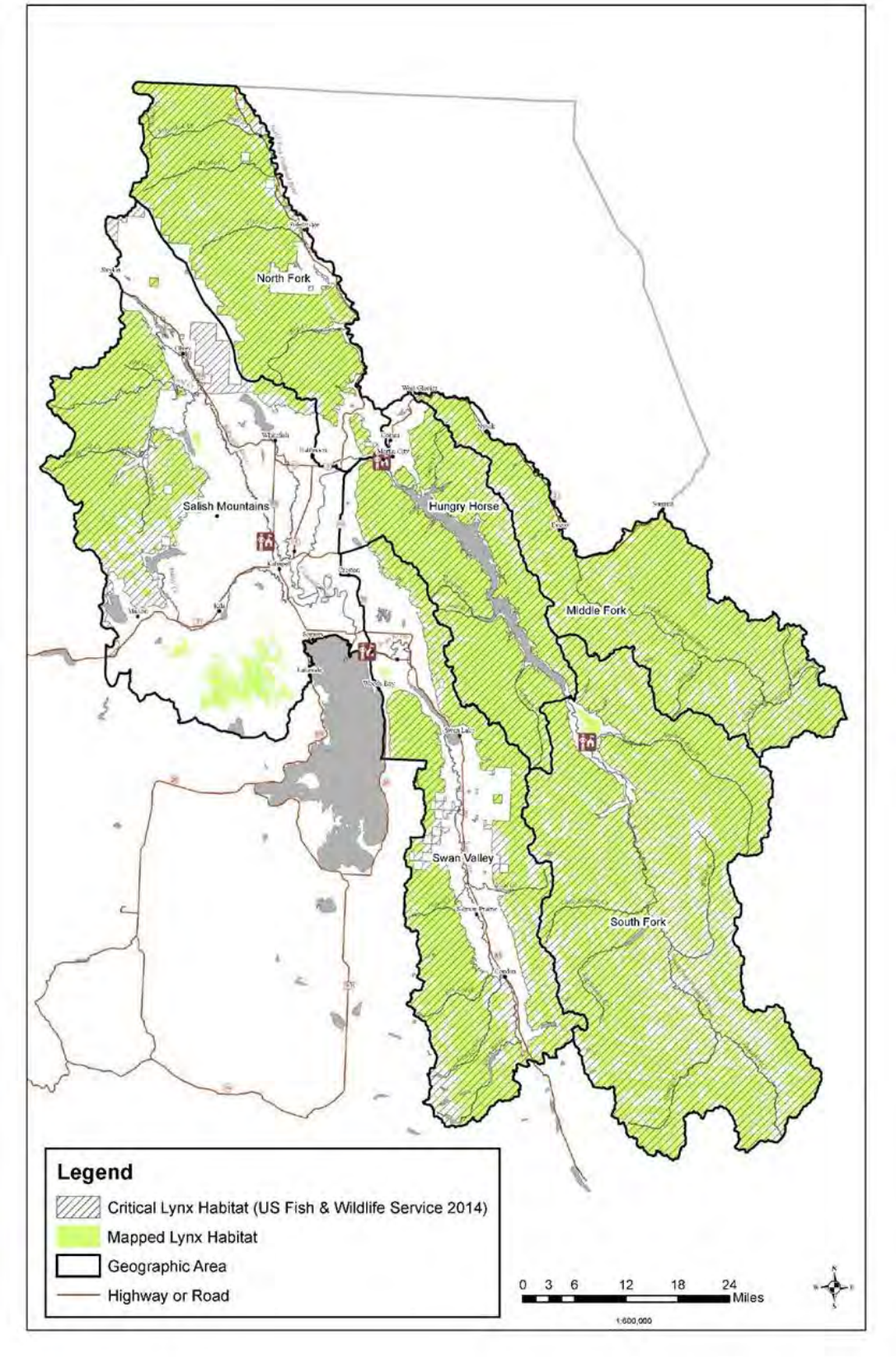


Figure B-9. Critical lynx habitat and modeled potential lynx habitat on the Flathead National Forest.

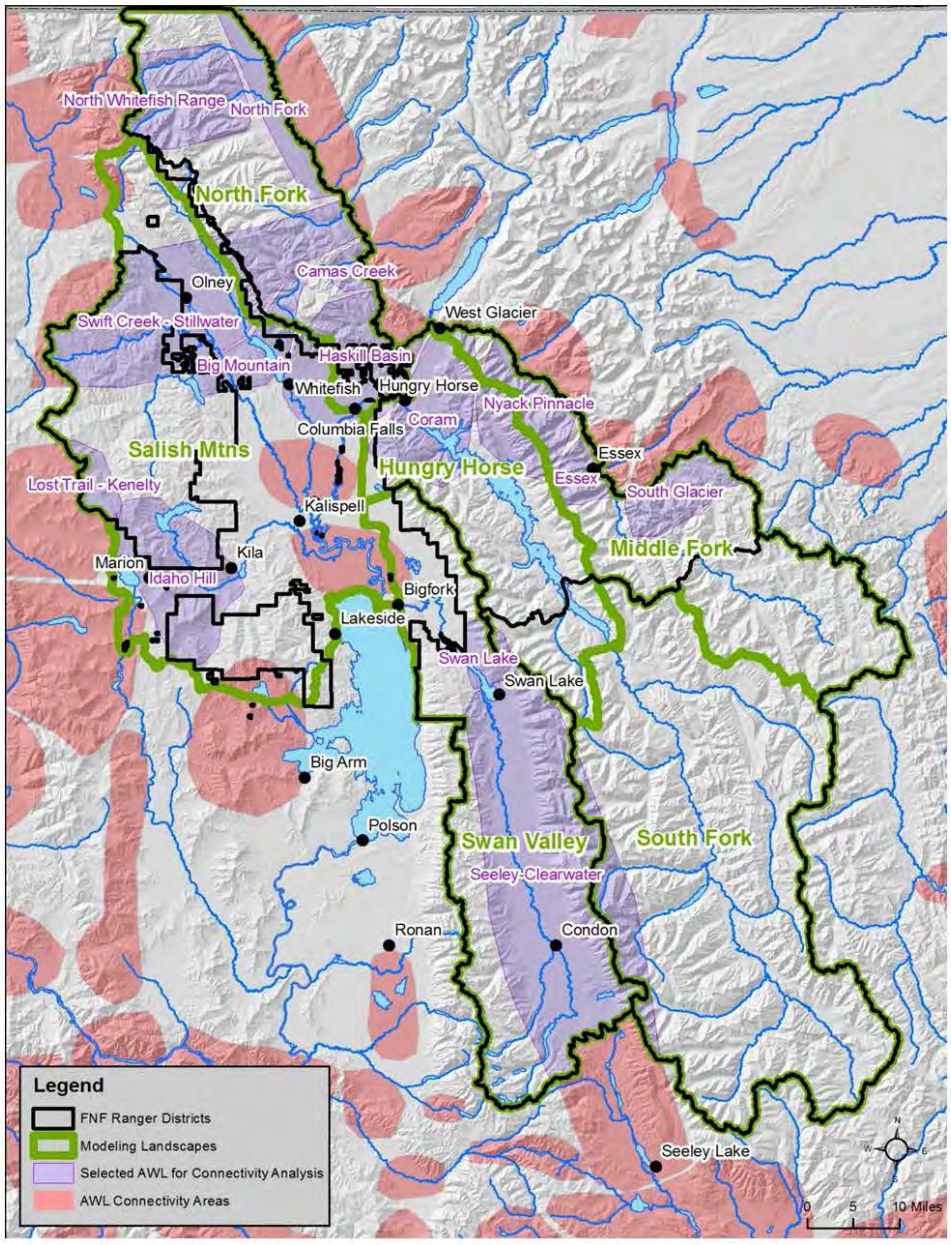
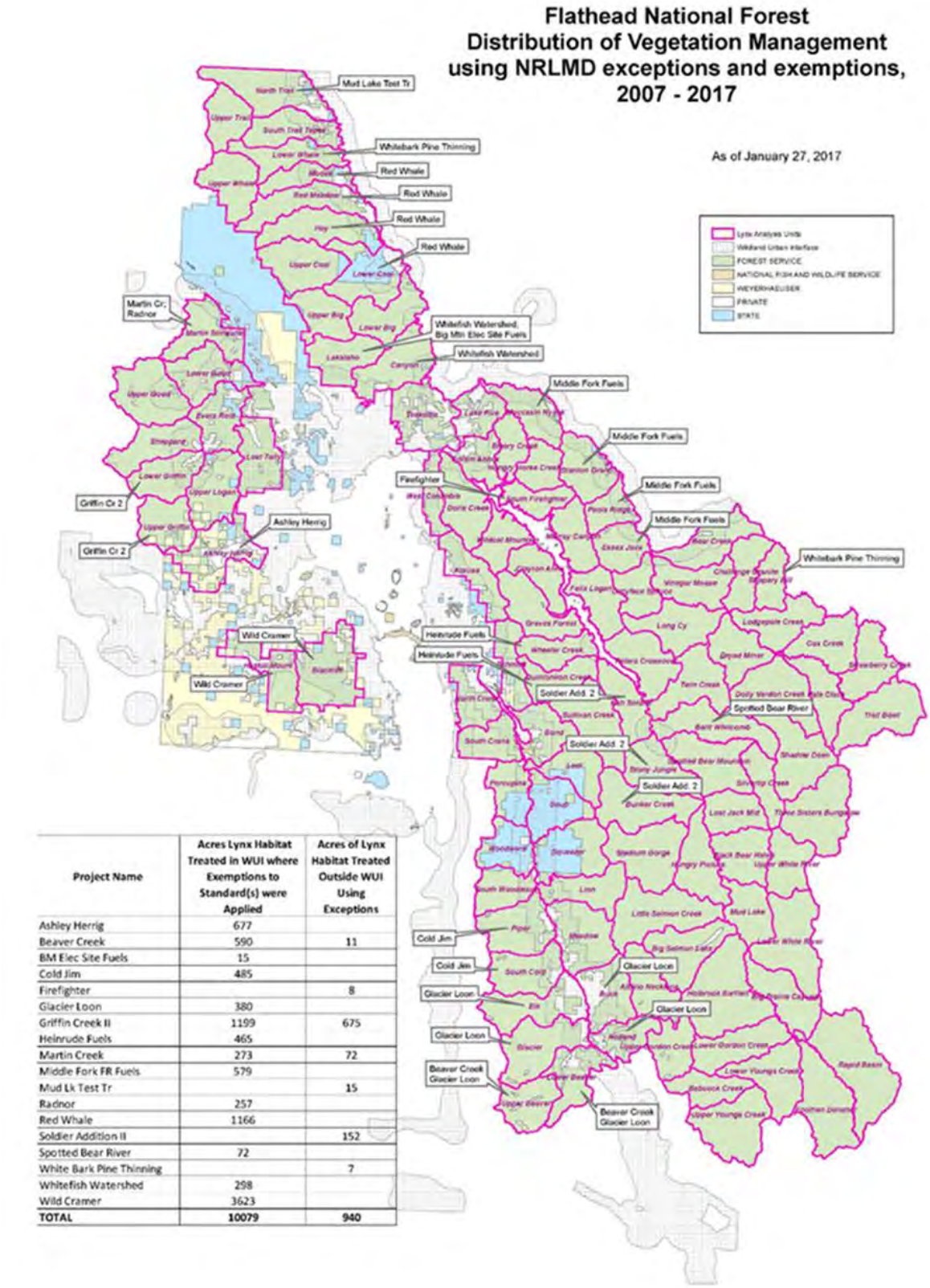


Figure B-10. Selected polygons for connectivity analysis (Source: American Wildlands obtained from databasin.org)



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
Helinrude 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 B-11. NRLMD exceptions and exemptions; Flathead National Forest 2007 to 2017.

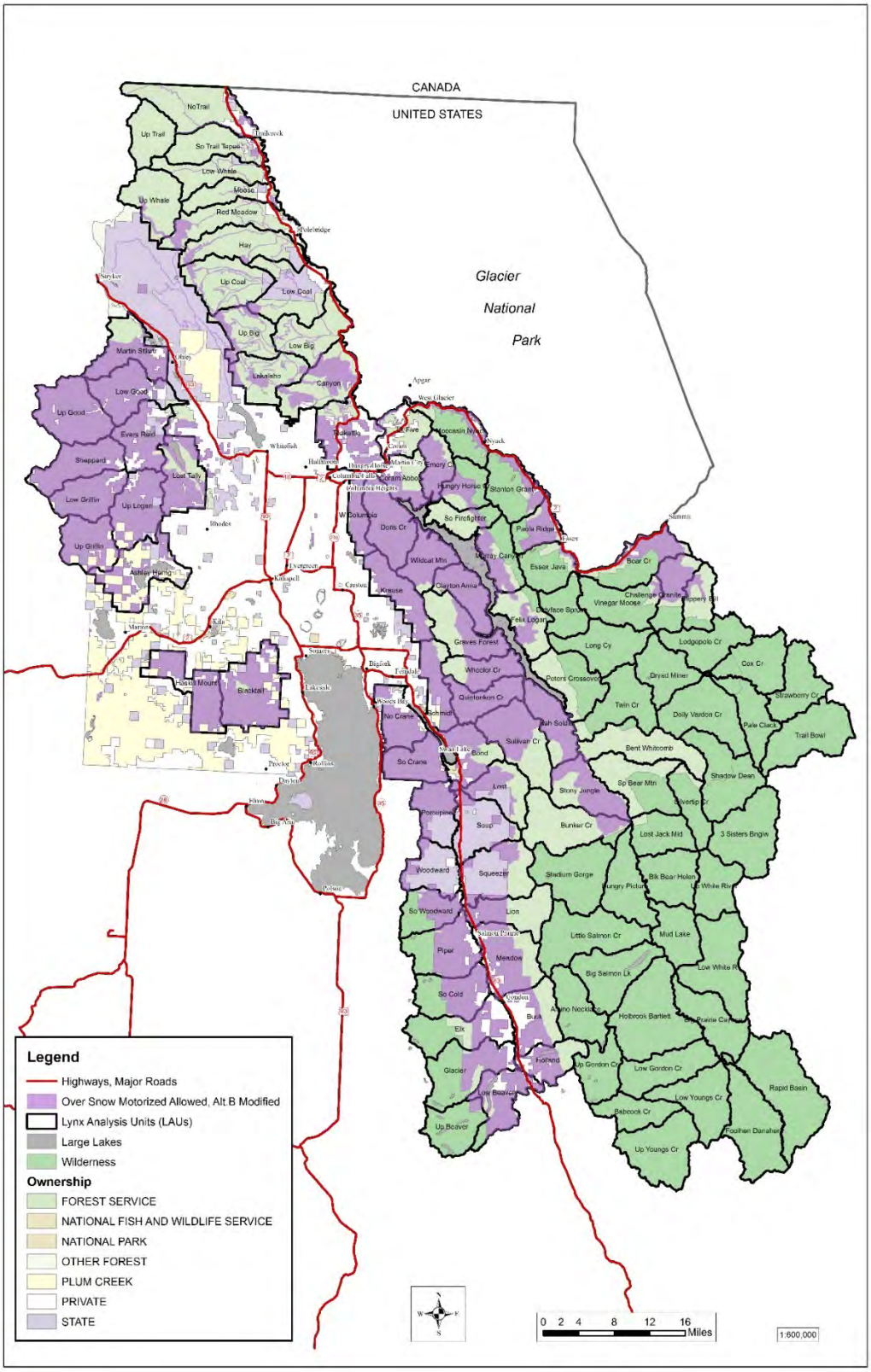


Figure B-12. Lynx analysis units and suitability for motorized over-snow vehicle use; alternative B modified.

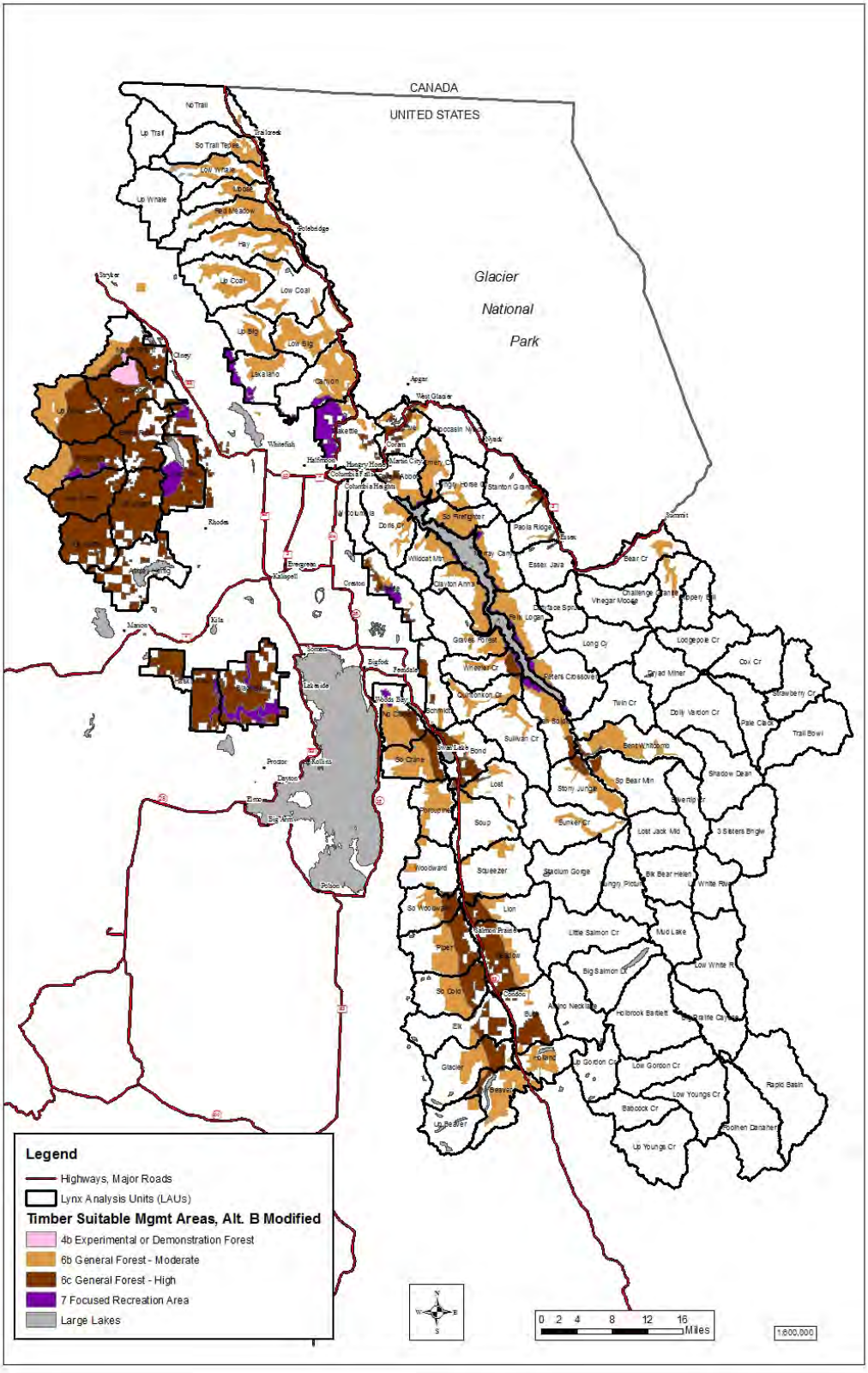


Figure B-13. Lynx analysis units and lands suitable for timber production; alternative B modified.

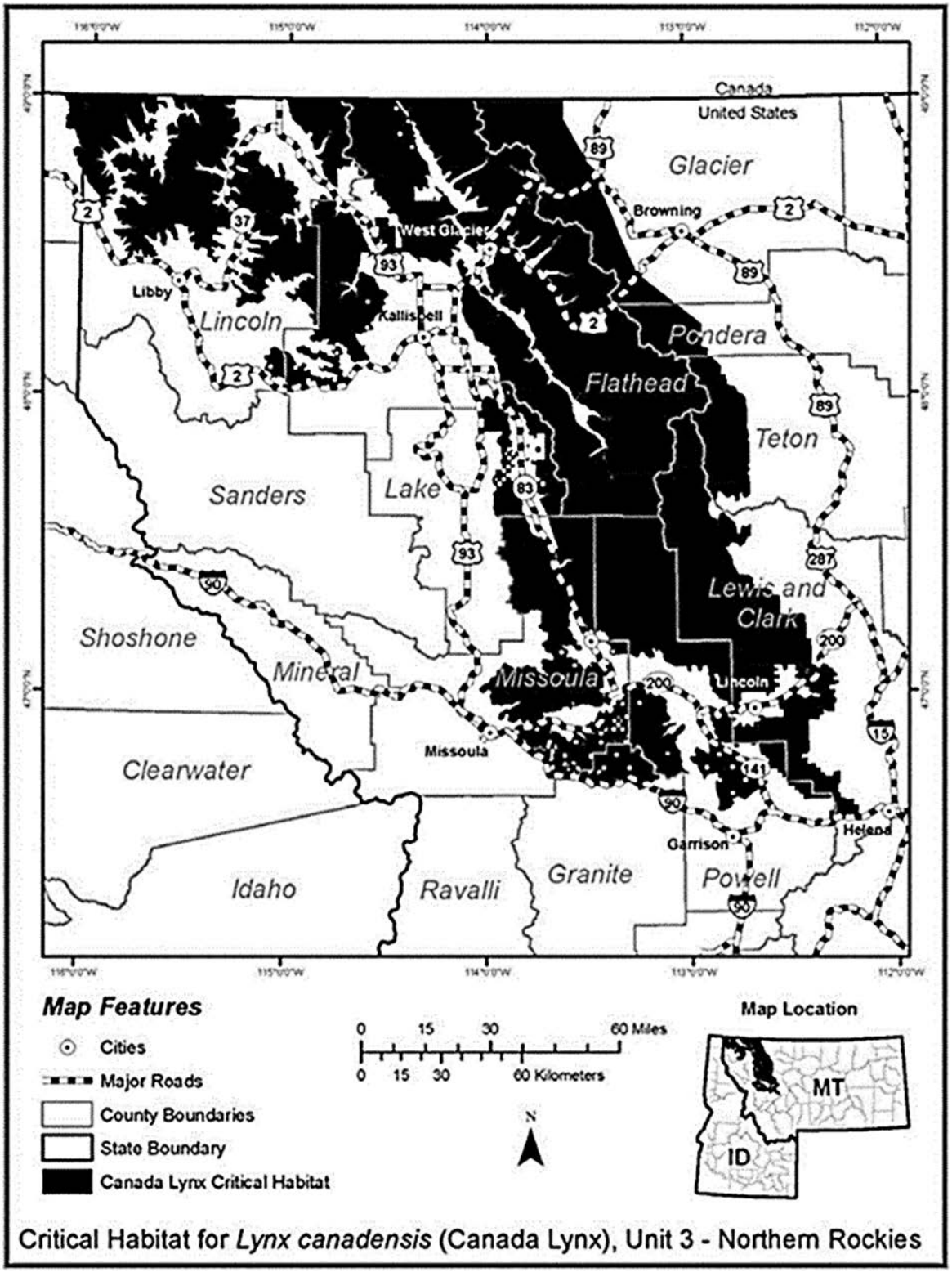


Figure B-14. Canada lynx critical Habitat Unit 3 (Source: Federal Register Vol. 79, No. 177, Friday, September 12, 2014).

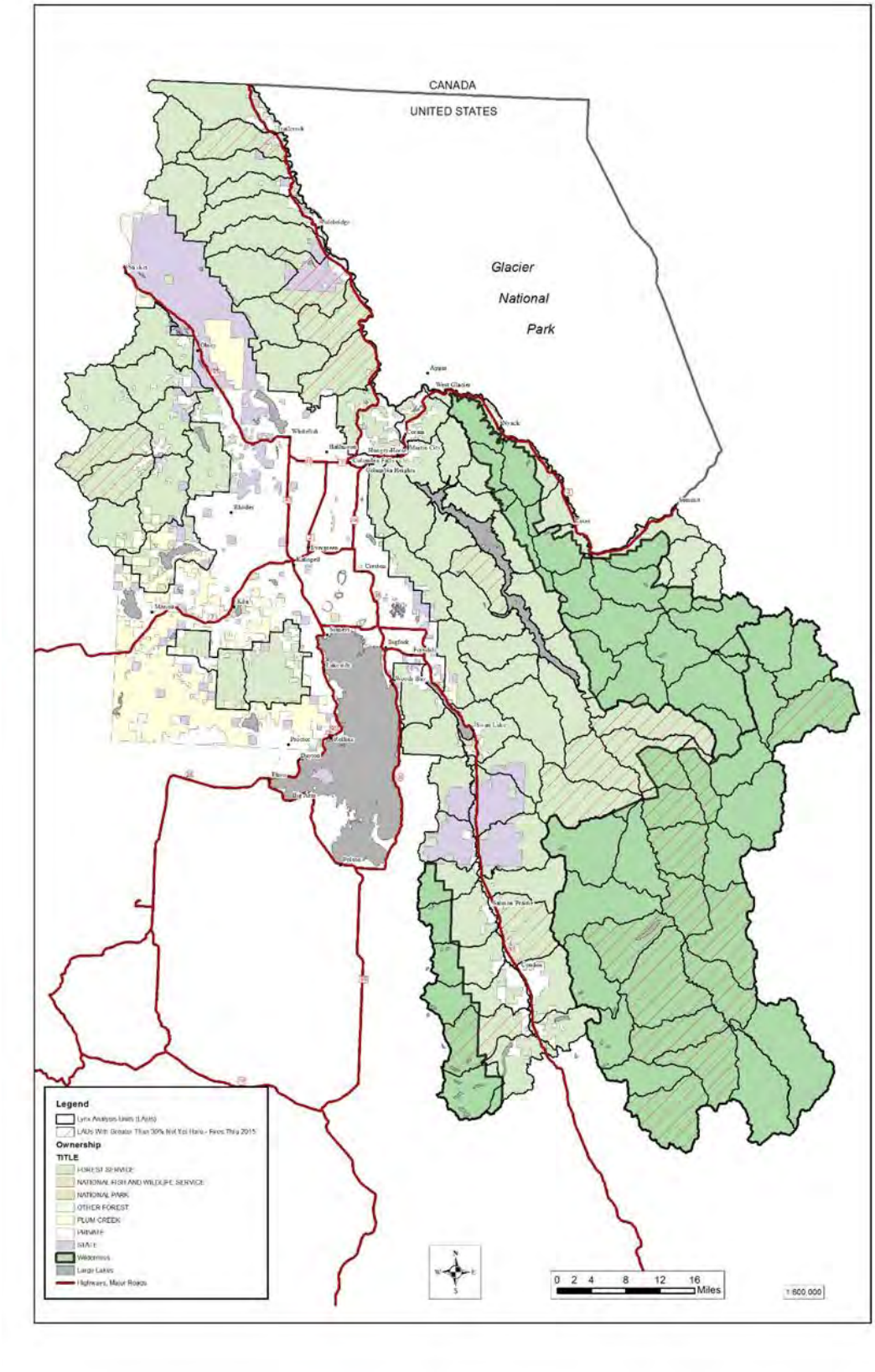


Figure B-15. Lynx analysis units that may have more than 30% of lynx habitat that is not yet hare habitat due to wildfires as of 2015.

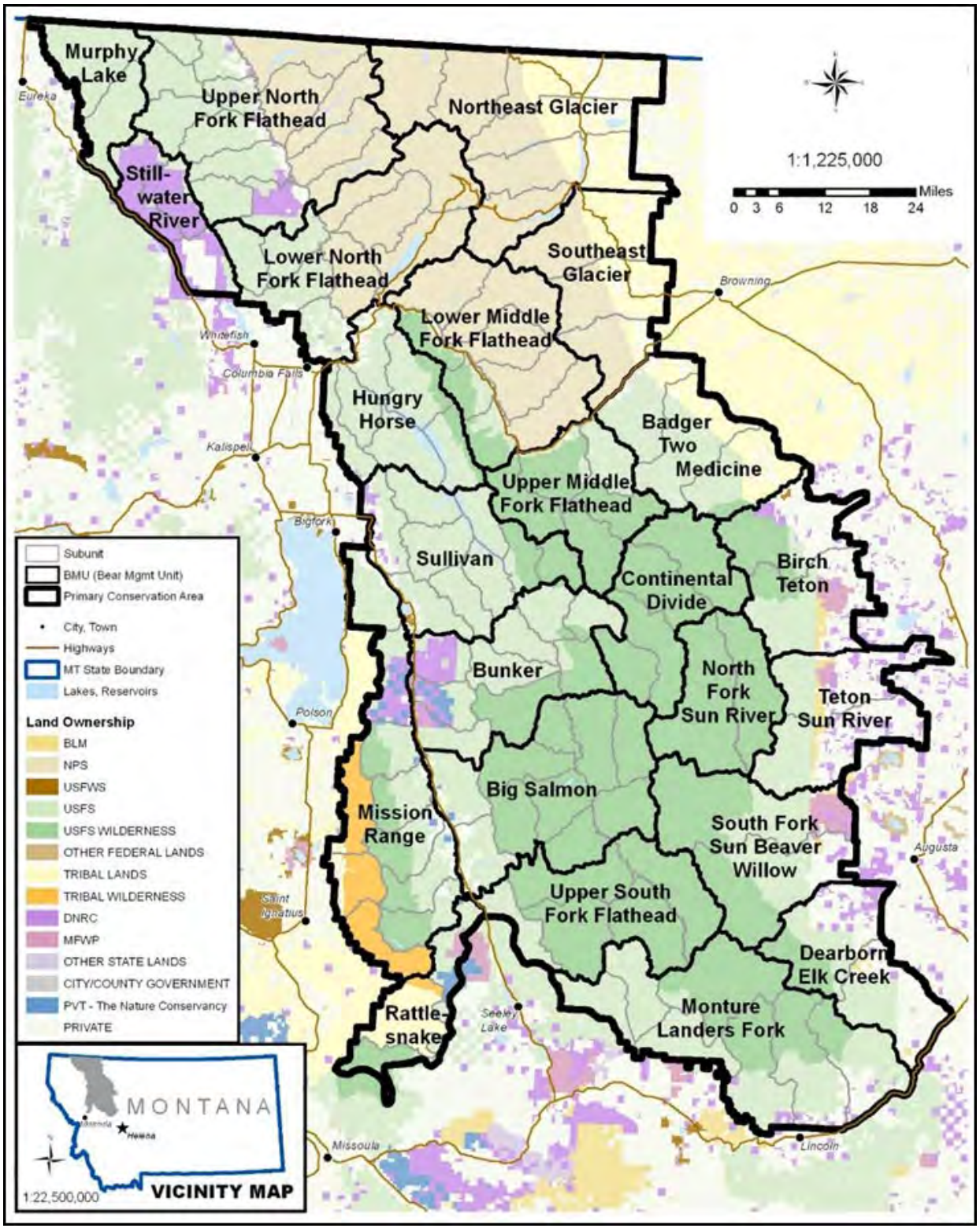


Figure B-16. Bear management units (BMUs) and subunits in the NCDE primary conservation area.

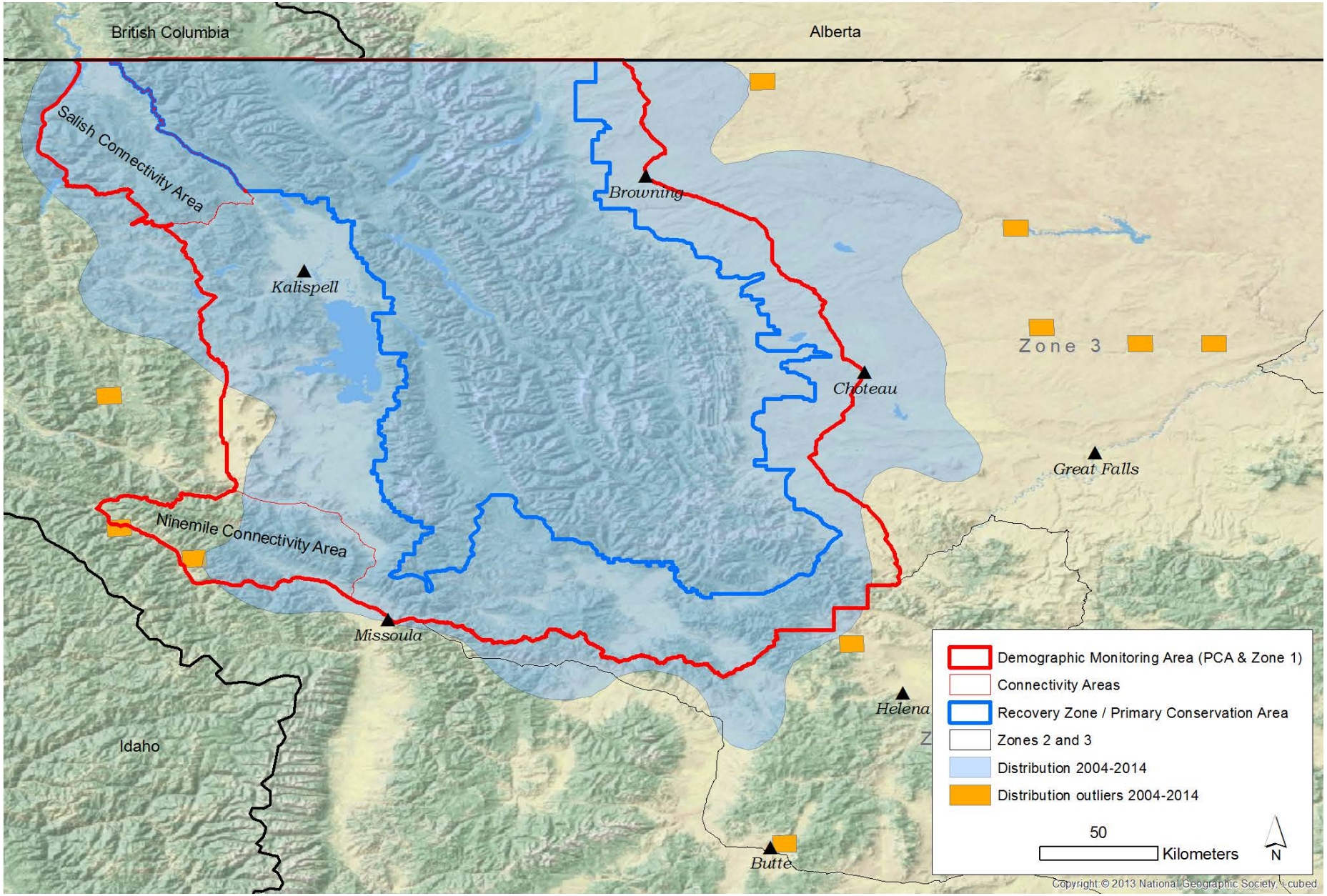


Figure B-17. Distribution of grizzly bears (2004 to 2014) in the NCDE (Source: Costello et al. 2016).

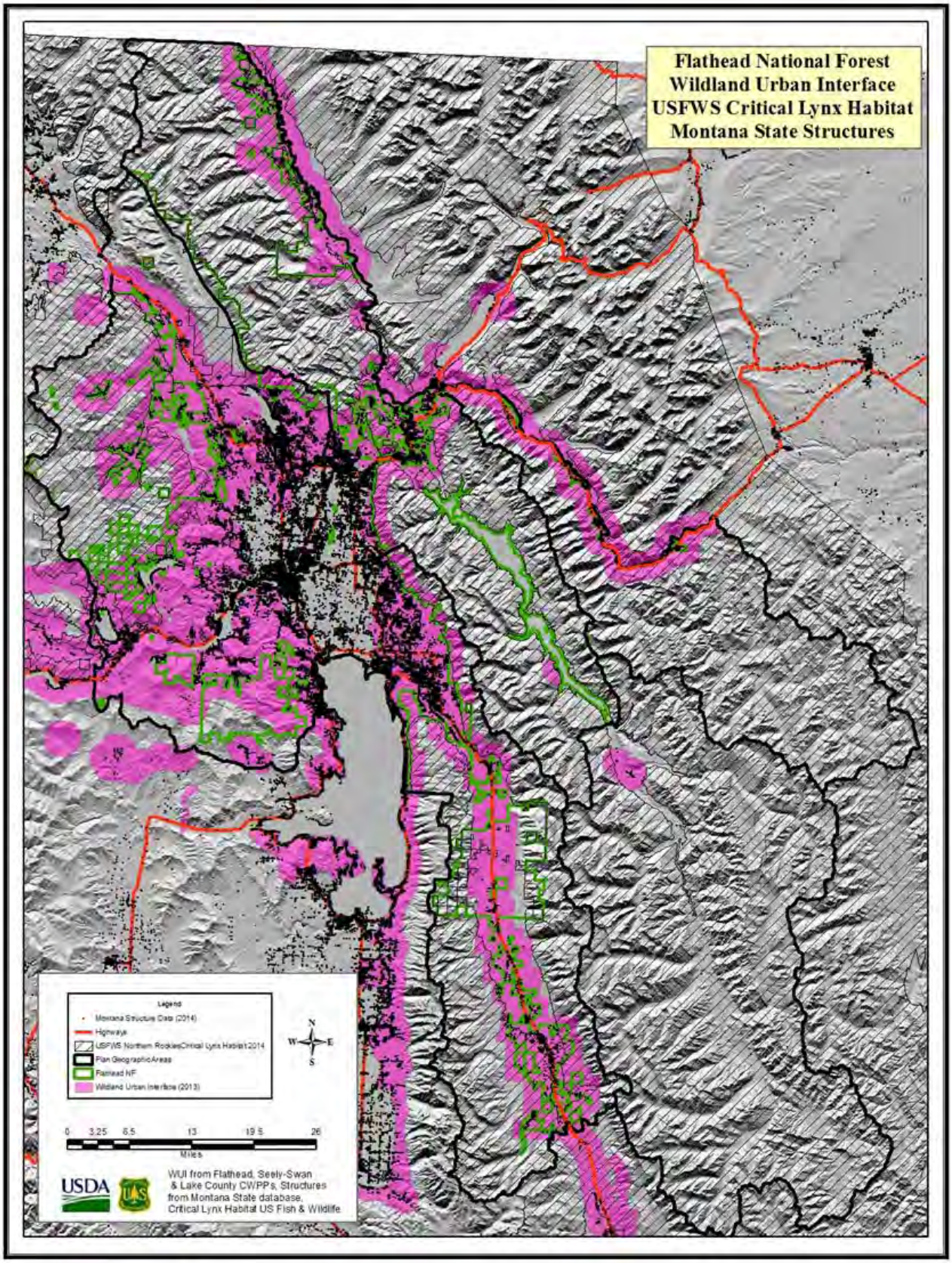


Figure B-18. Canada Lynx critical habitat and the wildland-urban interface.

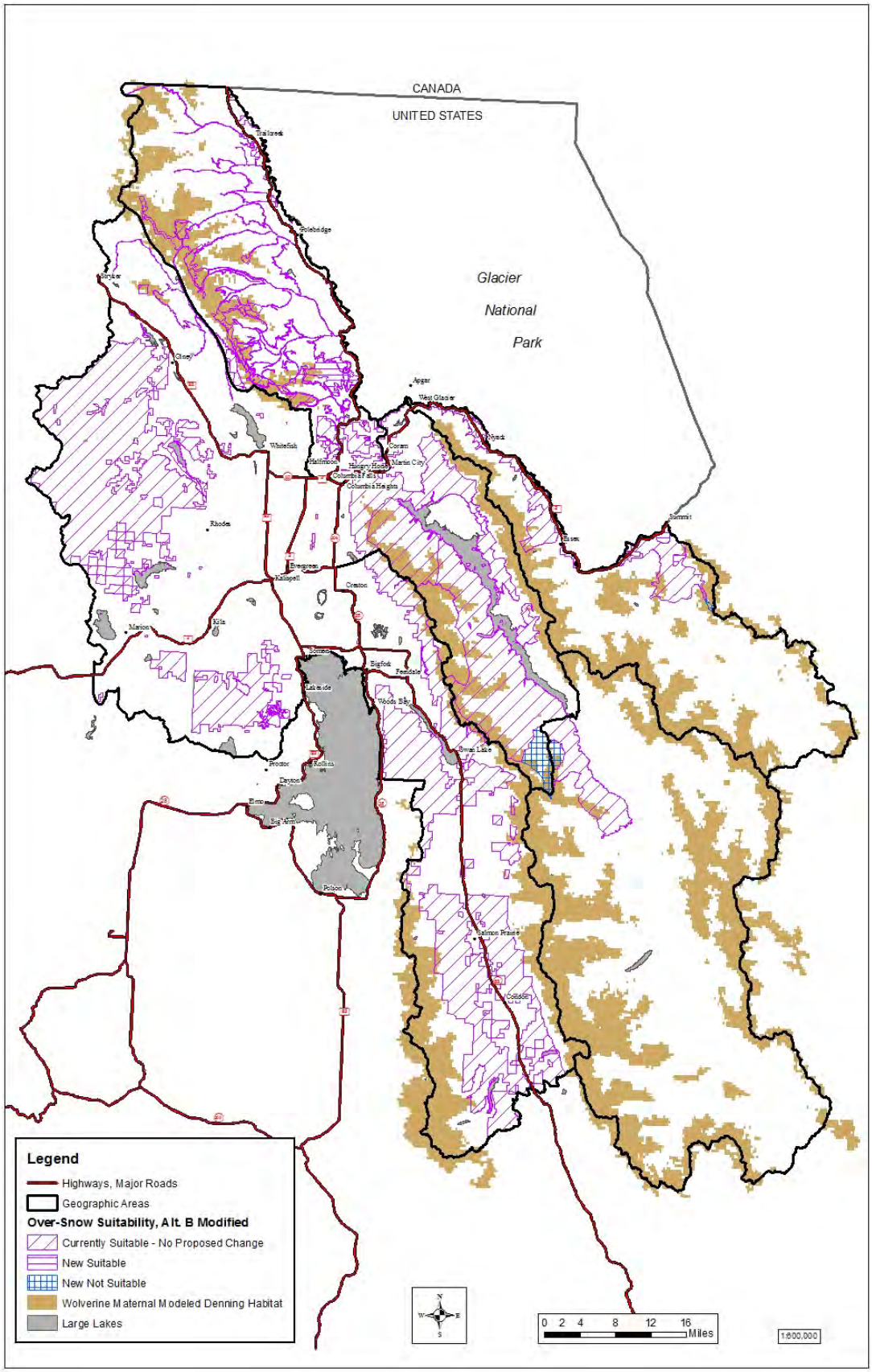


Figure B-19. Modeled wolverine maternal denning habitat (based on Copeland et al. 2010) and suitability for motorized over-snow vehicle use.

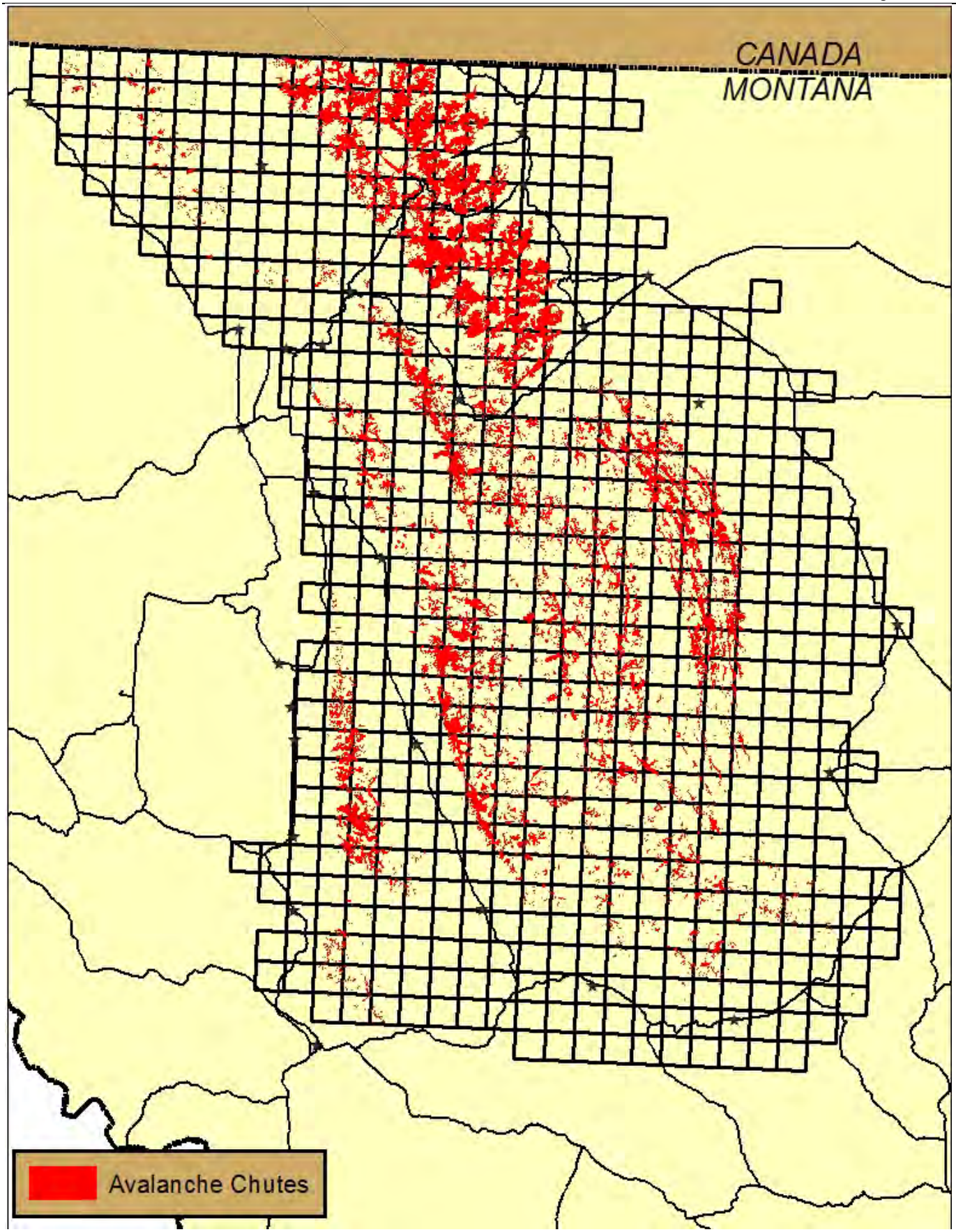


Figure B-20. Avalanche chute distribution in the NCDE (Source: T. Graves 2016).

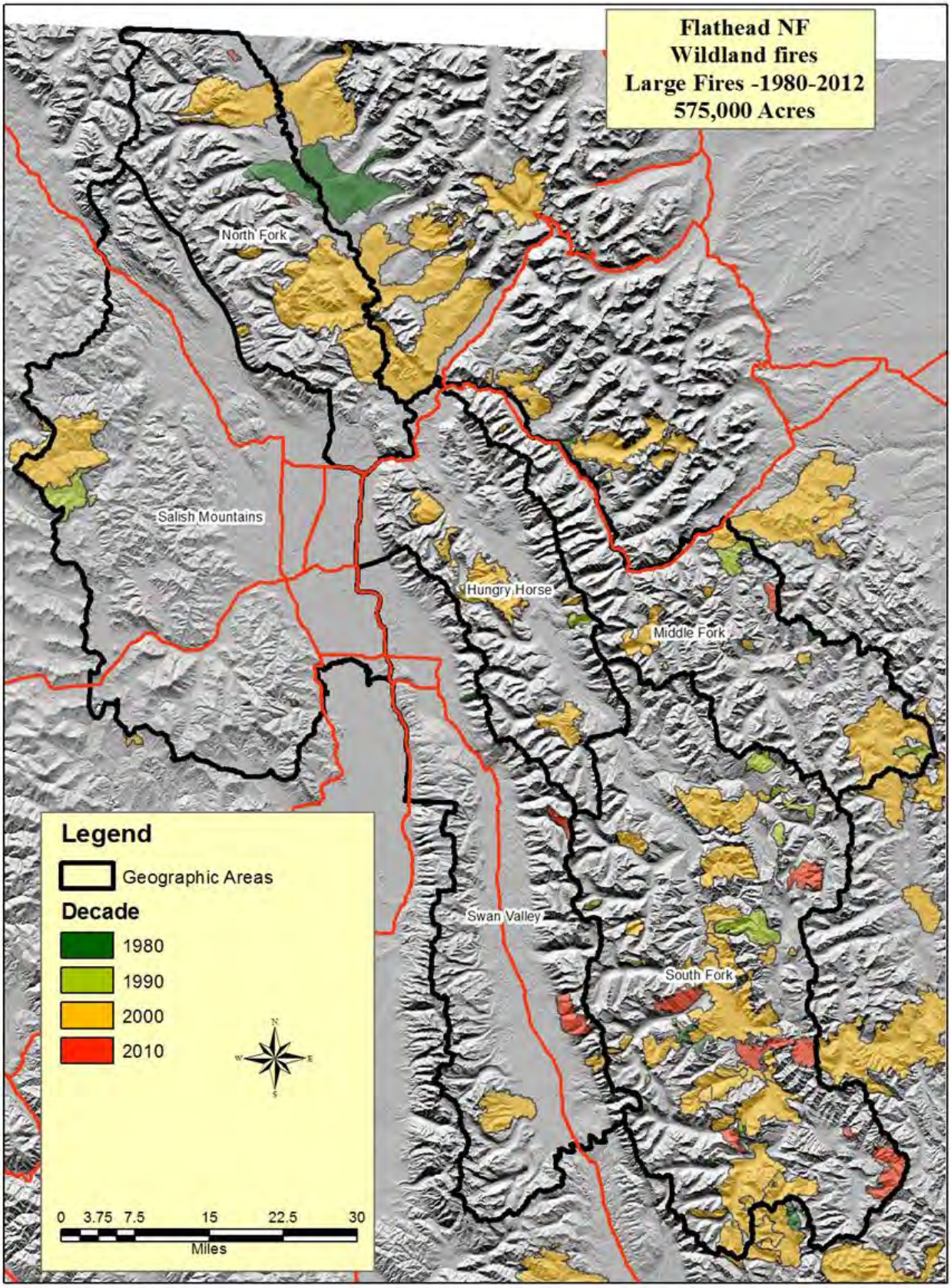


Figure B-21. Wildfire areas in, and adjacent to, the Flathead National Forest.

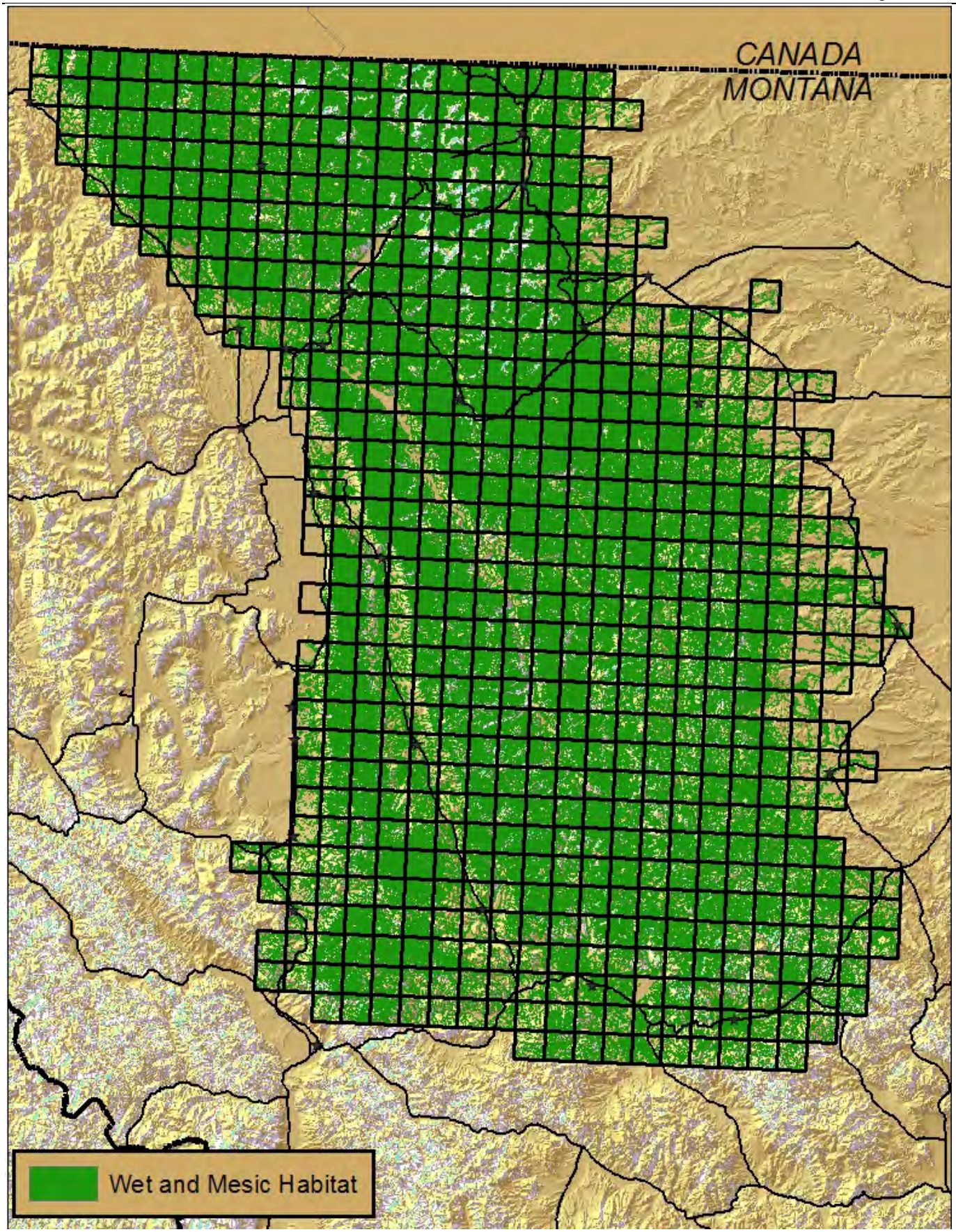


Figure B-22. Wet and mesic habitat in the Northern Continental Divide Ecosystem (Source: T. Graves 2016).

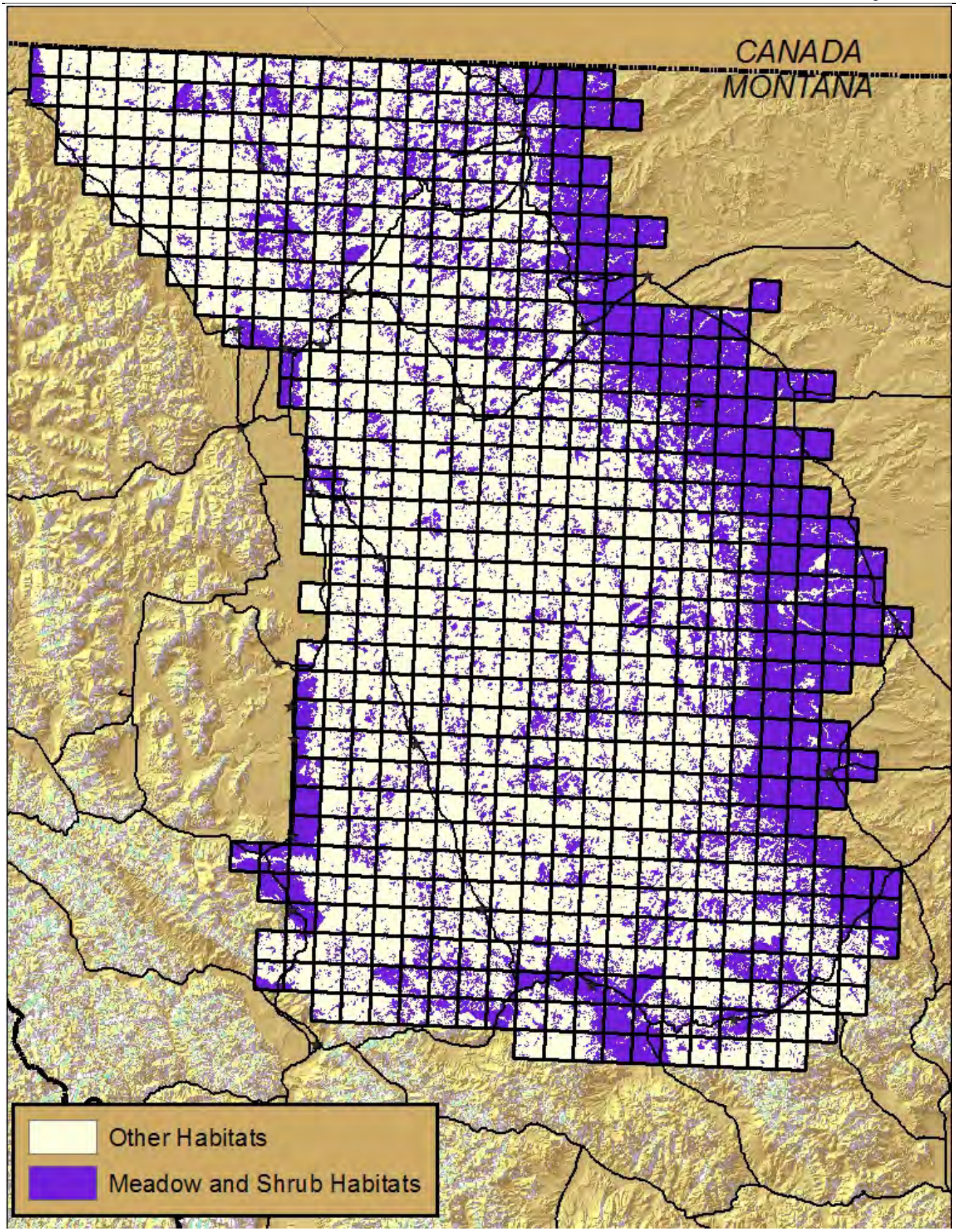


Figure B-23. Meadow and shrub habitat in the Northern Continental Divide Ecosystem (Source: T. Graves 2016).

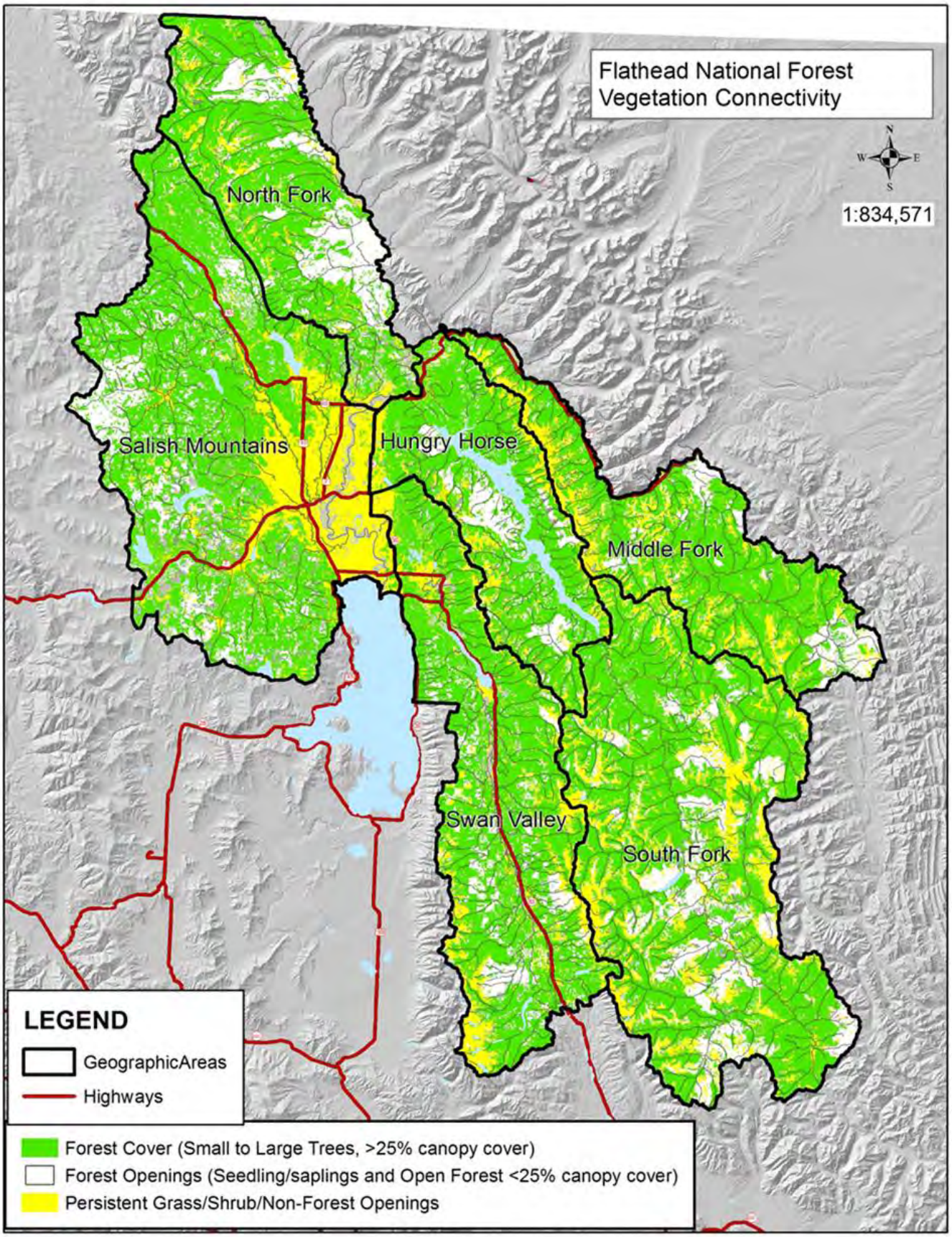


Figure B-24. Connectivity of vegetation in Flathead National Forest geographic areas; all land ownerships.

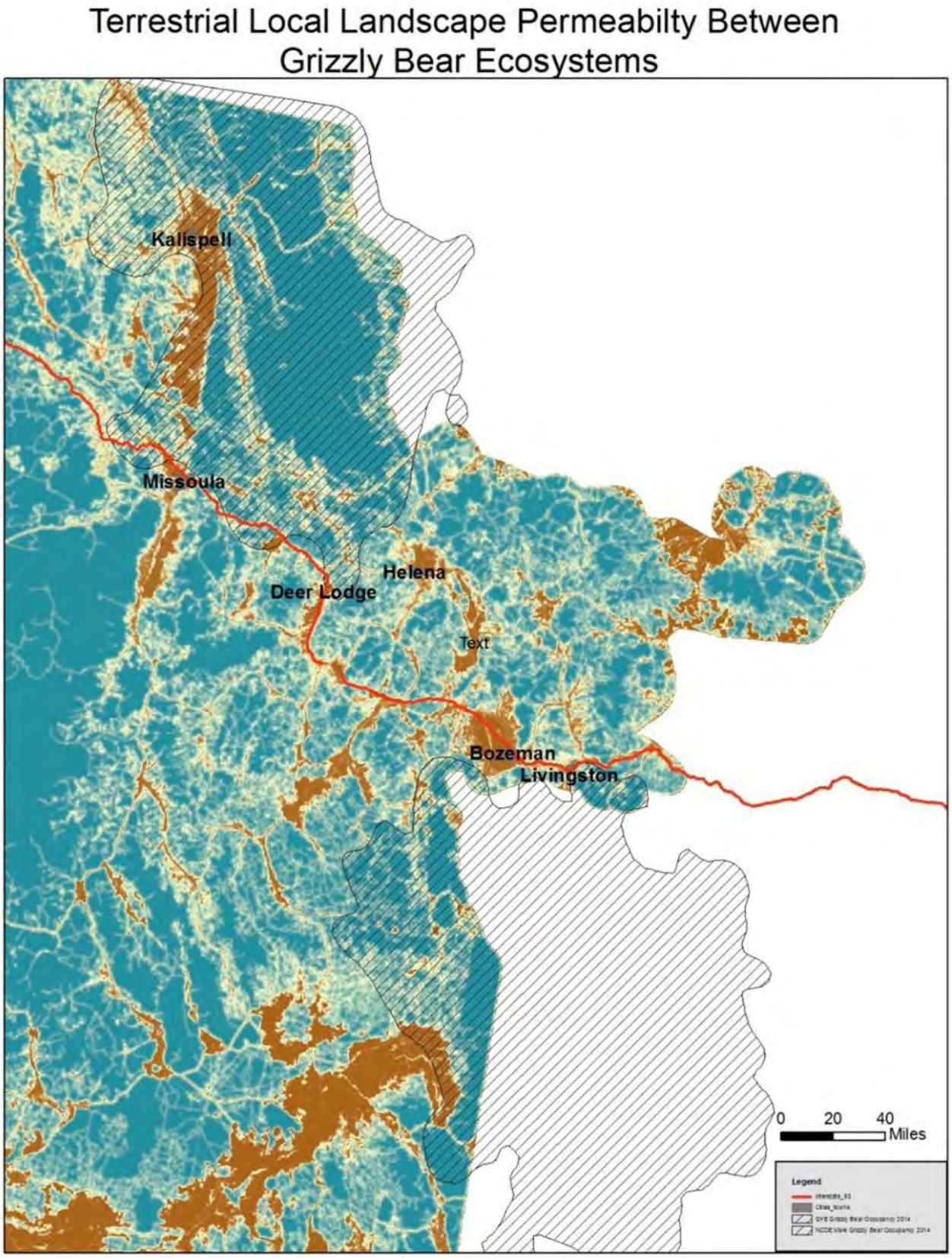


Figure B-25. Terrestrial landscape permeability between areas occupied by the grizzly bear: Northern Continental Divide and Greater Yellowstone Ecosystems (Source: R. Mace; http://nature.org resilienceNW obtained from databasin.org 2016).

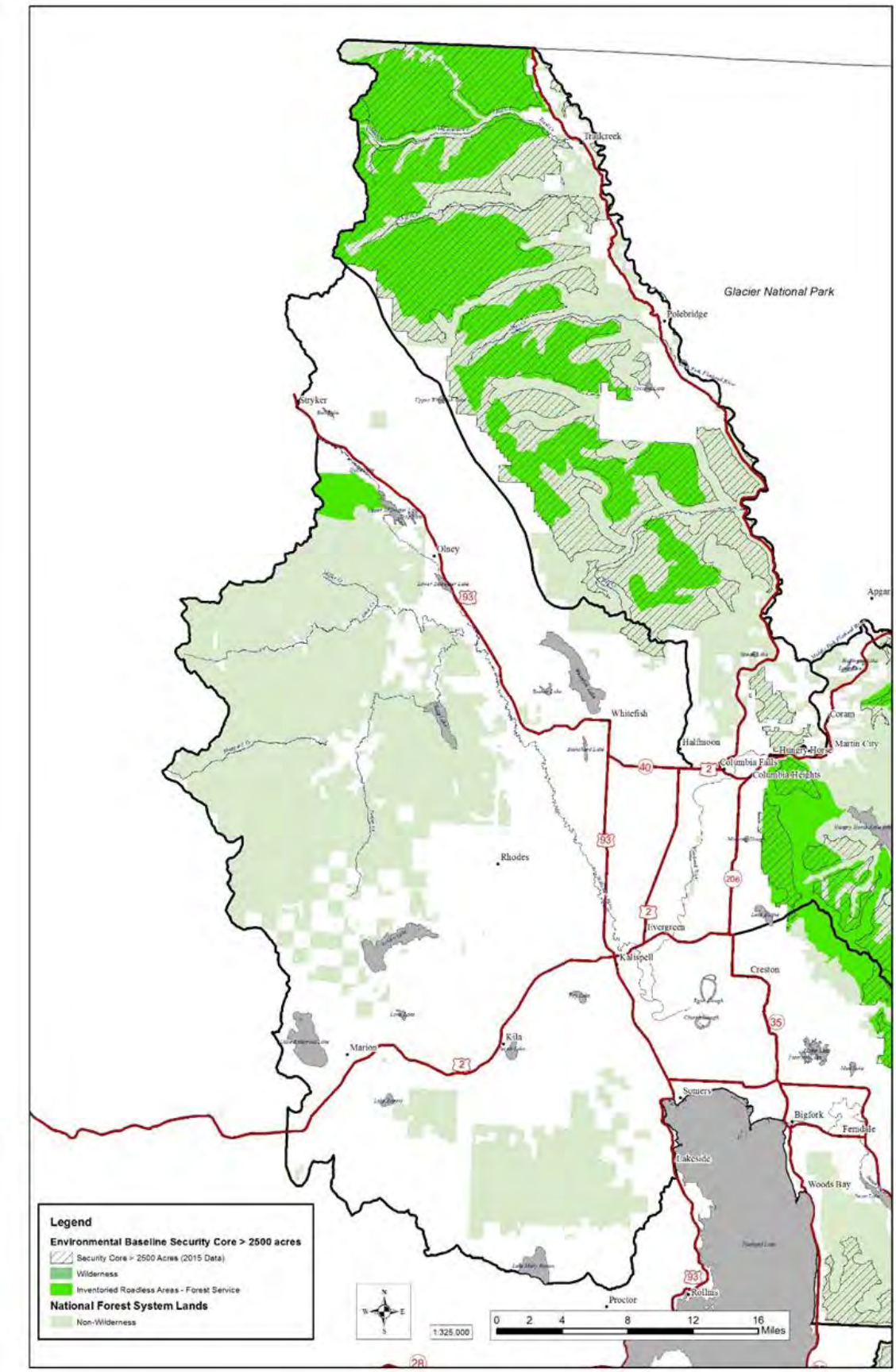


Figure B-26. Security core, wilderness, and inventoried roadless areas; Flathead National Forest north half.

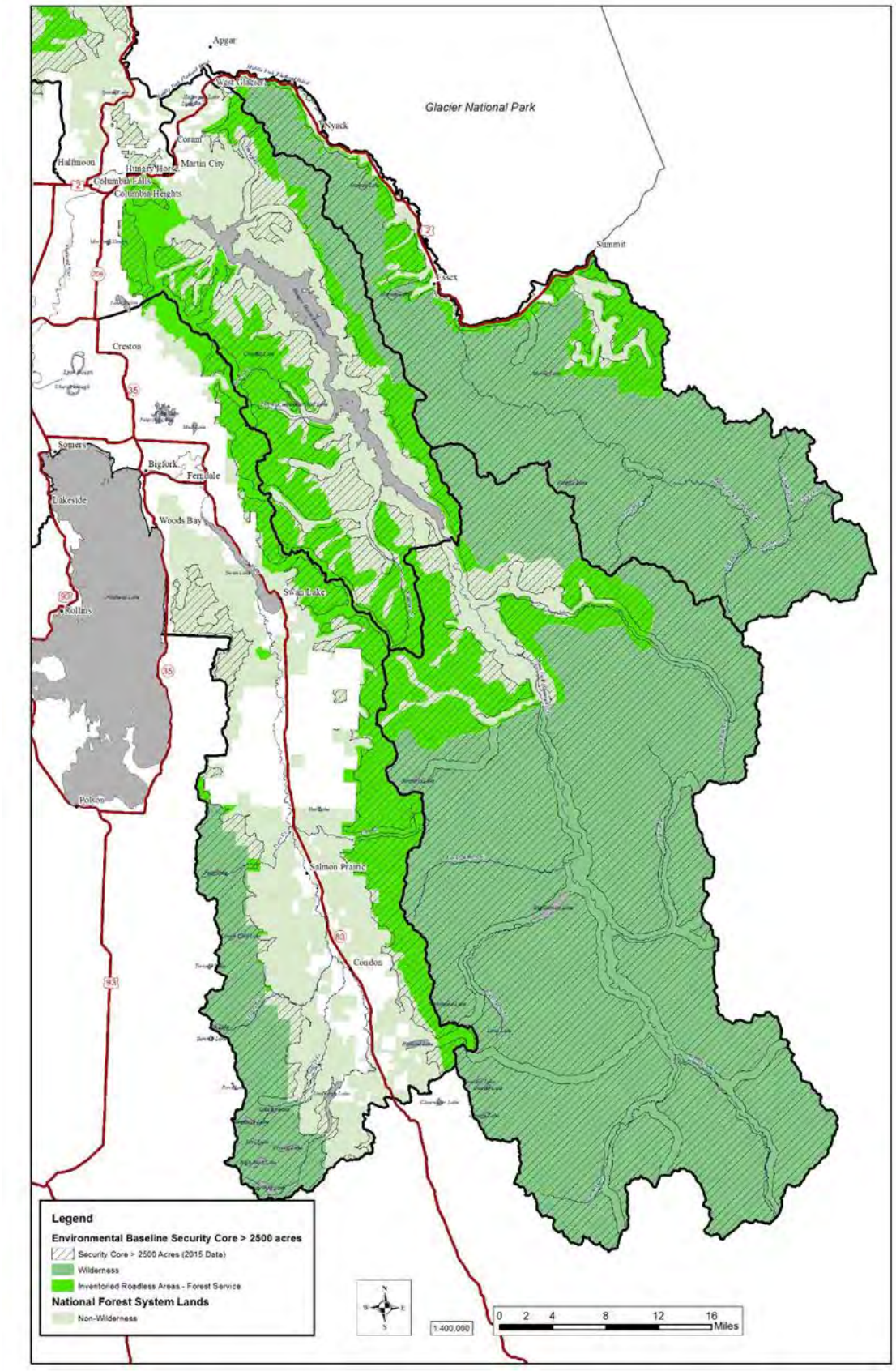


Figure B-27. Security core, wilderness, and inventoried roadless areas; Flathead National Forest south half.

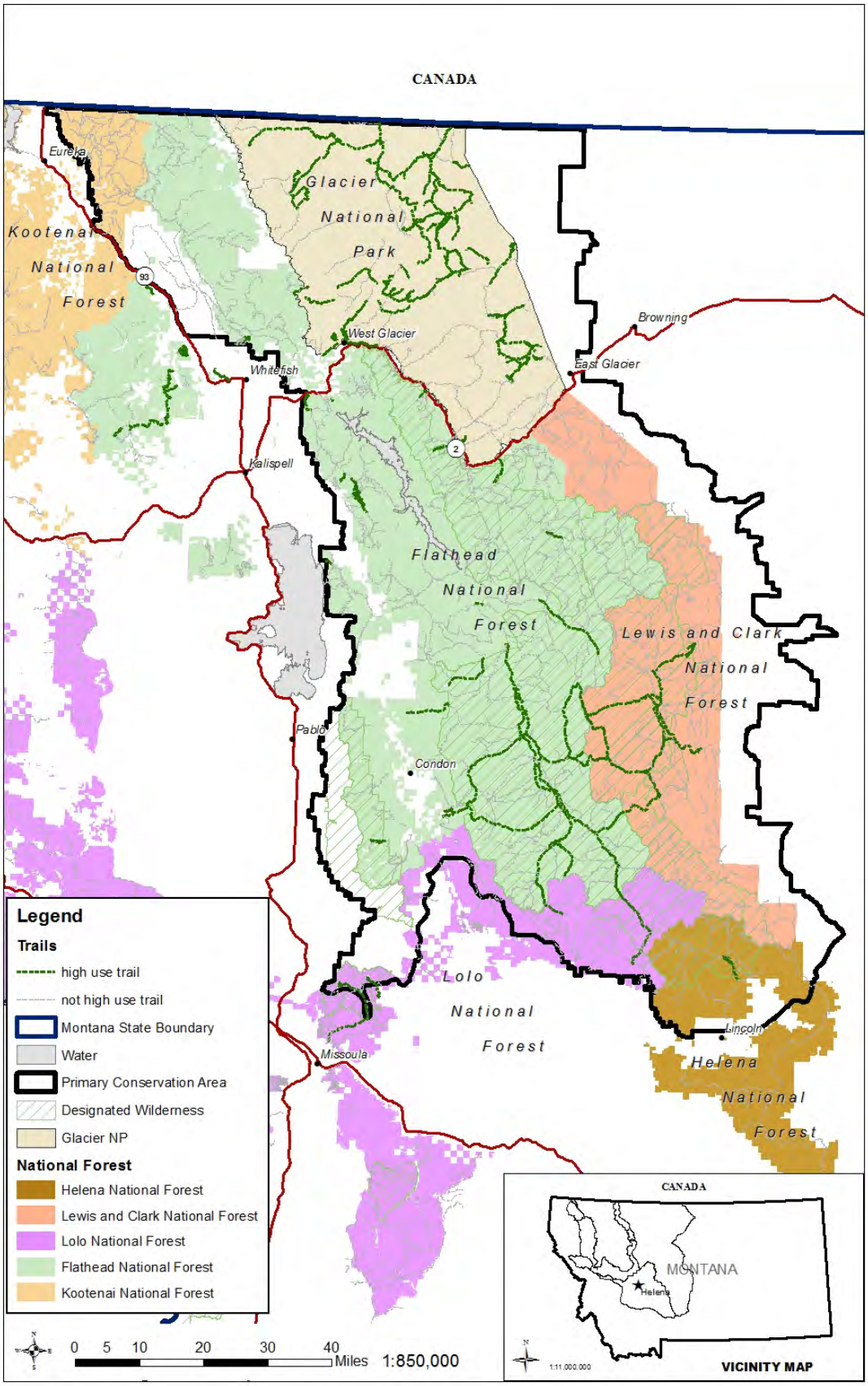


Figure B-28. High use trails in the NCDE.

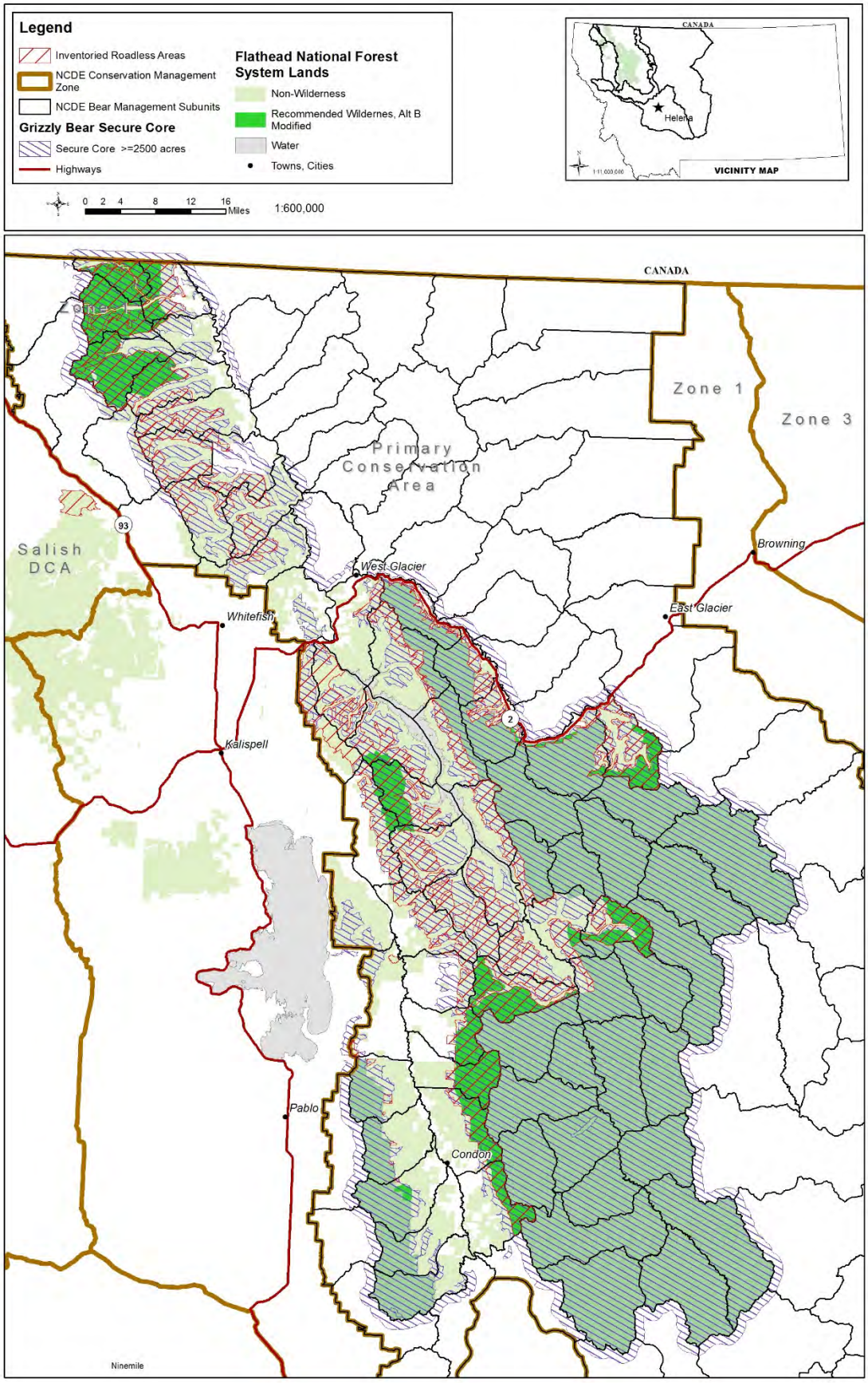


Figure B-29. Secure core with wilderness, recommended wilderness, and inventoried roadless areas; alternative B modified.

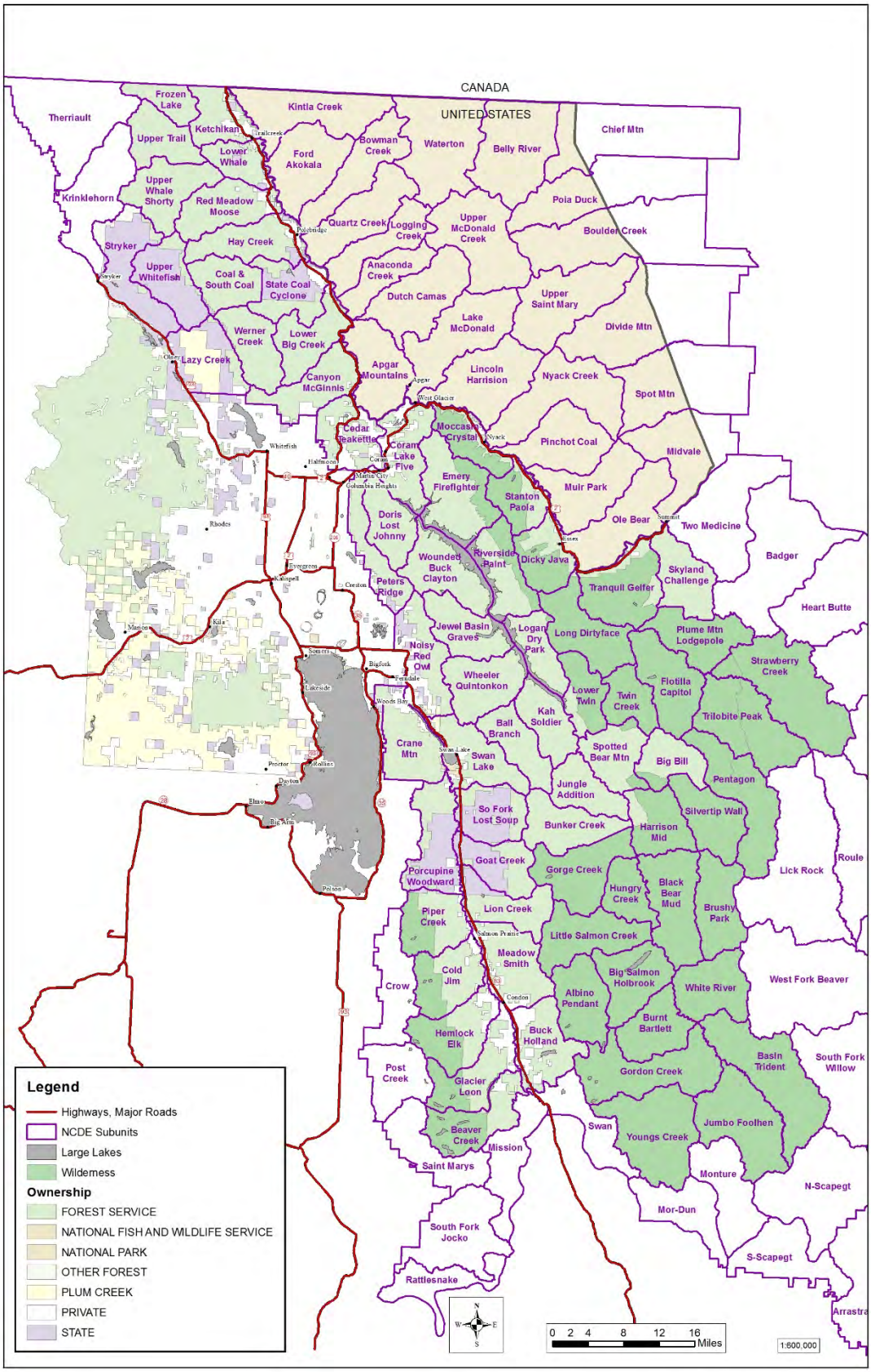


Figure B-30. Northern Continental Divide Ecosystem bear management unit (BMU) subunits.

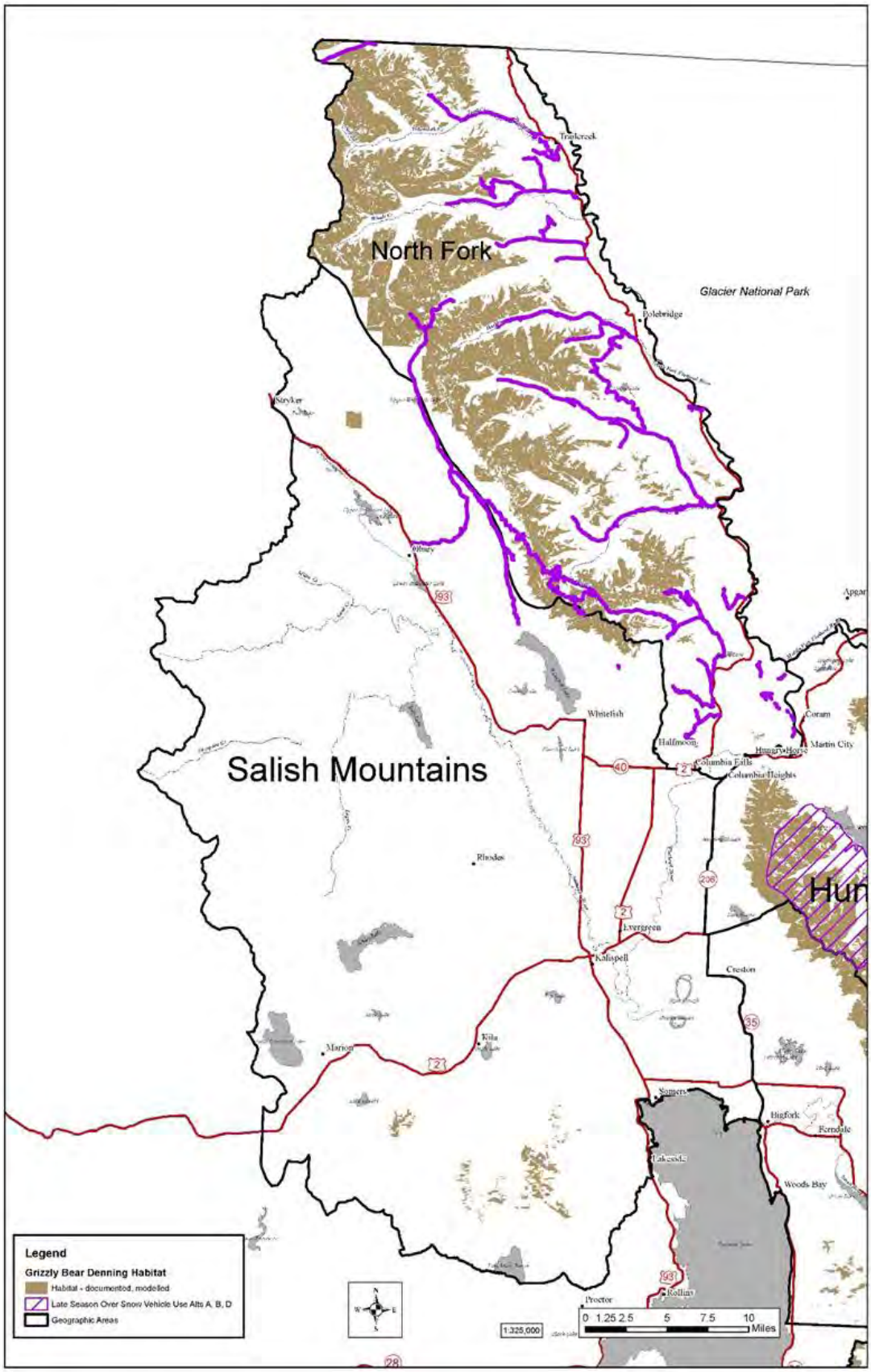


Figure B-31. Modeled grizzly bear denning habitat; designated late-season over-snow routes—north half.

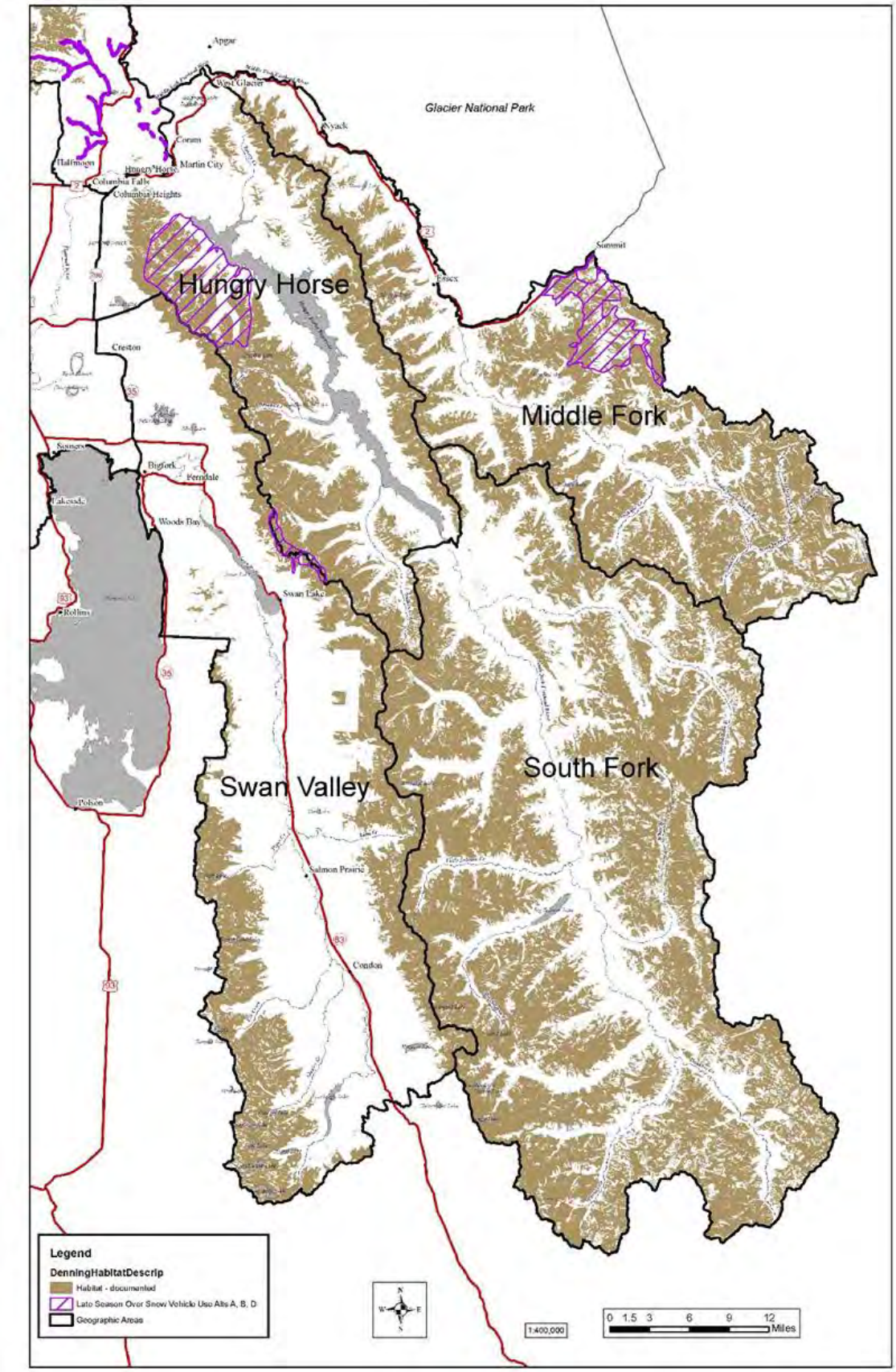


Figure B-32. Modeled grizzly bear denning habitat; designated late-season over-snow areas—south half.

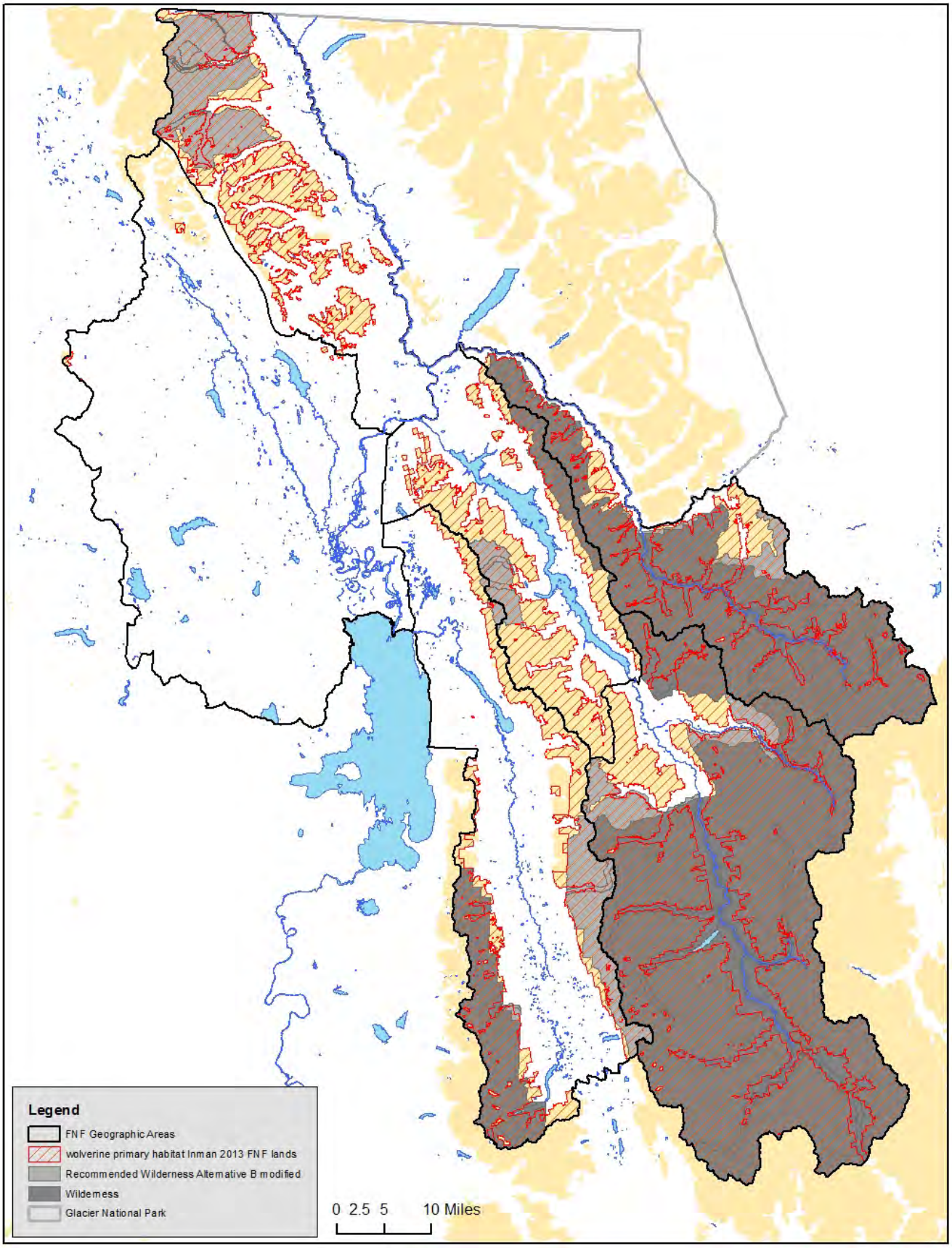


Figure B-33. Wolverine primary habitat (based on Inman et al. 2013; obtained from databasin.org), recommended wilderness, and wilderness.

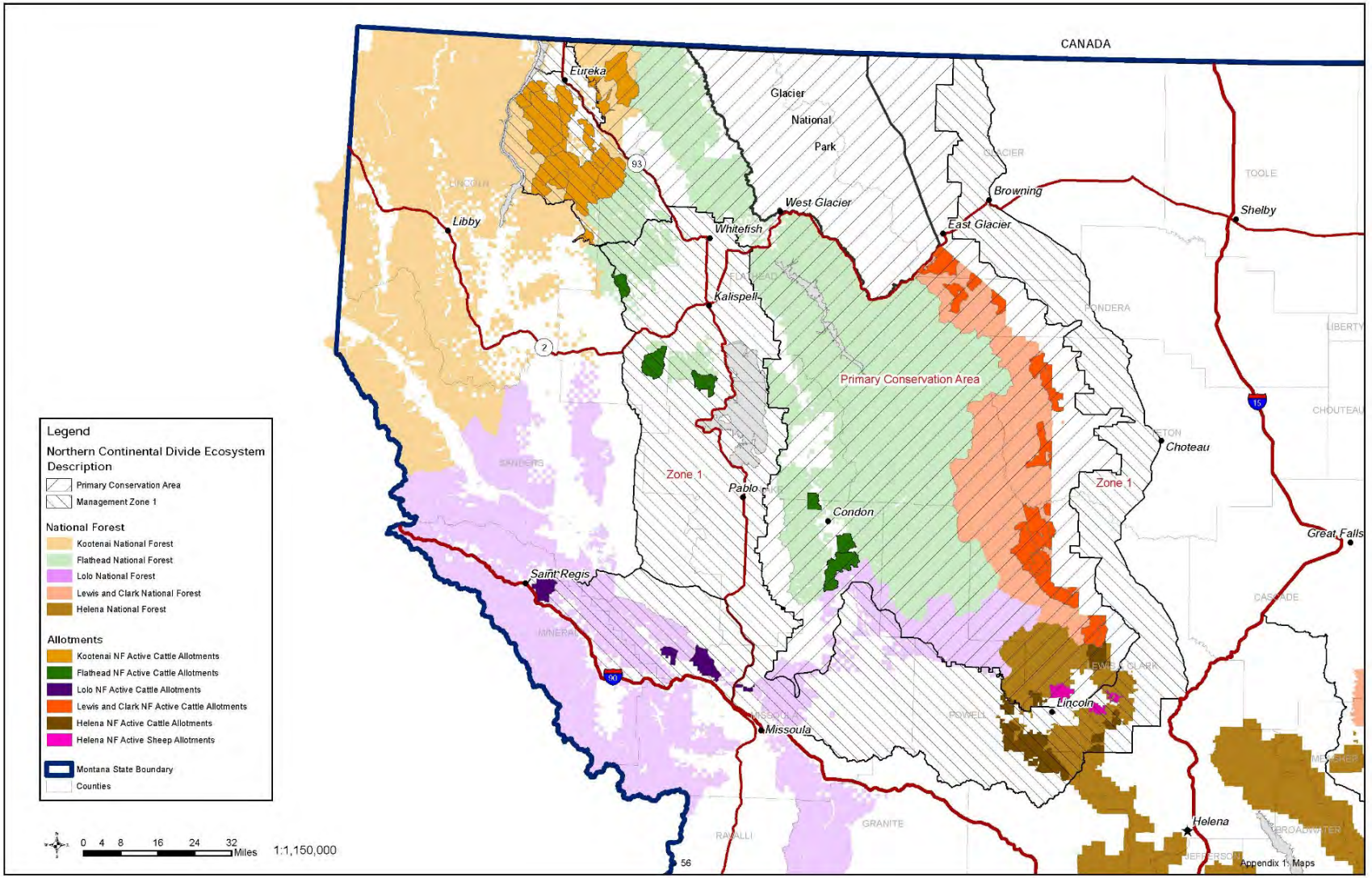


Figure B-34. Grazing allotments on the Northern Continental Divide Ecosystem.

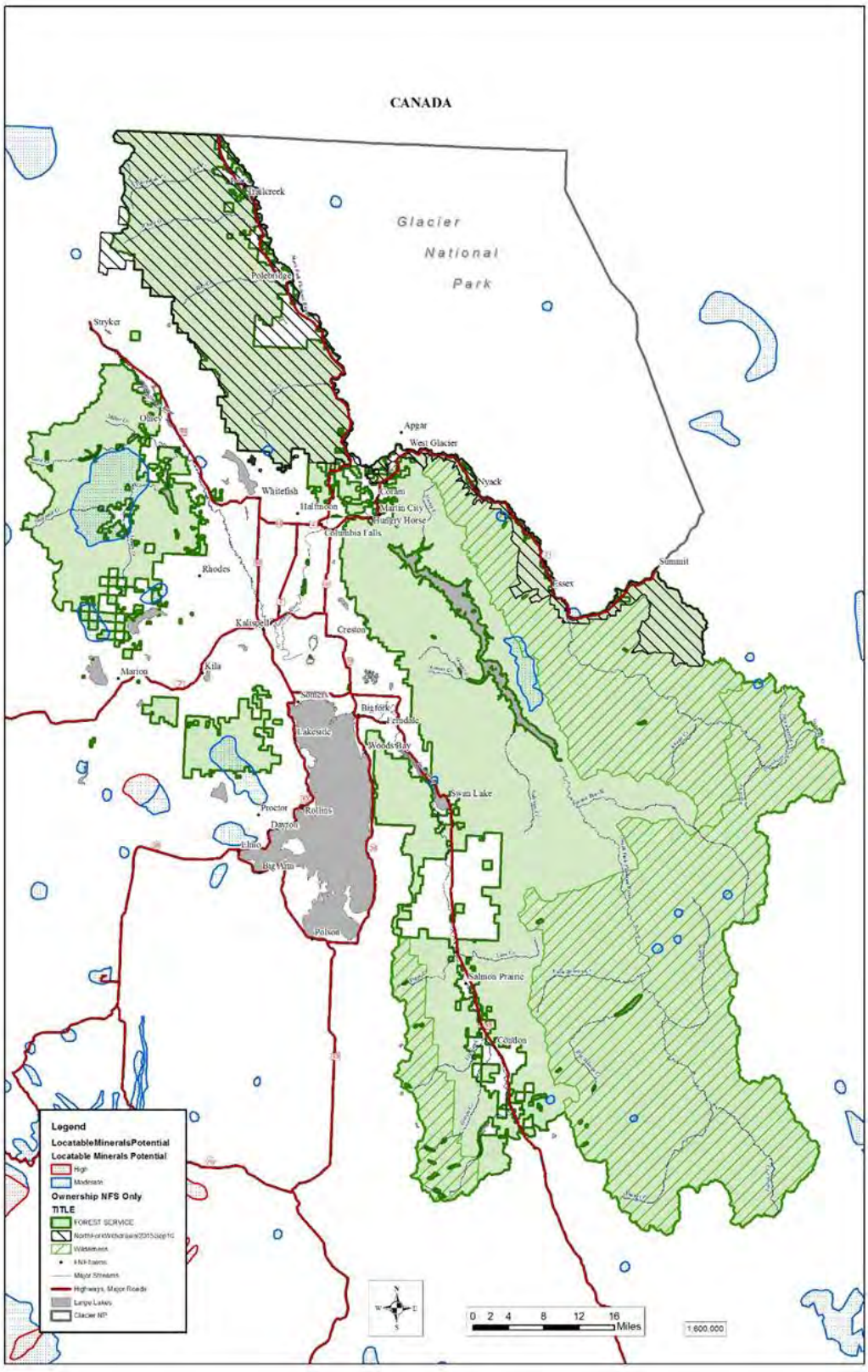


Figure B-35. Potential locatable minerals on the Flathead National Forest.

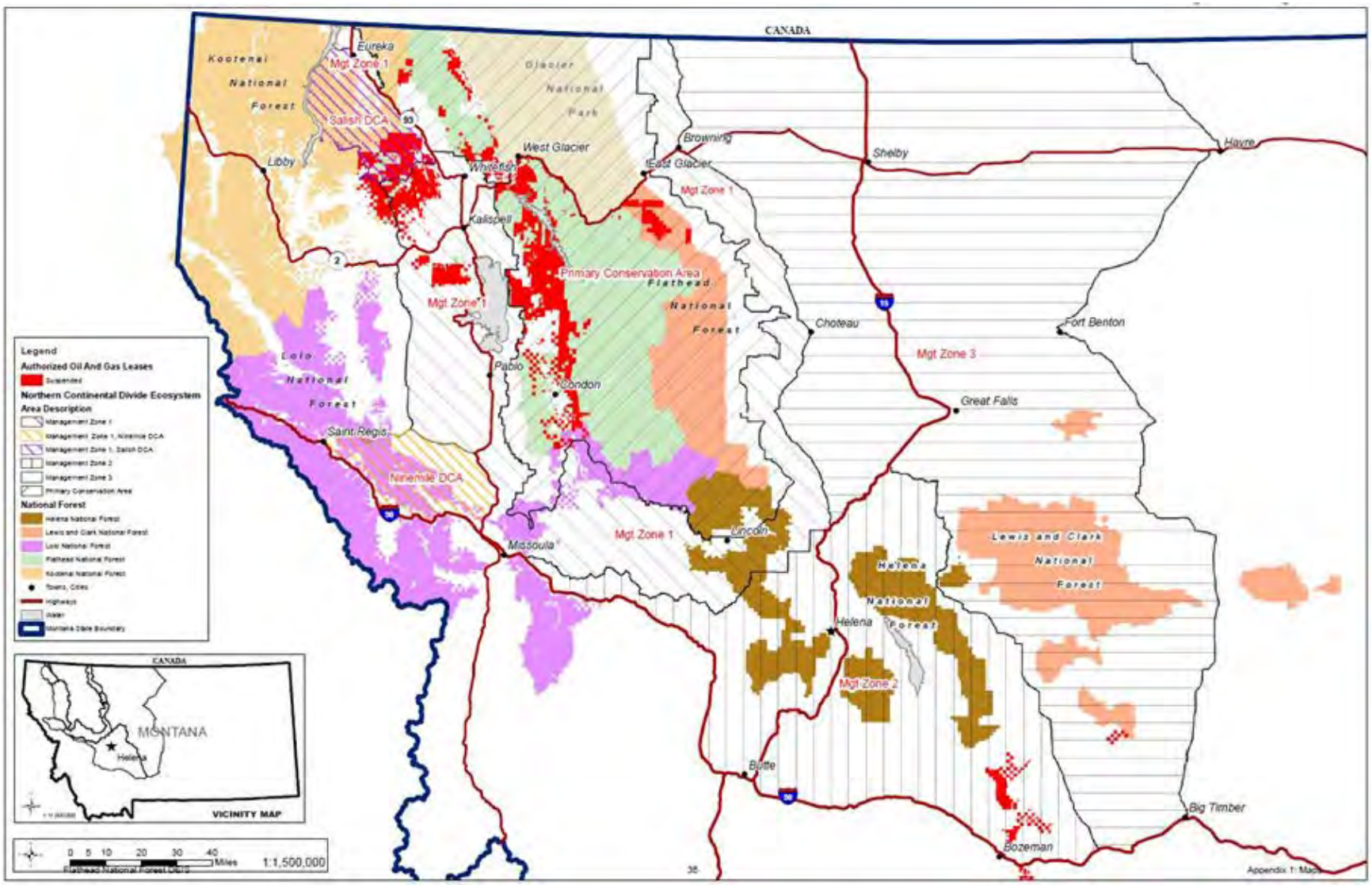


Figure B-36. Suspended oil and gas leases in the Northern Continental Divide Ecosystem.

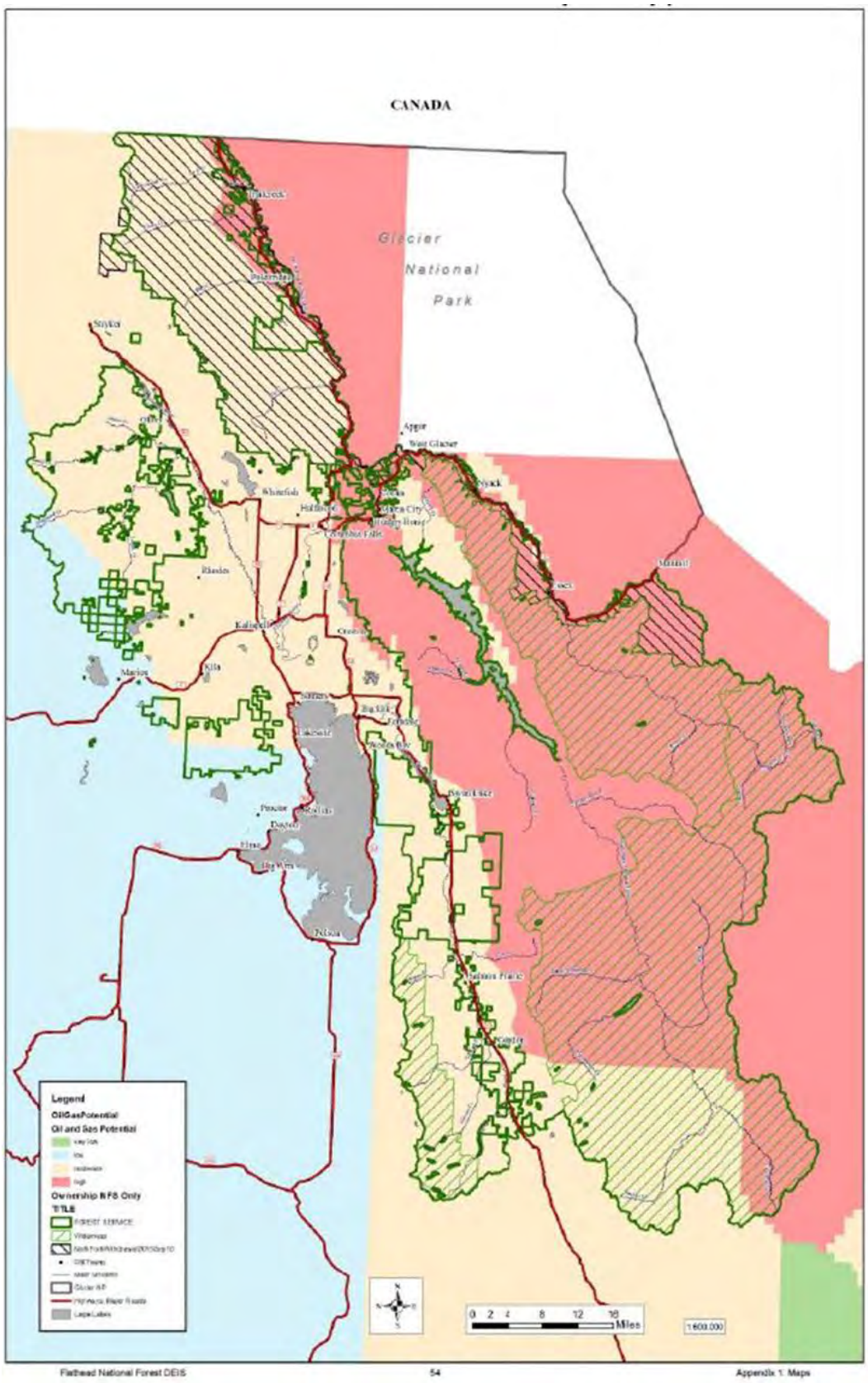


Figure B-37. Oil and gas potential and withdrawal areas on the Flathead National Forest.

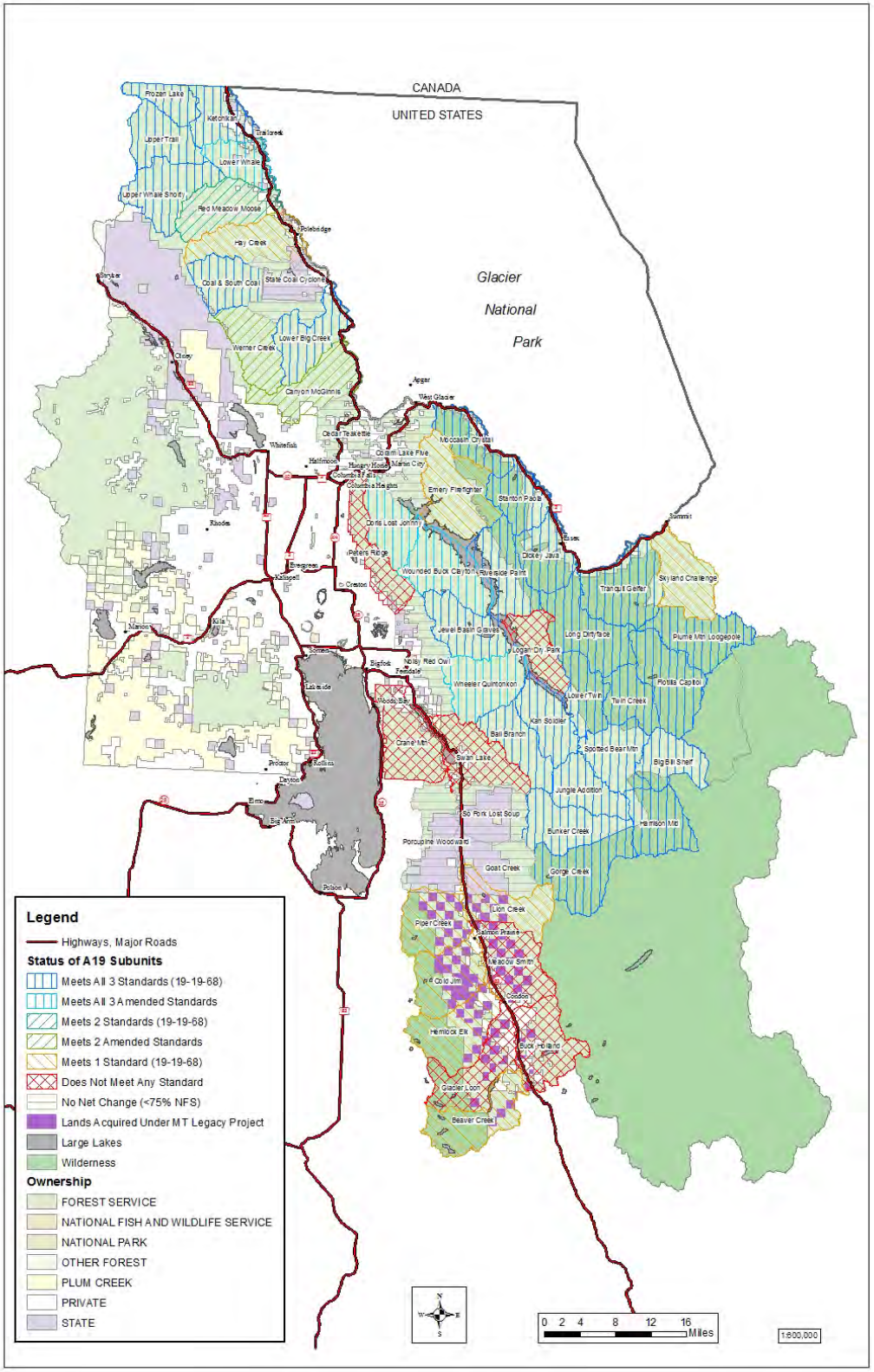


Figure B-38. Status of amendment 19 subunits.

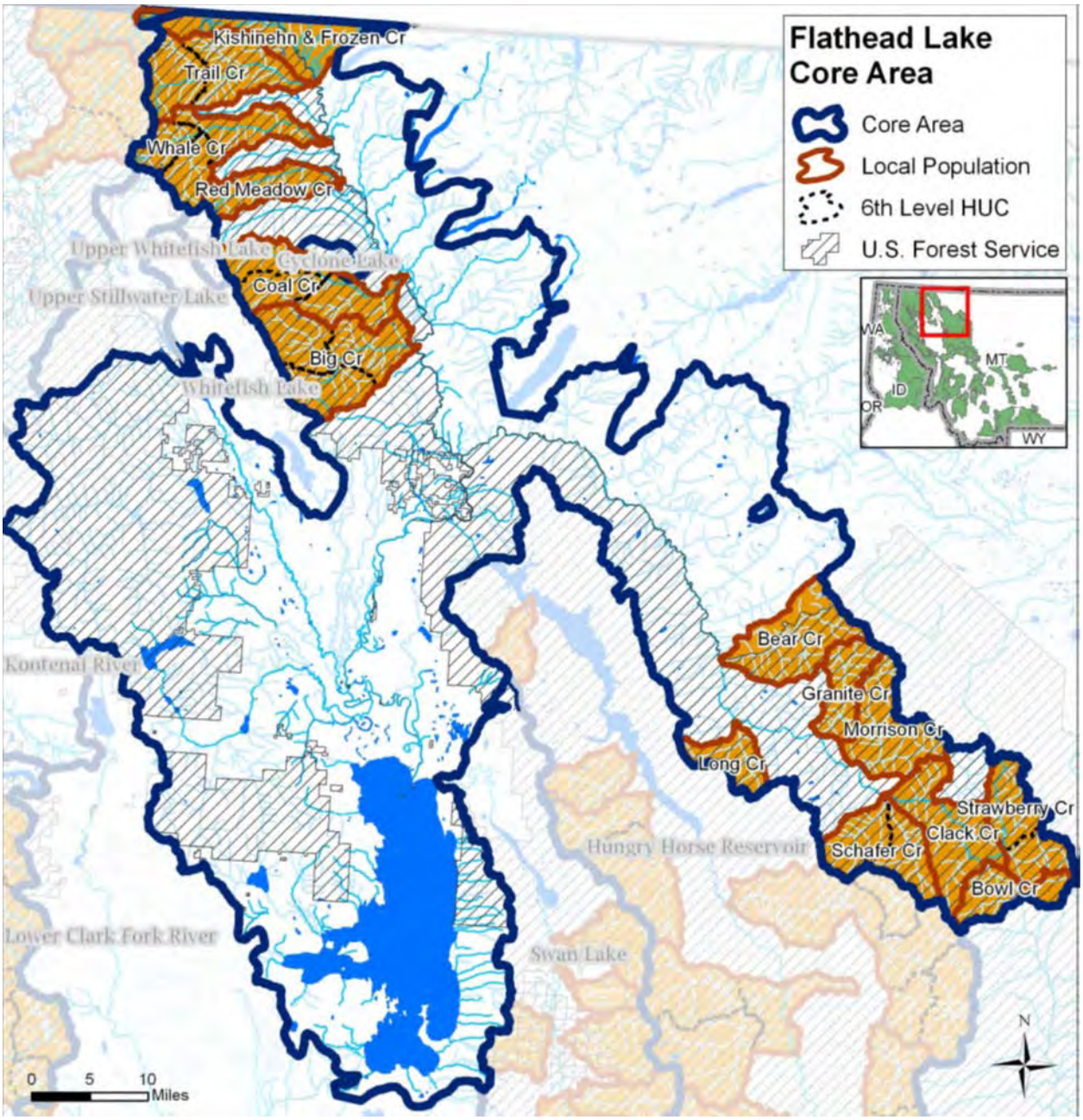


Figure B-39. Flathead Lake core area (including North and Middle Forks).

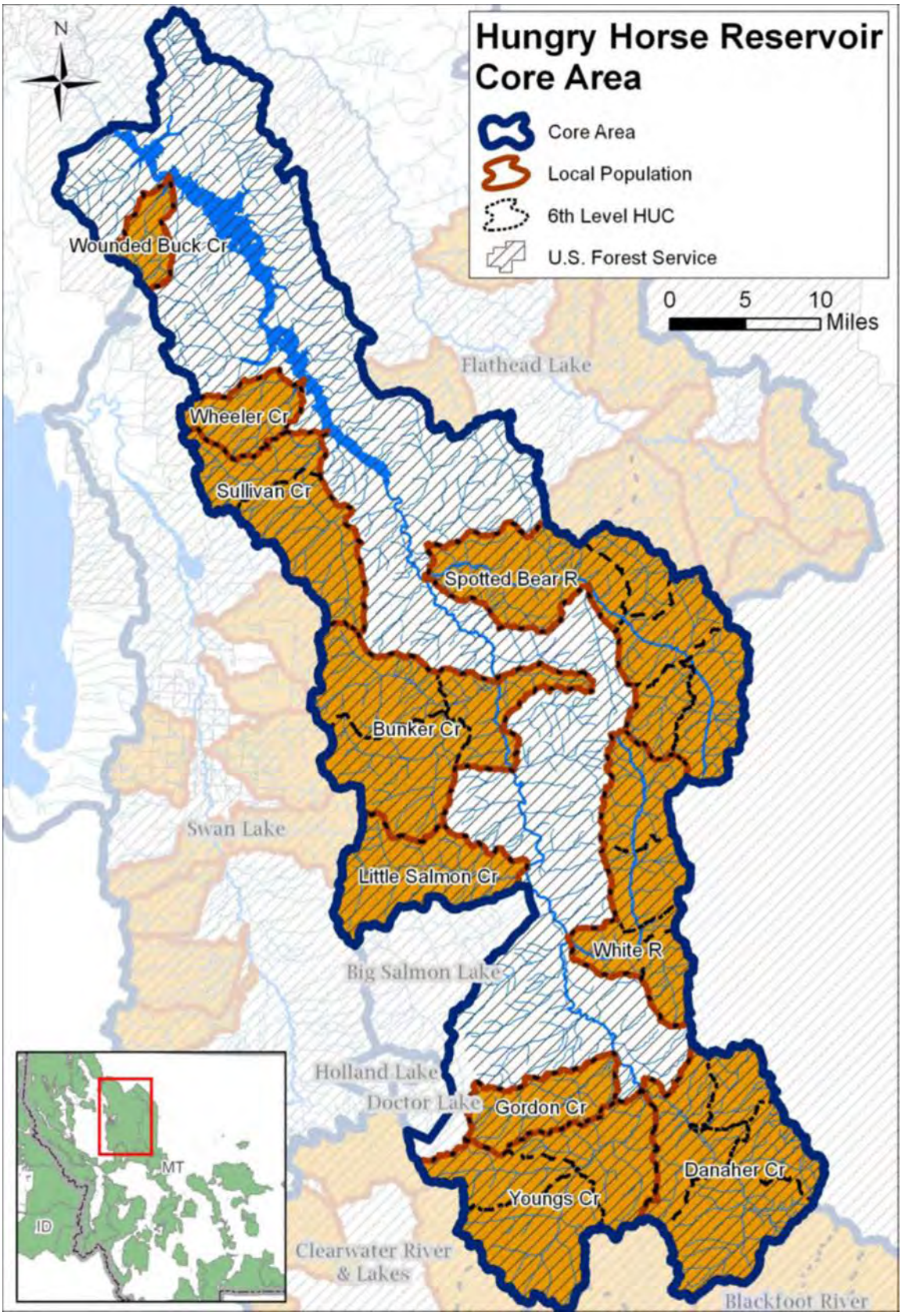


Figure B-40.Hungry Horse and surrounding core areas.

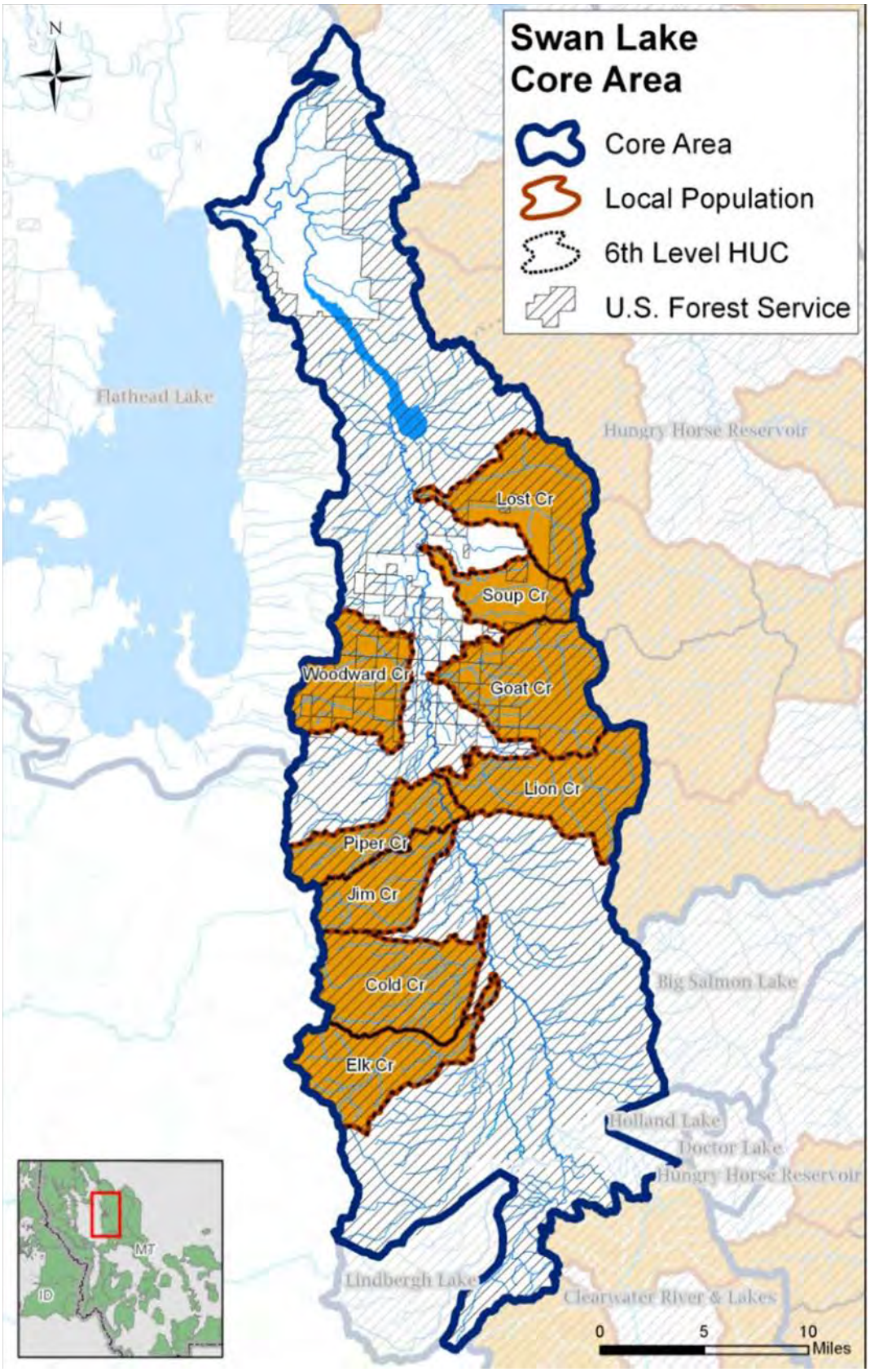


Figure B-41. Swan Lake and surrounding core areas.

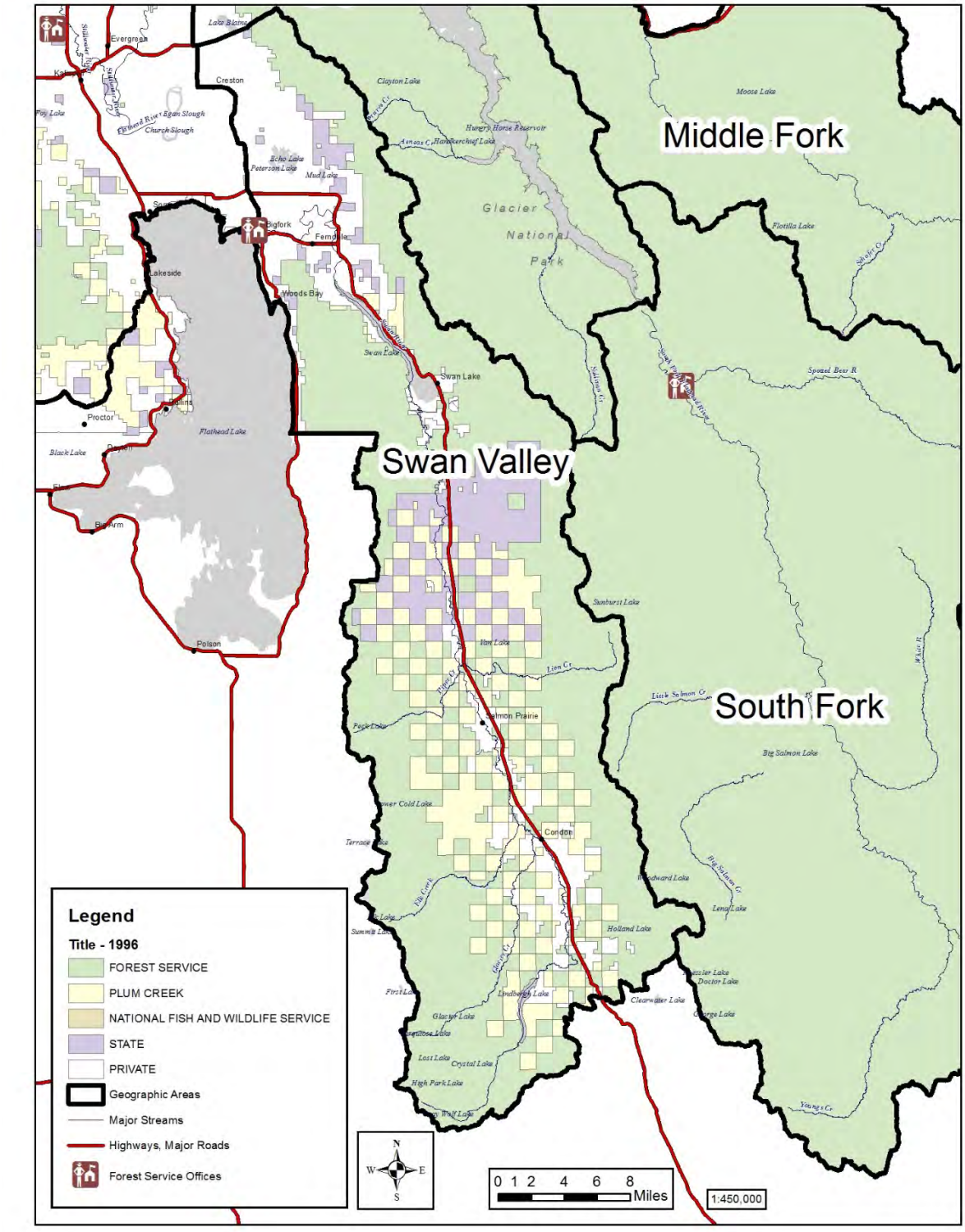


Figure B-42. Swan Valley ownership prior to Legacy Land acquisition.

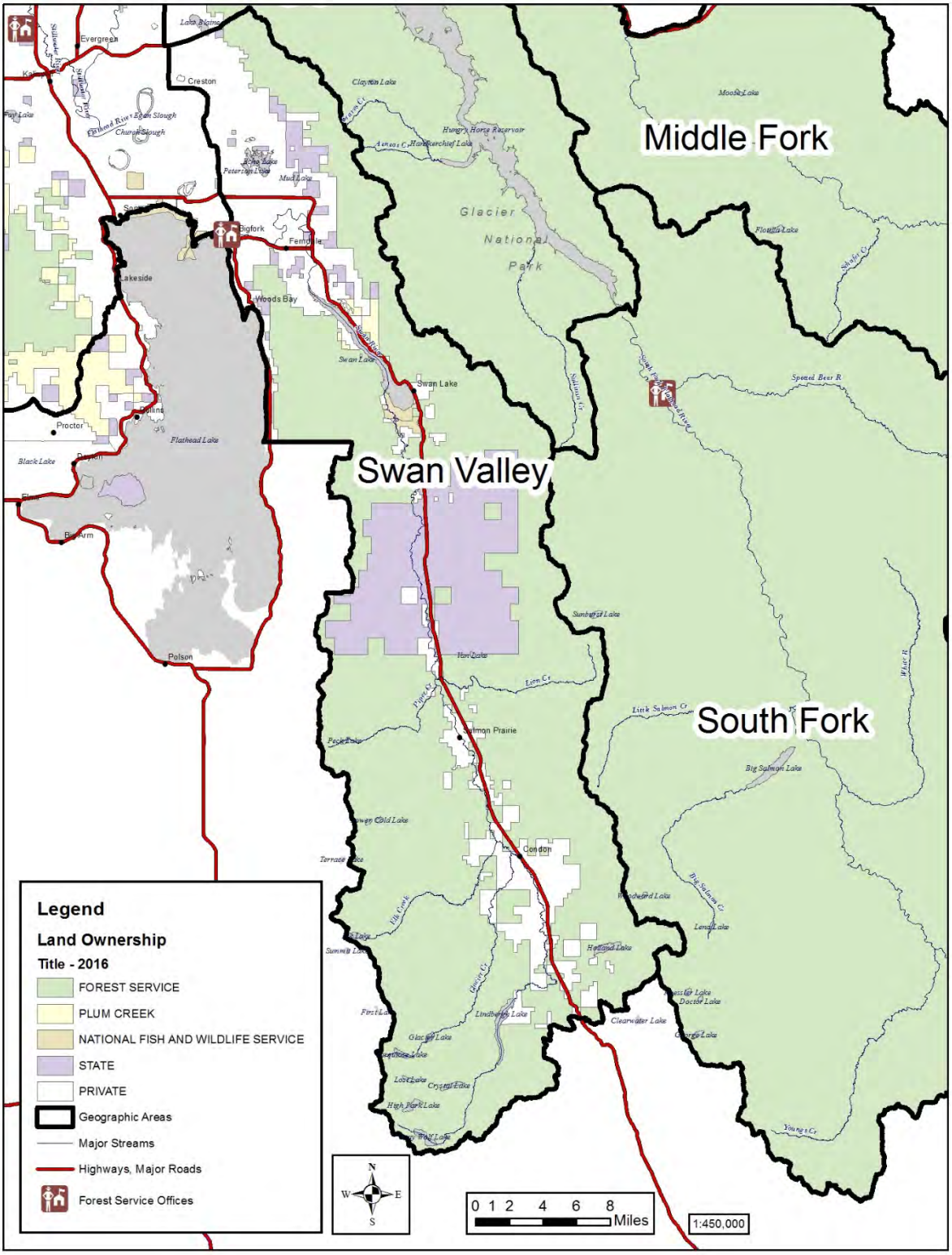


Figure B-43. Swan Valley ownership following Legacy Land acquisition and other acquisitions.

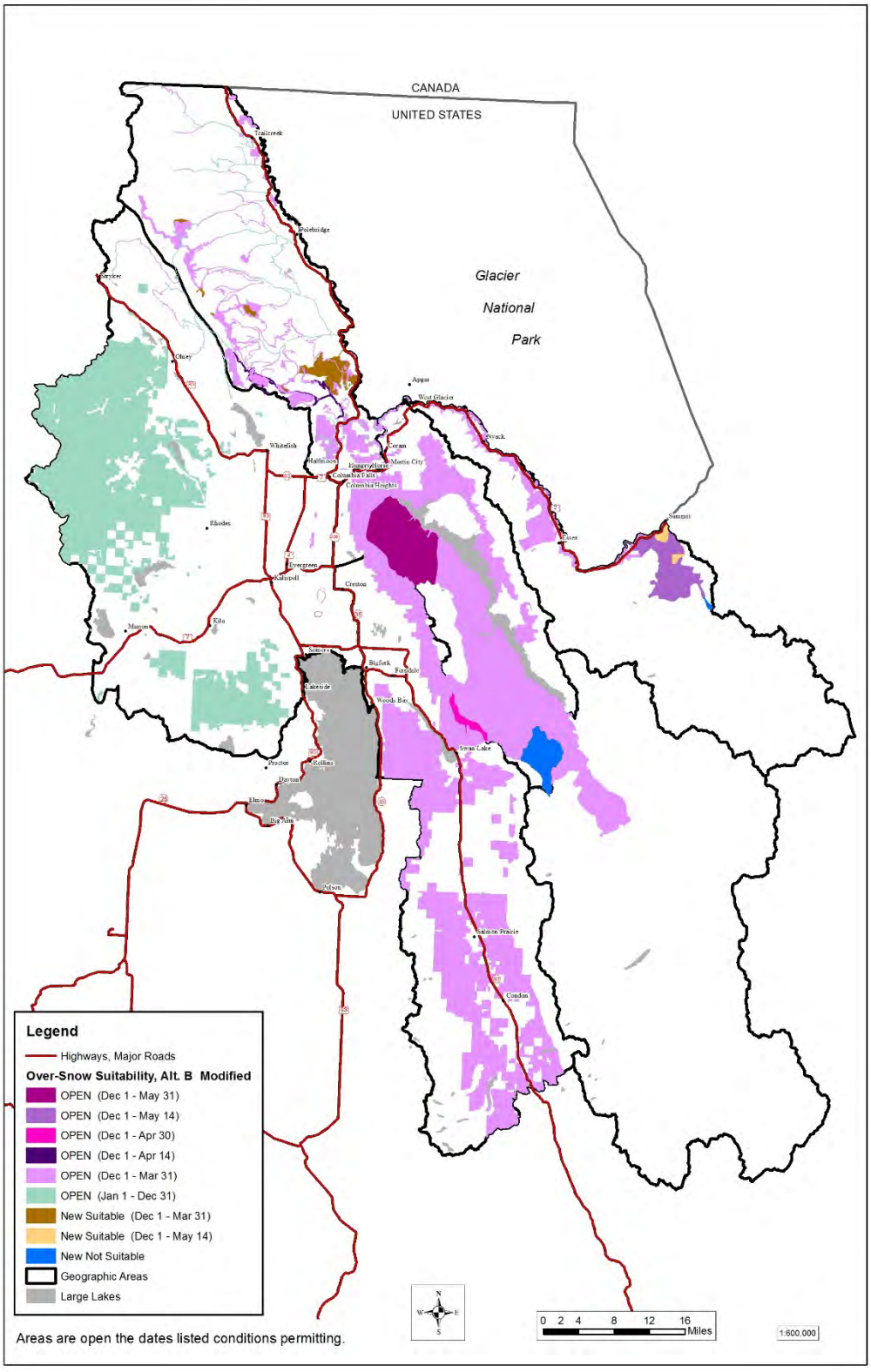


Figure B-44. Suitability for motorized over-snow vehicle use by season; alternative B modified.

Appendix C: Updates to Lynx Modelling

Canada Lynx Habitat Modelling for the Flathead National Forest Land and Resource Management Plan Revision Process Paper prepared by Reed Kuennen, wildlife biologist, Flathead National Forest, February, 2014.

Introduction

This document describes the process used to update modelling and mapping of lynx habitat for the Flathead National Forest plan revision. Lynx habitat on the Flathead National Forest (FNF) was modelled and mapped in 2000 when the Canada lynx (*Lynx canadensis*) was listed as a threatened species. New scientific information was incorporated into the 2014 Flathead National Forest model of lynx habitat, published in the Assessment of the Flathead National Forest (USFS 2014), in the Proposed Action—Revised Forest Plan Flathead National Forest (USFS 2015), and in the DEIS for the revised forest plan (USFS 2016), with subsequent public comment. Modeling and mapping is consistent with the definition of lynx habitat and is verified at the project level.

In 2007, there were 18 national forest plans amended to incorporate the Northern Rockies Lynx Amendment (NRLA), which is also known as the Northern Rockies Lynx Management Direction (NRLMD)(USDA FS 2007). The NLRMD standards and guidelines apply to lynx habitat on each national forest, including the Flathead National Forest. In 2009, lynx critical habitat was initially designated by the U. S. Fish and Wildlife Service (USFWS)(USDI FWS 2009) and was subsequently updated in 2014 (USDI FWS 2014).

The Flathead National Forest is part of lynx critical habitat Unit 3, Northern Rocky Mountains Region. The USFWS designated critical habitat for the Canada lynx based on assessment of areas: (1) determined to be occupied at the time of listing; (2) that contained the physical and biological features in the appropriate spatial arrangement and quantity, essential for the conservation of the species (called the primary constituent element, or PCE); and (3) that may require special management considerations or protection.

The following information and direction was used to update the 2000 lynx habitat geographical information system (GIS) map layer for the revised Flathead National Forest Land and Resource Management Plan (revised forest forest):

- Information and direction contained in the Canada Lynx Conservation Assessment and Strategy (LCAS)(Ruediger et al. 2000, Interagency Lynx Biology Team 2013)
- Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx; Final Rule; February 25, 2009 (USDI FWS 2009)
- Revised Designation of Critical Habitat for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary; Proposed Rule; FR Doc. 2013-23189 09/26/2013 (USDI FWS 2013); and also Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx and Revised Distinct Population Segment Boundary; Final Rule; Federal Register / Vol. 79, No. 177 / Friday, September 12, 2014 / Rules and Regulations (USDI FWS 2014)
- NRLMD (USDA FS 2007)

- Research published by Dr. John Squires for northwest Montana (Squires et al. 2006, 2008, 2010, 2013) and lynx telemetry locations within the Flathead National Forest provided by Dr. John Squires.
- Potential vegetation types (PVTs) for the Flathead National Forest (USDA FS 2004).
- VMAP classification for the Flathead National Forest (2012 Classification, Berglund et al. 2009)

The information cited is the best available scientific information concerning lynx populations, distribution, habitat use, and prey species on the Flathead National Forest. Although this information has greatly improved current understanding for modelling of lynx habitat, improved information is expected to be developed as research results become available.

Lynx habitat on the Forest will be modelled and mapped in two phases. Phase I entails identifying the combination of biophysical attributes that comprise potential boreal forest lynx habitat on the Flathead National Forest. At any given point in time, some of this habitat is in a suitable condition and some is in a temporarily unsuitable condition. Phase II will entail further characterizing the vegetative condition of modelled lynx habitat to estimate the proportion of habitat that is suitable for foraging by lynx, based upon studies in process. For example, Dr. Squires and others are working on development of a lynx habitat model using new technologies to assess the vegetation condition, and considering reproductive female home ranges, within the distribution of Canada lynx in western Montana.

Lynx Analysis Units

The LCAS (Ruediger et al. 2000, Interagency Lynx Biology Team 2013) indicated that lynx analysis units (LAUs) should be developed and used to determine habitat conditions and assess management effects to lynx. This process resulted in the mapping of 109 LAUs across the Forest.

The LCAS outlined a number of criteria and related information that should be considered in the identification of LAUs and in mapping areas of habitat. The following LCAS criteria and variables were considered when LAUs on the Forest were determined:

1. Development of LAUs need not be a new type of analysis unit. Previously delineated and accepted units such as 6th field Hydrologic Unit Codes (HUCs) or other ecological units are acceptable as LAUs.
2. LAUs could likely encompass both suitable lynx habitat (e.g., denning and foraging habitat) and unsuitable areas (e.g., lakes, low elevation ponderosa pine forest, and alpine tundra).
3. Conservation measures including NLRMD standards and guidelines apply to mapped lynx habitat within LAUs.
4. LAUs should be at least the size of the area used by an individual lynx.
5. LAU boundaries would not be adjusted for individual projects, but will remain constant.
6. The size of LAUs should generally be 25-50 mi^2 in contiguous habitat and likely larger in less contiguous or poor quality habitat.

LAU boundaries on the Flathead National Forest have not been adjusted, but have remained constant since their original determination.

Phase I: Modelling and Mapping Boreal Forest Lynx Habitat

Based on current knowledge of the life history, biology, and ecology of lynx, certain elements are thought to be important to the conservation of the species. Elements of lynx habitat and how they were used to update lynx habitat on the Forest are summarized in the following sections. The lynx habitat model is based on biophysical conditions that have the potential to produce lynx habitat in a suitable condition. At any point in time, some areas will be suitable and some will not (see glossary in NRLMD ROD and LCAS (Lynx Biology Team 2013)).

A. Boreal Forest Landscapes and Deep Fluffy Snow

Snow is a defining habitat variable for lynx. Lynx have large feet that are adapted for habitats with deep, fluffy snow, which gives them a competitive advantage. In areas which lack deep fluffy snow, there is greater habitat use by bobcats, mountain lions and coyotes (USDA FS 1999, pp.89-95; USDI FWS 2009 pg. 8616), an increase in competition for prey, and an increase in potential predation on lynx. Because snow is biologically important to lynx (Ruediger et al. 2000, Interagency Lynx Biology Team 2013) it was included as PCE1b of lynx critical habitat (see Table C-1). For mapping lynx habitat on the Flathead National Forest, elevation was used as a factor for indicating presence of deep fluffy snow.

Table C-1. Canada lynx critical habitat PCE[1]

Boreal forest landscapes supporting a mosaic of differing successional forest stages containing:	
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 multistory stands with conifer boughs touching the snow surface.
b.	Winter snow conditions that are generally deep and fluffy for extended periods of time.
c.	Sites for denning that have abundant coarse woody debris, such as downed trees and root wads.
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.

1. Excerpted from the Federal Register, Vol. 74, No. 36, February 25, 2009 [50 CFR Part 17]; Federal Register / Vol. 79, No. 177 / Friday, September 12, 2014 / Rules and Regulations (USFWS 2014)

In the Northern Rocky Mountains, Canada lynx select home ranges at mid-elevations of about 4,100 to 7,700 feet (ft). Looking at seasonal habitat use, Squires found that lynx used mid-to high-elevation forests during winter and slightly higher elevations during summer (Squires et al. 2010).

Flathead National Forest modelling of habitat that provides deep fluffy snow:

In modelling, the Flathead National Forest used an elevation of 4100 ft. as the lower limit of lynx habitat, based upon published research by Squires, unless: 1) we had lynx radiotelemetry data providing evidence of lynx use at lower elevations, or 2) data providing evidence of greater than average snow depths for a particular portion of a watershed. Flathead National Forest staff examined snow depth data from weather reporting stations and Natural Resource Conservation Service (NRCS) snow courses through 2013, where available (see Phase I: Lynx Habitat GIS Processing subsection at the end of this documents for details).

B. Boreal Forest Landscapes and Seasonal Habitat Use by Canada lynx

Lynx studies in the Northern Rockies have reported an association with moderate elevations, deep fluffy snow, relatively gentle topography, spruce and subalpine fir forests, a dense understory, and multistory forests containing a variety of tree size classes. In the western United States, lynx selected for mature multistory stands dominated by Engelmann spruce and subalpine fir in winter (Koehler et al. 2008 In USDI FWS 2009, Squires et al. 2010). In Squires' Montana study area; he observed that winter is the

most constraining season for lynx in terms of resource availability and use (Squires et al. 2010). High hare abundance occurred in stands of large diameter [greater than or equal to 11 inches diameter at breast height (dbh)] trees where limbs reached the snow at the surface level and smaller trees contributed to dense horizontal cover, resulting in lynx successfully capturing prey (Squires et al. 2010 pg. 1656). In northwest Montana, the proportion of size classes of trees in forests used by lynx were 5 percent saplings (2.5–8 cm or 1–3 in. dbh), 19 percent pole (8–18 cm or 3–7 in. dbh), 42 percent mature (18–28 cm or 7–11 in. dbh), and 29 percent large (>28 cm or >11 in dbh)(Squires et al. 2010 pg. 1654). Lynx generally avoided dry forest types with high proportions of Douglas-fir, grass in the understory, or snags. Regenerating stands composed of small-diameter saplings in recent clear-cuts, as well as other forest openings, were generally avoided during winter. When lynx did cross openings they remained near the forest edge, with an average crossing distance of 384 ft. from the forest edge (range 131–1,243 ft) (Squires et al. 2010). These key habitat parameters for snowshoe hare and winter lynx feeding habitat were also described as PCE1a for lynx critical habitat (see Table 1).

Contrary to habitat use by lynx in winter, Squires and others (2010) found forest stands in Montana with mature and large diameter trees were used less often during summer. Lynx broadened their selection to include younger regenerating stands composed of Engelmann spruce and subalpine fir with abundant small diameter and pole-sized trees, abundant total shrubs, and high horizontal cover (Squires et al. 2010). As in winter, lynx generally avoided dry forest types with high proportions of Douglas-fir, grass in the understory, or snags (Squires et al. 2010 pg. 1655). Elevations used by lynx were slightly higher (i.e., 136 ± 24 m [446 ± 79 ft]) in summer than during the winter but still occurred in the montane zone between the alpine and dry forest types (Squires et al. 2010).

As stated in the critical habitat final rule (USDI FWS 2009, pg. 8617), “Because of the patchiness and temporal nature of high-quality snowshoe hare habitat, lynx populations require large boreal forest landscapes to ensure that sufficient high quality snowshoe hare habitat is available and to ensure that lynx may move freely among patches of suitable habitat and among subpopulations of lynx.” Lynx habitat within the boreal forest landscape is typically patchy because the boreal forest contains stands of differing ages and conditions, some of which are suitable as lynx foraging or denning habitat (or will become suitable in the future due to forest succession) and some of which serve as travel routes for lynx moving between foraging and denning habitat (McKelvey et al. 2000, pp. 427–434; Hoving et al. 2004 In USDI FWS 2009, pp. 290–292).

Within the elevation range used by Canada lynx, the Flathead National Forest used potential vegetation types (USDA FS 2004) and VMAP existing vegetation classes (Berglund et al. 2009, USDA FS 2011) to model areas of boreal forest lynx habitat able to grow subalpine fir and spruce trees (see Phase I: Modeling Lynx Habitat GIS Processing subsection” at the end of this document for details). On the Flathead National Forest, there are also areas within the elevation range used by lynx that are not boreal forests able to grow subalpine fir and spruce.

Lynx Denning Habitat

Denning habitat is the environment lynx use in the late winter and early spring when giving birth and rearing kittens (until kittens are mobile). At a landscape level, dens were generally located in concave or drainage-like topographies and often on northeast aspects. Squires found that denning habitat is generally abundant across the coniferous forest landscape; especially in riparian habitats and in areas where insect, disease or fire kills patches of trees. Squires found that lynx located their dens in a variety of habitats. Multi- storied stands of spruce-fir forests with high horizontal cover and abundant coarse woody debris provide denning habitat (Squires et al. 2006, 2008, 2010). Squires found that eighty percent of dens were located in mature forest stands and 13 percent in mid-seral, regenerating stands. Young stands that were either naturally sparse or mechanically thinned were seldom used for denning, however, lynx denned

along the edges of regenerating forests where trees had blown down into piles of woody debris. Denning habitat should be located within daily travel distance of an adult female lynx (i.e., typical travel distance is 3-6 mi). Squires stated that, given the large home ranges and low den site fidelity of lynx, den sites are not likely to be limiting (Squires et al. 2008). As a result, denning habitat is not modelled as part of the Forest Plan revision process.

Lynx Matrix Habitat

In mountainous areas, the boreal forests that lynx use are characterized by scattered moist forest types with high hare densities in a matrix of other habitats (e.g., hardwoods, dry forest, non-forest) with low hare densities. In these areas, lynx incorporate the matrix habitat (non-boreal forest habitat elements) into their home ranges and use it for traveling between patches of boreal forest that support high hare densities where most foraging occurs (USDI FWS 2009 pg. 8616). LAUs contain a mix of lynx habitat as well as the matrix as defined in the 2009 rule designating lynx critical habitat. Since the matrix provides limited snowshoe hare resources or other life requisites for lynx, no conservation measures were developed that specifically address management of matrix, except as related to maintaining connectivity Interagency Lynx Biology Team 2013).

Lynx Foraging Habitat

At the present time, the Flathead National Forest is not modelling the dense understory conditions providing hare and lynx foraging habitat at the Forest level, because we do not currently have data that allows us to discern these conditions across the entire Flathead National Forest. Foraging habitat is determined through inventories at the project level.

Areas Excluded from Lynx Critical Habitat

Within critical habitat mapped by the USFWS, and also within lynx habitat modeled by the Forest, certain areas are excluded. According to the Critical Habitat Final Rule (USDI FWS 2009 pg. 8641)(Federal Register /Vol. 79, No. 177 / Friday, September 12, 2014 /Rules and Regulations pg. 54823): “Given the scale of the critical habitat units, it was not feasible to completely avoid inclusion of water bodies, including lakes, reservoirs and rivers; grasslands, or human-made structures such as buildings, paved and gravel roadbeds, parking lots, and other structures that lack the primary constituent element (PCE) for the lynx. These areas, including any developed areas and the land on which such structures are located, that exist inside critical habitat boundaries, are excluded by text and are not designated critical habitat.”

Updating Modelled Lynx Habitat

The initial process completed in 2000 relied upon existing forestwide data layers. In 2000, the Flathead National Forest stated that lynx habitat for the Flathead National Forest would be updated as new scientific information becomes available. Modelled lynx habitat will continue to be classified, verified, refined, and updated during project-level analysis. If new scientific information becomes available it will be assessed to determine whether changes in modelling of lynx habitat may be needed.

Flathead National Forest Lynx Habitat Assessment: Sensitivity Analysis

In the process of updating lynx habitat modelling on the Forest for the forest plan revision assessment, Squires’ 2010-2013 lynx locations (determined by radio telemetry) in the North Fork, Middle Fork and South Fork Flathead River drainages were examined. The ArcGIS “select by location” feature was used to examine data for potential vegetation types (PVTs, or groupings of habitat types) and Flathead National Forest 2012 VMAP polygons that overlapped with lynx telemetry locations. The 2012 VMAP classification, corrected for fires and recent harvest (called transitional forest) is the best available wall-

to-wall data layer available for analysis of current vegetation conditions. Data included satellite telemetry locations of 3 female and 5 male lynx. Lynx locations were recorded every half hour, resulting a total of 13,417 telemetry location points.

Analysis of Lynx Locations

Elevation: Squires' lynx telemetry data specific to the Flathead National Forest showed that lynx were located at a minimum elevation of about 3700 feet in the Middle Fork Flathead River watershed, 3800 feet in the North Fork Flathead River watershed (north of Polebridge) and 4000 feet in the South Fork Flathead River watershed, and at a maximum elevation of 7100 ft.

Potential Vegetation Types: In the North Fork Flathead River watershed, 95 percent of lynx locations occurred in polygons with the Abla1, 2, 3 and 4 PVTs. In the South and Middle Fork Flathead River watersheds, 94 percent of lynx locations occurred in polygons with these PVTs. If the Picea, Laly, Pial, and Tsme2 PVTs are added to the Abla PVTs, it accounts for 96 percent of lynx locations in all three watersheds. Other VMAP polygons, accounting for about 3 percent of lynx locations, included the following forested PVTs: Abgr3, Thpl 1 and 2. About 1 percent of lynx locations were documented in other PVTs, including Psme 1, 2 and non-forested.

VMAP Dominance Types: While PVTs are based on the potential of a site to produce a certain vegetation type, VMAP dominance types describe the existing vegetation at a point in time. VMAP polygons with lynx locations included a large number of tree dominance type classes as well as transitional forest (fire and harvest areas), shrub, and herb. Tree dominance types included MX- Abla (mixed subalpine fir), MX-Pien (mixed Engelmann spruce), MX-Pico (mixed lodgepole pine), MX-Psme (mixed Douglas-fir), MX- Laoc (mixed western larch) and Poptr (quaking aspen)(using the VMAP Dom40 classification). On the Flathead National Forest, subalpine fir and spruce often occur in mixed species stands. A stand is coded as a subalpine fir or spruce dominance type if a tree species makes up at least 40% of the tree species in a polygon. Most lynx locations were in mixed (MX) forest stands. In the North Fork, 31 percent of lynx locations occurred in subalpine fir or spruce dominance types and in the South and Middle Forks, 27 percent of lynx locations were found in these types. There were a few lynx locations in polygons classified as sparse vegetation, including polygons classified as "road."

Size Class: Winter lynx locations were assessed to see if there was an association with VMAP size class. Fourteen percent (929 of 6505) of Squires' lynx locations occurred within the class "avg. tree dbh greater than or equal to 15 inches d.b.h." If all tree classes greater than or equal to 10 inches avg. dbh were included, it accounted for 51 percent (3294 of 6505) of Squires' lynx telemetry locations (Feb-May15, South Fork and Middle Fork). If all tree classes greater than or equal to 5 inches avg. dbh are included it accounts for 77 percent (5032 of 6505) of Squires' tracked lynx locations (Feb-May15, South Fork and Middle Fork).

Canopy Cover: Winter lynx locations were assessed to see if there was an association with VMAP canopy cover. Fifty percent (3167 of 6505) of Squires' lynx telemetry locations occurred within tree canopy classes with 60 percent, or more, tree canopy cover. All tree canopy cover classes greater than or equal to 40 percent accounted for eighty-five percent (5515 of 6505) of Squires' locations. All tree canopy cover glasses greater than or equal to25 percent accounted for 91 percent (5918 of 6505) of Squires' lynx locations. Ninety three percent (6053 of 6505) of Squires' radioed lynx locations occurred within all VMAP tree canopy cover classes with greater than 10 percent canopy cover.

Past Harvest and Fires: All of the Flathead National Forest past harvest polygons that contained lynx telemetry locations were examined in this analysis. One male and one female lynx in the North Fork Flathead River watershed used 24-57 year old regeneration harvest units and 14-24 year old

sanitation/salvage harvest units. For the female lynx, 59 percent of the locations were found in past harvest units while for the male lynx, 65 percent of the locations were located in past harvest units. Many of the past harvest units were thinned prior to 1999, before the lynx was listed as a threatened species. Both of these lynx also used patches in the 2003 Wedge Canyon fire area during the summer. Patches used by lynx were either unburned or were in areas that had regenerated rapidly after the fire. The male lynx also made extensive use of the 1988 Red Bench fire area.

In the South Fork, 32 percent of lynx locations for three male lynx were in past regeneration harvest units from 14-55 years old. These lynx did not use the 8-year old Ball Creek fire area except along the edge and in a few unburned patches. In the Middle Fork, the two male lynx using National Forest lands had 15 percent of their locations in past regeneration harvest units from 23-56 years old, as well as post-fire sanitation/salvage units from 20-22 years old. These lynx were using burn edges as well as tree patches and stringers as small as 15 acres within the 8000-acre Challenge fire area (that burned 25 years ago) and also within the 46,000-acre Skyland fire area (that burned 15 years ago).

Edge Buffering: Lynx use of openings was also examined. Ninety-four percent of the lynx locations were found within 384 feet of the edge of polygons with trees greater than or equal to 5 inches dbh. Many of Squires' lynx telemetry locations on the Flathead National Forest that were in the herb and shrub VMAP dominance classes were located along the edge of forested polygons. Ninety-seven percent (6280 of 6505) of lynx locations were found within 121 feet of the forest edge.

Analysis of Summer Lynx Locations

The number of lynx telemetry locations on the Flathead National Forest was more limited for the summer time period than winter, with only 1956 total locations in the Middle Fork Flathead River watershed. In summer, 30 percent (113 of 379) of locations were found in herb, shrub, and sparse vegetation polygons compared to 6 percent in winter within the herb and shrub classes, consistent with Squires published findings (Squires et al. 2010). Ninety-two percent (1790 of 1956) of summer lynx locations were found within 384 feet of a forest edge which is 6 percent lower than that observed during winter.

GIS Process

Kathy Ake, GIS Specialist

Phase I: Lynx Habitat Map Updates Flathead National Forest

GIS process by Kathy Ake, GIS Specialist, Flathead National Forest

Elevation

Low elevations lacking deep, fluffy snow were not included as lynx habitat. Based upon Squires' research (2010, 2013) areas above about 4,100 ft. are considered lynx habitat unless: 1) the FNF had telemetry data indicating lynx are using lower elevations for a particular drainage/portion of a drainage or 2) there is data indicating greater than average snow depths for a drainage/portion of a drainage (based upon local snow depth data from weather reporting stations and NRCS snow courses) (see Table C-2 and Figure C-1). Where we lacked data, we were conservative.

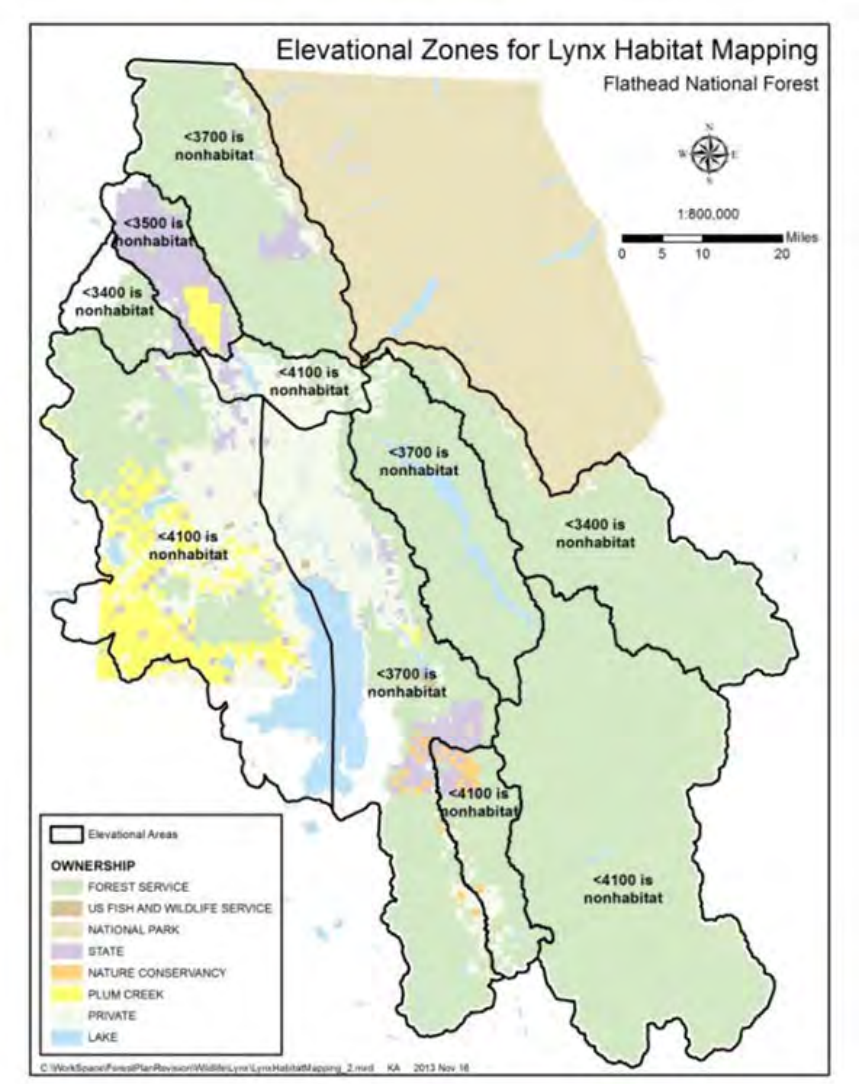


Figure C-1. Elevations for lynx habitat modeling on the Flathead National Forest

Table C-2. Areas above threshold elevations that are considered habitat for lynx based upon deep, fluffy snow

Area Description	Habitat Elevation Threshold (feet)
North Fork Flathead River, north of Canyon Creek drainage	3,700
North Fork Flathead River, south of Canyon Creek drainage	4,100
Middle Fork Flathead River	3,400
South Fork Flathead River, HH Reservoir drainage	3,700
South Fork Flathead River, south of HH Reservoir drainage	4,100
Swan River (Swan Valley), except as described below	3,700
Swan Valley east side from Goat Creek south to divide	4,100
Salish Mountains, south of Good Creek	4,100
Good Creek drainage (in the Olney, MT area)	3,400
Stillwater River, east of Hwy 93	3,500

Non-Forest

Non-forest areas were excluded as lynx habitat. The VMAP base-level layer (2012 classification, Barber et al. 2011, Berglund et al. 2009) was used to delineate non-forest vegetation classes, but was first updated for recent harvest and fires. To delineate recent harvest and fires, the USFS FACTS database and USFS fire databases were used to determine if a non-forest VMAP polygon was the result of recent fire or harvest. If so, it was coded as "transitional forest." Then the VMAP classes representing "sparse vegetation" (including permanent rock and other areas with <10 percent canopy cover) as well as herbaceous vegetation were not coded as lynx habitat. VMAP codes are 3100 for HERB; 7000 for SPVEG; and 8900 for TR-FOR (transitional forest).

QUERY: ("LIFEFORM" = 3100 OR "LIFEFORM" = 7000) AND "DOM_GRP_6040" <> 8900

Water

Water was excluded as lynx habitat. Lakes, ponds, and reservoirs greater than and equal to 5 acres in size were not coded as lynx habitat. National Hydrologic Data (NHD) datasets were used to select for water bodies greater than 5 acres in size. Codes are 390 for Lake/Pond and 436 for Reservoir. (Note: NHD "Ice Mass" polygons are all within the non-forest VMAP polygons and "Swamp/Marsh" polygons may be within the herbaceous or shrub VMAP polygons).

QUERY: ("FTYPE" = 390 OR "FTYPE" = 436) AND "GIS acres" >= 5.00

Potential Vegetation Type (PVT)

VMAP categories for "forest" and "transitional forest" within the elevation range used by Canada lynx were assessed for FNF lynx habitat. Forest, shrub and transitional forest VMAP polygons were coded as lynx habitat if:

1) the associated PVT has the capability of producing boreal spruce/subalpine fir forest, or 2) the pattern of vegetation on the forest is such that a PVT capable of producing snowshoe hares (such as grand fir PVT) is in close juxtaposition to a PVT capable of producing spruce/subalpine fir forest. Because lynx do not use warm dry habitats (Squires 2010) those PVT groups were not coded as lynx habitat (USFS R1 modeled PVT layer, USDA FS 2004). There is some uncertainty regarding lynx use of the *Pinus albicaulus* and *Larix lyalli* habitat types, but these habitat types make up only about 4% of the modelled lynx habitat on the Forest. Table C-3 provides a crosswalk between the PVT code and lynx habitat.

Table C-3. Crosswalk between PVT code and lynx habitat.

PVT Code	Characteristic	Lynx Habitat Code
abgr1	warm, dry	HABITAT
abgr2	warm, dry	HABITAT
abgr3	warm, moist	HABITAT
abla1	cool, wet	HABITAT
abla2	cool, moist	HABITAT
abla3	cool, moderately dry	HABITAT
abla4	Cold	HABITAT
laly	Cold	HABITAT
pial	Cold	HABITAT
picea	cool moist	HABITAT
pico	cool, moderately dry	HABITAT
pifl	Cold	HABITAT
pipo	warm, dry	NOT HABITAT

PVT Code	Characteristic	Lynx Habitat Code
poptre	Hardwood	HABITAT
psme1	warm, dry	NOT HABITAT
psme2	warm, dry	NOT HABITAT
psme3	warm, dry	NOT HABITAT
thpl1	cool, wet	HABITAT
thpl2	warm, moist	HABITAT
tshe	cool, moist	HABITAT
tsme1	cool, moist	HABITAT
tsme2	cool, moist	HABITAT

Combining Input Layers

After combining the four input feature classes (elevation, non-forest, water, and PVT group) and clipping the data to the Flathead NF Plan Revision geographic area boundaries (plus an additional 1 mile), the field <LynxHabitatPhaseI_description> was created.

Values are 'HABITAT' or NOT HABITAT (<reason>)' based upon the attributes of the input layers, within the elevation range used by lynx.

PVTs were available for more than 95 percent of the area mapped, but where the input feature classes did not have PVT information, the FNF VMAP classification (2012) updated with transitional forest for recent fires and timber harvest) was used, as shown in Table 4. VMAP is a classification of existing vegetation dominance types and not potential vegetation types (PVT). On the FNF, Douglas- fir (PSME) and western larch (LAOC) may occur as dominant seral species in boreal forest PVTs. As a result, the PSME and LAOC dominance types from VMAP were coded as habitat, to be conservative. If PVTs were not available, VMAP provided the best available information.

Table C-4. VMAP classes classified as potential lynx habitat on the Flathead National Forest

VMAP Class	Lynx Habitat Description
3300 – SHRUB	HABITAT
5000 – WATER	NOT HABITAT
8010 – PIPO	NOT HABITAT
8020 – PSME	HABITAT
8023 – PSME-IMIX	HABITAT
8024 – PSME-TMIX	HABITAT
8040 – LAOC	HABITAT
8043 – LAOC-IMIX	HABITAT
8044 – LAOC-TMIX	HABITAT
8050 – PICO	HABITAT
8053 – PICO-IMIX	HABITAT
8060 – ABLA	HABITAT
8064 – ABLA-TMIX	HABITAT
8070 – PIEN	HABITAT
8073 – PIEN-IMIX	HABITAT
8074 – PIEN-TMIX	HABITAT
8090 – THPL	HABITAT
8123 – PIAL-IMIX	HABITAT
8130 – LALY	HABITAT
8160 – POPUL	HABITAT
8400 – IMIX	HABITAT

VMAP Class	Lynx Habitat Description
8600 – HMIX	HABITAT
8900 – TR-FOR	HABITAT

As a final step, the DISSOLVE ArcTool was applied to decrease the number of polygons. Polygons less than 1.0 acre in size were merged into the adjacent polygon sharing the longest border.

Appendix C References

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Appendix D: Key plan components

The following selection of management direction are excerpts from the revised forest plan of key information related to listed species.

Bull Trout

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.

The Western Montana Bull Trout Conservation Strategy (2012) 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 to provide direction for affected forests to implement bull trout recovery actions. The strategy is a component of the final recovery plan and as such fits with the revised plan's stated desired condition for bull trout and designated critical habitat.

Desired Conditions

Bull Trout Specific Desired Condition

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.

Additional desired conditions determined to benefit bull trout and designated critical habitat are listed below.

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[3] 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 – Soils (FW-DC-SOIL)

01 Soil function and long-term productivity is conserved.

[3] 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.[4] 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.

Forest Plan Standards

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

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

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

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.

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-

[4] USDA. (2014). Travel analysis report for Flathead National Forest. Kalispell, MT: USDA Forest Service, Flathead National Forest. Planning record exhibit # 00413.

potential trees,[5] 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.

[5] 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.

Forest Plan Guidelines

Guidelines: A guideline is a constraint on project and activity decision making that allows for departure from its terms, so long as the purpose of the guideline is met (§ 219.15(d)(3)). Guidelines are established to help achieve or maintain a desired condition or conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iv)).

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 5. 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[6] from activities may be acceptable when those activities support long-term benefits[7] 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.

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.

[6] Effects that occur during, or immediately following, implementation of activity.

[7] Benefits that occur following completion of the activity.

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 – Soils (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 – Infrastructure (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[8] 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.

Table 6. 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

[8] Linear features include powerline rights-of-way and utility corridors.

Area	Route	Mile Marker
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

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

Culvert Monitoring Plan

The Culvert Monitoring Plan (July 2016) follows.

USDA
Forest Service

Northern
Region

Flathead
National
Forest

July 2016

Version 1.0

Culvert Monitoring Plan

Flathead National Forest



Background

In 1995, the Flathead National Forest amended the Forest Plan with specific road density standards to provide for grizzly bear security. This management direction was included in Forest Plan Amendment 19, which includes specific road density standards by grizzly bear management units on the Hungry Horse, Glacier View, and Spotted Bear Ranger Districts. As a result, all project-level decisions since 1995 had to incorporate the new A-19 road density standards to meet the new direction. The Tally Lake and parts of Swan Lake Ranger Districts were not affected by A-19 but still reduced road density for various resource management purposes. This resulted in numerous roads being decommissioned, closed, gated, or bermed. In the majority of cases, roads that were decommissioned (removed from the transportation system) involved removal of all stream culverts and water proofing of the road prisms. However, roads that remain on the system that are closed have had evolving and complex decisions which resulted in gated/bermed roads with have stream culverts in some cases, while others have had culverts removed. Because motorized access on these roads is limited (even for administrative use), regular inspection of culverts is a challenge. At the present time, approximately 702 miles of road have been closed, and 299 miles have been decommissioned in bull trout watersheds. These roads have been blocked by gates, berms, guard rails, boulders, or other structural barriers. Not all roads have been closed or decommissioned for grizzly bear security, but vast majority have.

At the present time, the Forest has seven Biological Opinions for bull trout that have specific terms and conditions that require some form of culvert inspection and/or monitoring. These opinions span a period of 14 years, with the first one being issued in 2002. Table 1 summarizes these opinions and associated Terms and Conditions that require culvert inspection and/or monitoring.

Stream crossing culverts on roads behind gates, berms, and other structures represents a risk to bull trout habitat. With access limited by motorized use, culverts may not be observed by Forest Service personnel on any kind of regular basis, whether it be through a formal monitoring program or just casual observation by employees. This monitoring plan is an attempt to address Terms and Conditions in all Biological Opinions to date, in a comprehensive and systematic way.

Biological Opinions and Associated Terms and Conditions

The following Biological Opinions for bull trout and their associated Terms and Conditions have been issued by the US Fish and Wildlife Service. The Terms and Conditions listed under each Opinion relate to culvert inspection and monitoring only. These opinions are both programmatic and project specific.

Table 1. Terms and Conditions contained in Biological Opinions that include culvert monitoring elements.

Biological Opinion	Terms and Conditions Related to Culvert Monitoring	Area of Applicability
Chilly James Restoration Project (January 2016)	The Forest shall provide the results of the annual monitoring conducted as described in Terms and Conditions above, by May 1 each year, for activities occurring in the preceding calendar year, or by an alternate date as agreed by the Service. These annual monitoring reports will follow the same format used in the Biological Opinion on the Effects to Bull Trout and Bull Trout Critical Habitat from the Implementation of Proposed Actions Associated with Road-related Activities that May Affect Bull Trout and Bull Trout Critical Habitat in Western Montana, Appendix B. Annual Report of Road-related Activities	Cold Creek Jim Creek

	(USFWS 2015). The annual monitoring report shall include a narrative on compliance of proposed actions identified in the BA, EA, and this BO and shall expressly describe whether the level of incidental take associated with these elements of the proposed project has been exceeded.	
Roads Programmatic (April 2015)	Appendix E in the Roads Programmatic Opinion includes specific design criteria for two types of closure levels. These design criteria must be followed to meet the first Term and Condition in the opinion (page 66). The specific monitoring requirements listed in Appendix E are shown below. These requirements apply to roads closed by gates, guardrails, concrete or earth barriers, or recontour at intersection. • Annually check pipes and ditches to assure they remain free from blockage • Annually inspect and maintain each stream-crossing structure left in place. If annual inspection and maintenance is not feasible, remove all stream crossing structures when the road is closed. • Annual inspect water-bars or cross ditches until stabilized or revegetated to assure they remain stable and free from blockage.	All bull trout habitat (Forest-wide) where the 2015 Roads Programmatic BO was applied.
Amendment 19 Revised Implementation (November 2010)	TC1. In order to minimize potential or unanticipated consequences from the delayed implementation of A-19, the Service requires the Forest to adopt the following measures, or respond in a letter to the Service within 60 days as to the reasons such reasonable and prudent measures were considered and are not feasible and provide an alternative plan for Service approval. The following terms and conditions are established to implement Reasonable and Prudent Measure #1. • By August 1, 2009, survey the culvert status on the 16.5 miles of roads in the four watersheds identified at risk due to delayed implementation of A-19. In Red Meadow Creek, this includes approximately 6 miles of road and 12 culverts. In Granite and Morrison Creeks, this includes approximately 6.5 miles of road and 14 culverts. In North Fork Lost Creek, this includes approximately 4 miles of road with 2 culverts and 2 bridges. Each culvert or bridge should be GPS located, examined, digitally photo-documented from both ends, and classified for risk of failure according to existing Forest standards (see e.g., Stevens and Kendall 2007). • For all culverts described in TC1(a), conduct and document timely maintenance; defined as removing debris and ingrown vegetation in and around entrance and exits. This maintenance shall occur prior to September 1, 2009, to reduce chances of failure during significant runoff events that may occur after bull trout spawning in 2009. • For any culverts documented in TC1(a) that have either failed or are in the imminent process of failing (e.g., partially or entirely plugged and/or with evidence of road fill undercutting or fill slope eroding), appropriate remedial actions to remove or replace the culvert, including channel restoration, will be implemented prior to bull trout spawning in 2009. There is an expectation that one or fewer culverts will be in this condition. However, if the number or location of such culverts exceeds one, the Forest should contact the Service within 72 hours and seek written approval of the Service in developing a plan to proceed, potentially including reinitiation of consultation because authorized levels of take in this BO may be exceeded. • For culverts considered at high risk to fail, but not actively in the process of failing as in TC1(c), a plan and schedule to either remove those culverts and restore the channel per INFISH BMPs, or to upgrade the culvert to a pipe sufficiently sized to minimize future risk rating, must be completed and submitted to the Service prior to December 31, 2009. Remedial actions or other measures agreed to during reconsultation must be approved by the Service prior to July 1, 2010.	Red Meadow Creek Coal Creek Hay Creek North Fork Lost Creek Skyland Creek Challenge Creek

	TC3 The Forest shall provide the results of culvert monitoring and maintenance conducted in summer 2009, to the Service by December 31, 2009, in report format including pre- and post-maintenance photo documentation of all pipes considered high risk. Results of monitoring conducted shall follow the reporting format described in Stevens and Kendall 2007, with the addition of GPS locations and photo-documentation described in TC1(a).	
Robert Wedge Post-Fire Project (November 2004)	• 14. The Forest will submit a proposal for monitoring culverts on bermed roads. The proposal must be approved by the Service prior to project implementation. The proposal should include rationale for the proposed monitoring method based on the results of previous monitoring efforts in the Moose and Spotted Beetle projects. A report of monitoring activities shall be submitted by the Forest fisheries biologist in a format agreed upon by the Forest and the Service by March 01 of each year for the previous year's activities. This report shall include, but is not limited to the location of the pipe, size, amount of fill, and current condition.	Whale Creek Trail Creek
West Side Reservoir Post-Fire Project (December 2004)	• 14. The Forest will submit a proposal for monitoring culverts on bermed roads. The proposal must be approved by the Service prior to project implementation in 2005. The proposal should include rationale for the proposed monitoring method based on the results of previous monitoring efforts in the Moose and Spotted Beetle projects. Culverts on bermed roads in bull trout priority watersheds will be considered a priority for monitoring. A report of monitoring activities shall be submitted by the Forest fisheries biologist in a format agreed upon by the Forest and the Service by March 01 of each year for the previous year's activities. This report shall include, but is not limited to the location of the pipe, size, amount of fill, and current condition.	Wounded Buck Sullivan Creek
Moose Post-Fire Project (November 2002)	• 3. The Forest shall ensure that roads closed year-long by gates or berms have properly functioning culverts and effective surface drainage to minimize surface erosion. The Forest shall implement monitoring of culverts on these roads according to monitoring components 1-5 as outlined in the September 19, 2002 letter from the Forest to the Service, "Moose Post-Fire Project EIS, Additional Information Regarding Culverts on Bermed Roads," (Appendix A). Additionally, culverts identified as high risk of failure during monitoring shall either be replaced or fill shall be removed to the extent practicable and an overflow design shall be implemented prior to high water the following year. A report of monitoring activities shall be submitted by the Forest fisheries biologist to the Service, in a format agreed upon by the Forest and the Service, by January 31 of each year for the previous year's activities. This report shall include, but is not limited to the size of pipe and amount of fill. If the Forest fails to turn in the monitoring report to the Service, consultation shall be reinitiated. • 4. For the 10 culverts to remain on decommissioned roads 315, 1692, 5286 and 316E, fill shall be removed to the extent practicable and an overflow design shall be implemented. The design shall be reported to and agreed upon by the Service prior to decommissioning. These culverts shall be monitored and reported in the same manner established in term and condition 3.	Lower Big Creek Upper Big Creek Hallowat Creek Coal Creek Lower
Spotted Beetle Project (March 2002)	• The Forest Service shall ensure through yearly inspections that roads closed by gates or berms have properly functioning culverts and effective surface drainage to minimize surface erosion. Culvert maintenance and roadbed restoration shall be accomplished as soon as practicable to prevent large erosive events from occurring.	Sullivan Creek

The intent of all the Terms and Conditions issued to date is sound in terms of mitigating the risk to bull trout habitat in the places where their associated Biological Opinions apply. However the areas where

the opinions apply are somewhat scattered across the forest and have resulted in an inefficient and sometimes duplicative monitoring requirement. Furthermore, not every bull trout watershed has an opinion that requires culvert monitoring.

For the most part, current Terms and Conditions require annual monitoring of culverts. In most cases, annual culvert monitoring may be duplicative, unless there are major disturbances that would cause changes in hydrologic and sediment regimes. Where hydrologic and stream channel conditions are relatively stable, it is unlikely that culvert conditions would change appreciably over a one year period. A 5-10 year period may be more reasonable to detect changes in culvert conditions and/or trends.

The culvert monitoring plan described below has two purposes. The first is to meet the intent of all Terms and Conditions contained in the Biological Opinions issued to date. The second purpose is to ensure that risks to bull trout habitat from culvert failures is minimized, not only where current opinions apply, but in all bull trout habitats across the forest. The specifics of the culvert monitoring plan are provided below.

Culvert Inspection and Monitoring Plan

Forest-wide, roads overlap with eight core areas occupied by 28 local bull trout populations. The general approach of this monitoring plan is to sample groups of watersheds that contain local bull trout populations on a six year rotating panel (Figure 1). The groups were developed based on the logistics of monitoring and the relative miles of system road and historic road. This would allow all roads behind gates or berms in a given group to be sampled during a given field season, along with historic roads. In the vast majority of cases, roads that have been decommissioned (historic roads) had stream culverts removed. The groups and associated local populations are summarized in Table 2. Adjustments to the panel groups are anticipated, depending on past year's progress, efficiency, and logistics. Panel groups may also be adjusted based on disturbance events such as fires or floods.

Table 2. Core areas, bull trout local populations, and panel group numbers.

Panel Group	Core Area	Local Population	Closed Road Miles	Historic Road Miles
1	Flathead Lake	Trail Creek		
1	Flathead Lake	Whale Creek		
1	Flathead Lake	Red Meadow Creek		
1	Frozen Lake	Frozen Creek (part in BC)	75.0	71.0
1	Upper Stillwater Lake	Stillwater River		
1	Upper Whitefish Lake	East Fork Swift Creek		
1	Whitefish Lake	Swift Creek		
2	Flathead Lake	Coal Creek		
2	Flathead Lake	Big Creek	106.7	122.6
2	Cyclone Lake	Cyclone Creek		
3	Flathead Lake	Morrison Creek		
3	Flathead Lake	Granite Creek		
3	Flathead Lake	Bear Creek	170.8	75.1
3	Hungry Horse Reservoir	Spotted Bear River		
3	Hungry Horse Reservoir	Sullivan Creek		

3	Hungry Horse Reservoir	Wheeler Creek		
3	Hungry Horse Reservoir	Wounded Buck		
4	Holland Lake	Holland Creek	100.0	14.7
4	Swan Lake	Goat Creek		
4	Swan Lake	Lion Creek		
4	Swan Lake	Soup Creek		
4	Swan Lake	Lost Creek		
5	Swan Lake	Jim Creek	111.3	2.5
5	Swan Lake	Piper Creek		
5	Swan Lake	Woodward Creek		
6	Swan Lake	Elk Creek	138.1	13.5
6	Swan Lake	Cold Creek		
6	Lindbergh Lake	Swan River		

All culverts associated with armored stream channels will be inspected by field crews. The crews will gather data electronically using a tablet or enhanced GPS recorder. Data at each culvert would be collected using the data dictionary shown in Appendix A. Prior to entering data on culvert conditions, the inlets would be cleared of any debris or sediment that may contribute to failure using hand tools. Photos of each culvert will be logged. If the degree of cleaning is beyond what can be done in a short period of time with hand tools, then these needs would be documented in the notes. Therefore, data entered into the data recorders will reflect conditions of the culvert when the crews leave them.

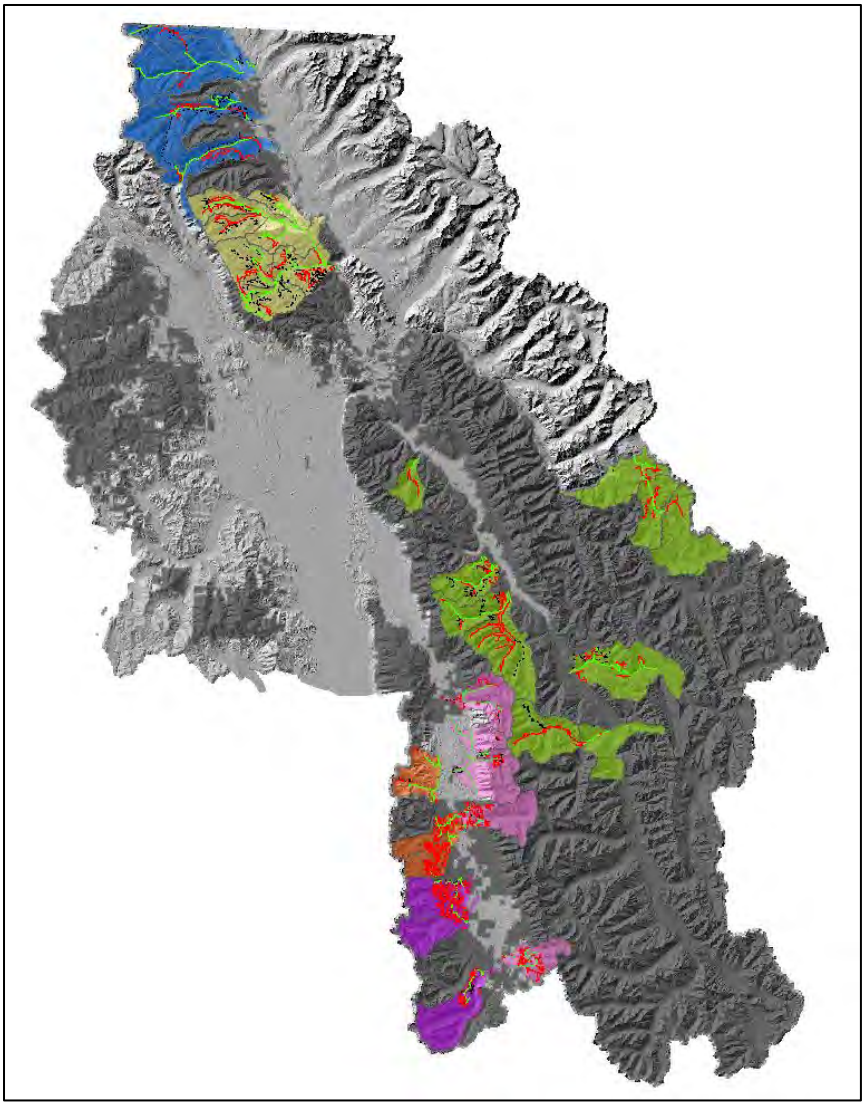


Figure 1. Panel groups of bull trout watersheds.

Annual Reporting

At the end of each field season, all culvert monitoring data will be exported into a spreadsheet. The data will include all attributes in the data dictionary (Appendix A). This spreadsheet will be e-mailed to the USFWS by the Flathead National Forest. General conclusions about the status of culverts in that year's panel will be provided, along with any information about corrective actions taken to reduce the risk of culvert failure.

Once the annual report is submitted, a meeting will be scheduled with the USFWS to discuss results. This annual meeting will also provide the opportunity to discuss potential changes to the monitoring plan, based on previous year's monitoring (adaptive management). The Flathead National Forest is responsible for preparing the annual report and scheduling the follow-up meeting with the USFWS.

Adaptive Management

This culvert monitoring plan is intended to be adaptive. The sampling strategy, as shown in Figure 1 may be adjusted based on the amount of culvert inspections completed during each field season. For example, if crews complete all culverts in a given panel before the season is over, they may move to the next panel. Therefore, the watersheds contained in each panel may change, based on the progress of crews during each field season. The sampling strategy may also change due to fire and/or floods. For example, if a fire burns a large proportion of land within a panel, it may be critical to inspect culverts within that panel during Burned Area Emergency Response. The data dictionary shown in Appendix A may also be adjusted based on lessons learned in the field.

If this plan cannot be implemented for any reason, the forest will revert back to the original monitoring requirements defined in the Biological Opinions listed in Table 1. This monitoring plan is designated as Version 1.0. Revisions will be designated as 2.0, 3.0, and so on.

Remedial Actions

If culverts are found to be in the imminent process of failing (i.e. partially or entirely plugged and/or with evidence of road fill undercutting or fill slope eroding, etc.), they will be removed or replaced. The USFWS will be contacted if such culverts are found and the optimum timing of remedial work will be agreed upon. If culverts are found to be at high risk of failure, a plan and schedule will be developed to remove or upgrade such culverts. All culverts that are in the imminent process of failing or at high risk of failing will be highlighted in the annual report submitted to the USFWS, and also discussed during the annual meeting.

Financial Plan

The annual cost of the monitoring program is itemized in Table 3 below. This cost includes four seasonal employees that would be divided into two separate crews, with each crew having one vehicle. Individual line item costs may fluctuate from year to year, but the total cost of the program is expected to be approximately $45,000.

Table 3. Financial Plan.

Employee/Cost	Days	Cost
Forest Aquatics Specialist (GS-9)	10	$3,000
Forest Civil Engineer (GS-9)	20	$6,000
Engineering Technician (GS-4)	60	$7,200
Engineering Technician (GS-4)	60	$7,200
Engineering Technician (GS-4)	60	$7,200
Engineering Technician (GS-4)	60	$7,200
Supplies	n/a	$1,500
Fleet (two rigs)	n/a	$4,000
Total Program Cost		**$44,800**

Appendix A

Culvert Inspection Data Dictionary

	Stream Crossing Information	
Field Number	**Field Name**	**Menu Choices**
1	Date	Enter Date
2	Road Number	Enter Number and Letters
3	Stream Name (if known)	Enter Name
4	Culvert Type	Round, arch, box, bottomless arch, other
5	Culvert Construction	Galvanized steel, concrete, wood
6	Culvert Width (feet)	Enter Number
7	Culvert Height (feet)	Enter Number
8	Stream Bankfull Width	Enter Number
9	Upstream Fill Height (feet)	Enter Number (use range finder if necessary)
10	Downstream Fill Height (feet)	Enter Number (use range finder if necessary)
	Risk Assessment	
Field Number	**Field Name**	**Menu Choices (Yes is bad, No is good)**
11	Culvert Inlet Cleaned Prior to Assessment	Yes, No
12	Shrubs, Debris, or Sediment Blocking Inlet	Yes, No
13	Inlet Below Stream Grade	Yes, No
14	Outlet Below Stream Grade	Yes, No
15	Inlet Rust Line >33%	Yes, No
16	Evidence of Flooding, Backwater, or Overflow	Yes, No
17	Significant Culvert Damage*	Yes, No
18	Floatable Debris Upstream	Yes, No
19	Channel Alignment >15 Degrees	Yes, No
20	Unstable or eroding banks Upstream	Yes, No
21	Notes	Enter notes if needed

*Barrel broken, beaver activity, inlet bent, invert worn through, inlet or outlet plugged, water flowing under culvert

Canada Lynx

Appendix A: Northern Rockies Lynx Management Direction

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.[9]

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

[9] The NRLMD final environmental impact statement and record of decision are available at https://www.fs.usda.gov/detail/r1/landmanagement/resourcemanagement/?cid=stelprdb5160650.

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:

- 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

6. a final rule designating lynx critical habitat prepared by the FWS in 2014[10];
7. an update to the Lynx Conservation Assessment and Strategy prepared by the Interagency Lynx Biology Team in 2013[11]; and
8. 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.

[10] 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.

[11] 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.

- 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.
- 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][12]

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.

[12] Note: In this section, superscript numbers refer to numbered definitions in the glossary.

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 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.

NRLMD References

[note: This is the complete reference list from the NRLMD record of decision.]

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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.

Grizzly Bear

Preferred alternative for initiation of ESA section 7 consultation: Flathead National Forest Plan Revision Alternative B modified

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), available on CD.

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 grizzly 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 calculated 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 open motorized route density, total motorized route density, or secure core values 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 allowed 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 sure 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. See also FW-DC-WL-01 and 02.

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. See also FW-STD-GR-01.

Guidelines

FW-GDL-GR-02. Within the NCDE primary conservation area, an allotment management plan and plan of operations 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 or 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 calculated 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-7. 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	63	69	69	69

Table D-8. 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. 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.
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?

Monitoring Question	Plan Component(s)	Potential Indicator(s)
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

The following terms, and definitions, are to be used only where they apply within the Northern Continental Divide Ecosystem (NCDE) for grizzly bears.

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 for overnight use (e.g. the number of sites in a campground; the number of rooms available for lodging (as a commercial rental); or the number of cabins, bunkhouses, or recreation residences 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.

Water howellia and Spalding's catchfly

Refer to the bull trout plan components for riparian management zone and other aquatic-related plan components (specifically **FW-STD-RMZ-01**).

Plant species currently designated threatened, endangered, proposed, or candidate (PLANT)

Desired Conditions (FW-DC-PLANT)

01 Habitat conditions support the recovery or long-term persistence of plant species listed as threatened and endangered under the Endangered Species Act, which currently include Spalding's catchfly (*Silene spaldingii*) and water howellia (*Howellia aquatilis*).

02 Vegetation conditions and ecological processes within a 300-foot riparian management zone surrounding ponds that provide *Howellia aquatilis* habitat (occupied and unoccupied) create a favorable physical environment that protects against hydrological changes that may adversely impact the species. The structural and floristic diversity of the vegetation in the riparian management zone is maintained.

Guidelines (FW-GDL-PLANT)

01 Ground-disturbing vegetation treatments within 300 feet of ponds providing habitat for *Howellia aquatilis* should occur only if the vegetative, physical, and/or hydrologic features required for long-term habitat conservation are maintained or improved. Treatments should develop vegetation conditions consistent with natural ecological processes and should sustain soil quality and functioning to support the long-term persistence of *Howellia aquatilis*.

02 Road maintenance on roads within 300 feet of ponds providing habitat for *Howellia aquatilis* should maintain or improve hydrological integrity to protect habitat conditions for *Howellia aquatilis*.

03 To protect habitat conditions for *Howellia aquatilis*, water drafting (for invasive plant control or fire management activities) should not occur in occupied or unoccupied but suitable water howellia ponds.

Non-Native Invasive Plants/Noxious Weeds (NNIP)

Desired Conditions (FW-DC-NNIP)

01 Native plant species and plant communities dominate the landscape, whereas invasive plant species are at low abundance or non-existent, especially in areas identified of high priority, including wilderness areas, native grassland plant communities, riparian areas (particularly those associated with water howellia ponds), research natural areas (management area 4a), around known populations of plant species of conservation concern, and in special areas (management area 3b).

02 No new non-native invasive plant species become established in terrestrial or aquatic plant communities on the Forest.

03 Terrestrial communities at risk of negative impacts from non-native invasive plants are able to retain or regain function, process, and structure after disturbance.

04 Invasive plant species are controlled with integrated pest management approaches in a strategic and adaptive manner. These approaches include an effective prevention and education program, combined with mechanical, biological, cultural, and chemical methods of weed control. Technological advances in weed treatments are capitalized on if they are shown to be equivalent to or more effective than existing treatments.

Objective (FW-OBJ-NNIP)

01 Treat 12,000 to 16,000 acres to contain or reduce non-native invasive plant density, infestation area, and/or occurrence. Greatest attention will be given to treating potential invaders or new invaders most likely to negatively impact native plant communities and ecosystem integrity, especially in areas identified as high priority (see FW-DC-NNIP-01)

Guidelines (FW-GDL-NNIP)

01 To reduce the probability of establishment of new non-native invasive plant populations, areas where soils are disturbed by management activities conducted or authorized by the USFS should be reseeded as soon as practical using USFS-certified weed-free seed mixes.

Sustainable Recreation—General (SREC)

Guidelines (FW-GDL-REC)

02 To protect resources, new solid and sanitary waste facilities should be located outside of the inner riparian management zone.

Lands and Special Uses (LSU)

Guidelines (FW-GDL-LSU)

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.

Energy and Minerals (E&M)

Guidelines (FW-GDL-E&M)

07 To protect water quality and inland native fish habitat, wildlife and other riparian-associated resources, mineral operations should not be authorized in riparian management zones. If the riparian management zone cannot be avoided, the authorization should include measures to maintain, protect, and rehabilitate fish and wildlife habitat that may be affected by the operations.

Grazing (GR)

Standard (FW-STD-GR)

07 New or reauthorized livestock grazing permits shall incorporate requirements that reduce the risk of impacts to native fish or riparian habitat (e.g., through modifying accessibility of riparian areas to livestock, length of grazing season, stocking levels, timing of grazing, etc.).

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.

Guideline (FW-GDL-GR)

01 During allotment management planning, grazing practices (e.g., length of grazing season, stocking levels, timing of grazing) should be adjusted if needed to achieve desired conditions for riparian management zones (this varies on a site-specific basis).

03 Livestock trailing, bedding, watering, salting, loading, and other handling activities should be avoided in riparian management zones.

Plant species at risk Monitoring

Also refer to Bull Trout (Aquatic) Monitoring (e.g. MON-WTR-03) above.

Monitoring Question(s)	Plan Component(s)	Potential Indicator(s)
MON-PLANT-01: What is the status of water howellia in areas where disturbances (natural or human-caused) have occurred?	**FW-DC-PLANT-01**	**IND-PLANT-01**: Presence/absence of water howellia in habitat that has been disturbed.
Monitoring Question(s)	**Plan Component(s)**	**Potential Indicator(s)**
MON-NNIP-01: What is the status of plant communities at highest risk of negative impacts to their system functions from established or new invaders?	**FW-DC-NNIP-01**	**IND-NNIP-01**: Percent of invasive plant species cover within identified high-risk/high-priority areas. These would include such areas as forests on the warm-dry biophysical setting, dry grassland plant communities, wilderness trailheads, and management area 3b (special areas).
MON-NNIP-02: What management actions are contributing to coordination and cooperation with adjacent landowners and partners in managing non-native invasive weeds?	**FW-DC-P&C-16**	**IND-NNIP-02**: Number and type of weed management actions conducted involving coordination and cooperation with partners and adjacent land owners

Appendix E: Primary Constituent Elements for Bull Trout Critical Habitat and Critical Habitat Maps

The following describe how the Matrix of Pathway Indicators for the species is related to a crosswalk evaluation of each PCE for bull trout designated critical habitat. Table E-1 displays that crosswalk relationship. For maps of critical habitat for bull trout refer to the Figure E-1, Figure E-2, Figure E-3, and Figure E-4 at the end of this appendix.

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 analysis of *changes in peak/base flows* addresses subsurface water connectivity and *substrate embeddedness* addresses inter-gravel flows. *Increase in drainage network* and *road density and location* address potential changes to groundwater sources and subsurface water connectivity. *Streambank condition*, *floodplain connectivity* and *riparian conservation areas* address groundwater influence. C*hemical contamination/nutrients* address concerns regarding groundwater water quality.

2. ***Migratory 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***.

Physical, biological or chemical barriers to migration are addressed directly through water quality habitat indicators, including *temperature*, *sediment, chemical contamination/nutrients* and *physical barriers*. The analysis of these indicators assess whether barriers have been created due to impacts such as high temperatures or high concentrations of turbidity or contaminants. Analysis of *change in peak/base flows* and *average wetted width/maximum depth ratio* assess whether changes in flow might create a seasonal barrier to migration. An analysis of *refugia* considers the habitat's ability to support strong, well distributed, and connected populations for all life stages and forms of bull trout.

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

Floodplain connectivity and *riparian conservation areas* provide habitat to aquatic invertebrates, which in turn provide a forage base for bull trout. *Pool frequency and quality* and *substrate embeddedness* contributes to the variety and density of aquatic invertebrates and other fish species. Changes in *temperature*, *sediment*, and *chemical contaminants and nutrients* affect aquatic invertebrate production, floodplain and riparian areas provide habitat to aquatic invertebrates, which in turn provide a forage base for bull trout. The combined analyses of all the Matrix habitat indicators and the other seven PCEs provide information to assess whether there is an abundant food base in the analysis area. Therefore, any impairment to the food base will be addressed by way of summarizing the biological and habitat indicators.

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

Large woody debris increases channel complexity and creates pools and undercut banks, so the analysis of the current amounts and sources of *large woody debris* available for recruitment is pertinent to this PCE. *Pool frequency and quality* considers the number of pools per mile as well as the amount of cover and temperature of water in the pools. *Average wetted width/maximum depth ratio* is an indicator of channel shape and pool quality. Low ratios suggest deeper, higher quality pools. *Large pools,* consisting of a wide range of water depths, velocities, substrates and cover, are typical of high quality habitat and are a key component of channel complexity. Analysis of *off-channel habitat* describes side-channels and other off-channel areas. *Streambank condition* analyzes the stability of the banks, including features such as undercut banks. The analysis of riparian *conservation areas* and *floodplain connectivity, disturbance history, and disturbance regime* includes the maintenance of habitat and channel complexity, the recruitment of large woody debris, and the connectivity to off-channel habitats or side channels. Complex habitats provide refugia for bull trout and in turn, analysis of *refugia* assesses complex stream channels.

All of these habitat indicators consider the numerous characteristics of instream bull trout habitat and quantify critical components that are fundamental to creating and maintaining complex in-stream habitat over time.

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

This PCE is addressed directly by the analysis of *temperature*. It is also addressed through consideration of *refugia*, which by definition is high quality habitat of appropriate temperature. Availability of refugia is also considered in analysis of *pool frequency and quality* and *large pools*. *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 refugia. This indicator in conjunction with *change in peak/base flows* is an indicator of potential temperature and refugia concerns particularly during low flow periods. *Streambank condition*, *floodplain connectivity,* r*oad density and location* and *riparian conservation areas* address the components of shade and groundwater influence, both of which are important factors of water temperature. Stable streambanks and intact riparian areas, which include part of the floodplain, typically support adequate vegetation to maintain thermal cover to streams during low flow periods. *Road density and location* addresses the potential contributions of warm water discharges from storm water ponds.

6. ***Substrates 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 (e.g., less than 12 percent) of fine substrate less than 0.85 mm (0.03 in.) in diameter and minimal embeddedness of these fines in larger substrates are characteristic of these conditions.***

The analyses for *sediment* and *substrate embeddedness* assess substrate composition and stability in relation to the various life stages of the bull trout as well as the sediment transportation and deposition. *Large woody debris* and *pool frequency and quality* affect sediment transport and redistribution within a stream and assessment of these indicators will clarify substrate composition and amounts. Analysis of *streambank condition* will provide insight into the amount of fine sediment contribution.

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

The analysis of *change in peak/base flows* considers changes in hydrograph amplitude or timing with respect to watershed size, geology, and geography. Analyses of *floodplain connectivity*, *increase in drainage network, road density and location, disturbance history,* and *riparian conservation areas* provides further information regarding possible interruptions in the natural stream hydrology. *Floodplain connectivity* considers the hydrologic linkage of off-channel areas with the main channel. Roads and vegetation management both have effects strongly linked to a stream's hydrograph. *Disturbance regime* ties this information together to consider how a watershed reacts to disturbance and the time required to recover back to pre-disturbance conditions.

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

The quantity of permanent water will be considered in the analyses for PCE 4 natural hydrograph and PCE 5 springs, seeps, and groundwater, which include *floodplain connectivity*, *changes in peak/base flows*, *drainage network increase*, *disturbance history,* and *disturbance regime*. Analysis of *temperature, sediment, and chemical contaminates and nutrients* consider the quality of permanent water. Current listing under 303(d) and 305(d) status should be considered, as well as the causes for that listing. Analysis pertinent to sediment should address turbidity.

9. ***Few or no nonnative predatory (e.g., lake trout, walleye, northern pike, smallmouth bass; inbreeding (e.g., brook trout); or competitive (e.g., brown trout) species present.***

This PCE is addressed in terms of the subpopulation characteristics, as analyzed in *life history and diversity* and *persistence and genetic integrity*. 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. Analysis of these indicators and the associated baseline provides an understanding of biological implications of non-native species. Non-native species can be affected by changed habitat conditions in a subwatershed and the population status can provide information on the existing condition of a local population.

Table E-1. MPI indicators relevant to each of the PCEs of bull trout designated critical habitat

Diagnostic Pathway/Indicator	PCE 1 Springs, seeps, groundwater	PCE 2 Migratory habitats	PCE 3 Abundant food base	PCE 4 Complex habitats	PCE 5 Water temperature	PCE 6 Substrate features	PCE 7 Natural hydrograph	PCE 8 Water quality and quantity	PCE 9 Predators and competitors
Water Quality									
Temperature		x	x		x			x	
Sediment		x	x			x		x	
Chemical	x	x	x					x	
Habitat Access									
Physical Barriers	x	x	x						x
Habitat Elements									
Substrate	x		x			x			
Large Woody Debris				x		x			
Pool Frequency and			x	x		x			
Large Pools				x	x				
Off-Channel Habitat				x					
Refugia		x			x				x
Channel Conditions									
Wetted		x		x	x				
Streambank	x			x	x	x			
Floodplain	x		x	x	x		x	x	
Flow/Hydrology									
Changes in	x	x			x		x	x	
Drainage Network	x						x	x	
Watershed									
Road Density and	x				x		x		
Disturbance History				x			x	x	x
Riparian	x		x	x	x		x		
Disturbance Regime				x			x	x	

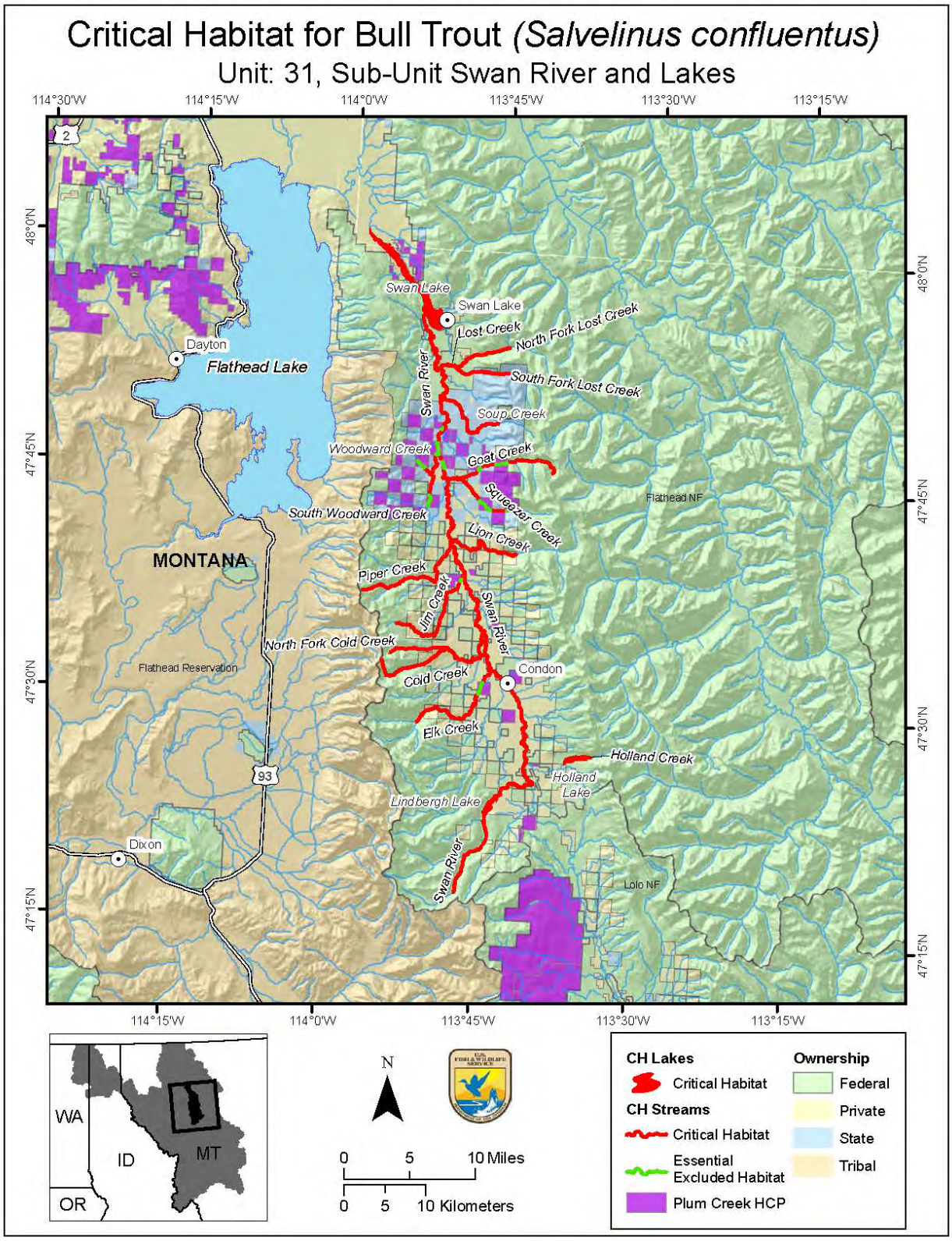


Figure E-1. Critical habitat for bull trout, unit 31 Swan River and Lakes.

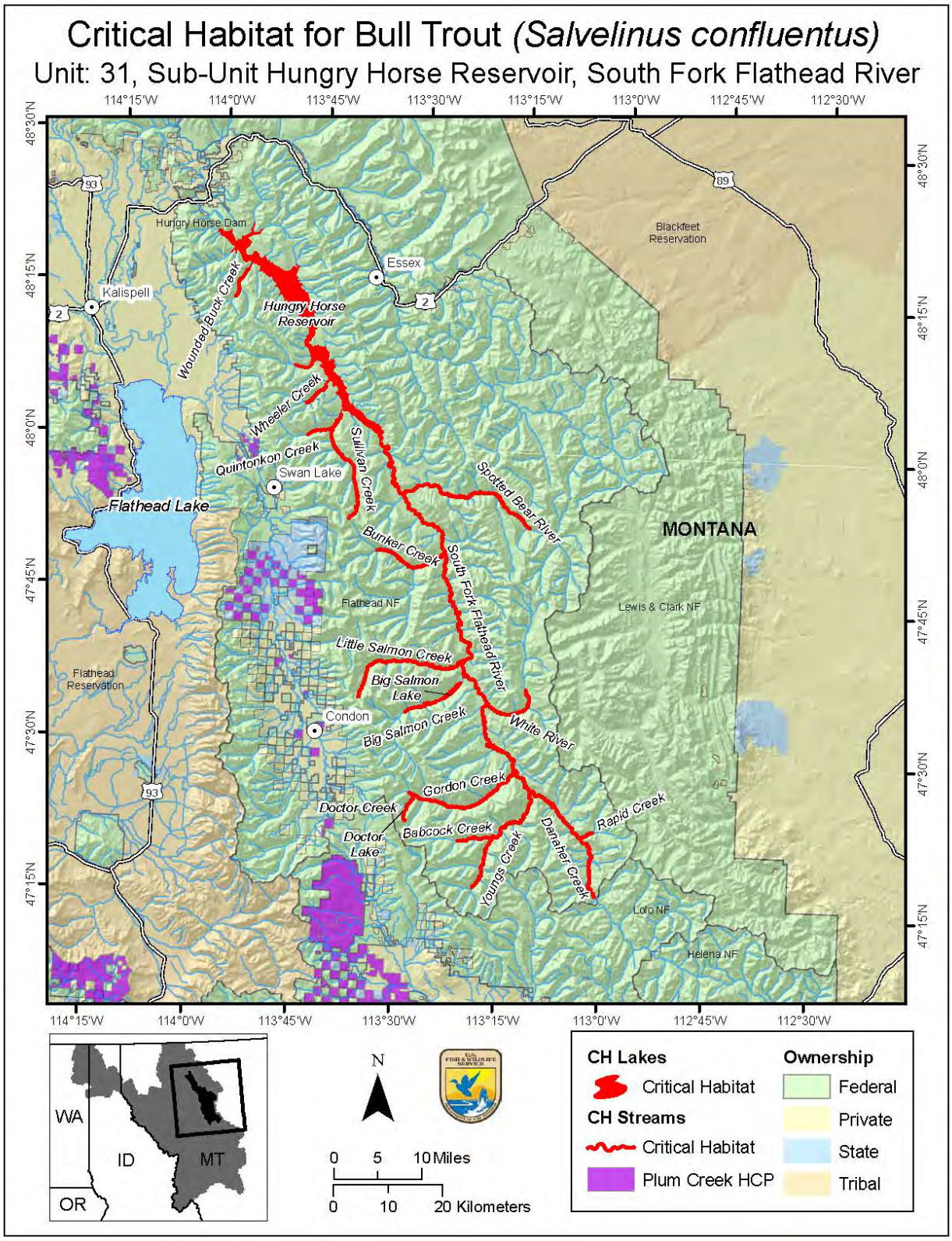


Figure E-2. Critical habitat for bull trout, unit 31, Hungry Horse Reservoir, South Fork of the Flathead River.

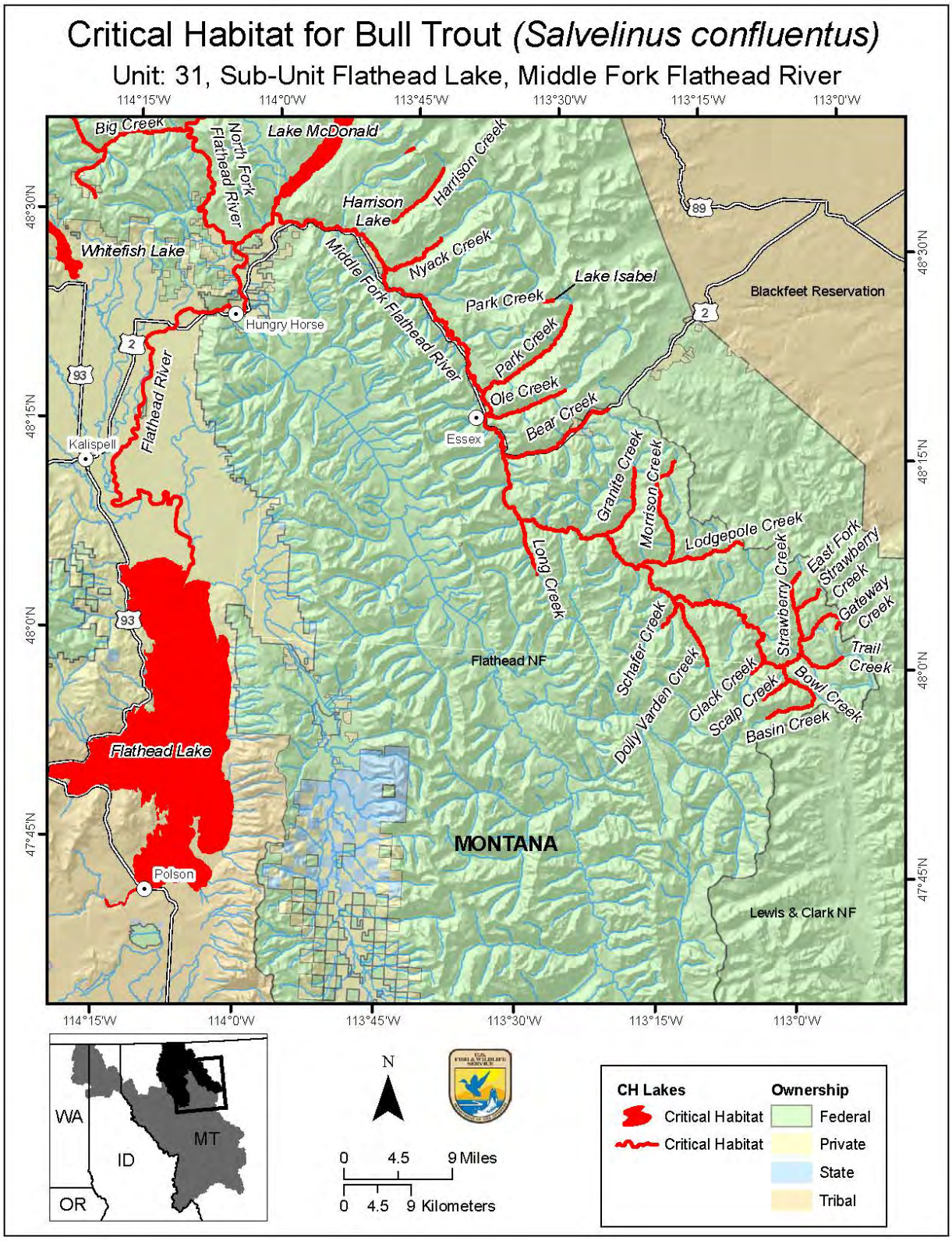


Figure E-3. Critical habitat for bull trout, unit 31, sub-unit Flathead Lake Middle Fork of the Flathead River.

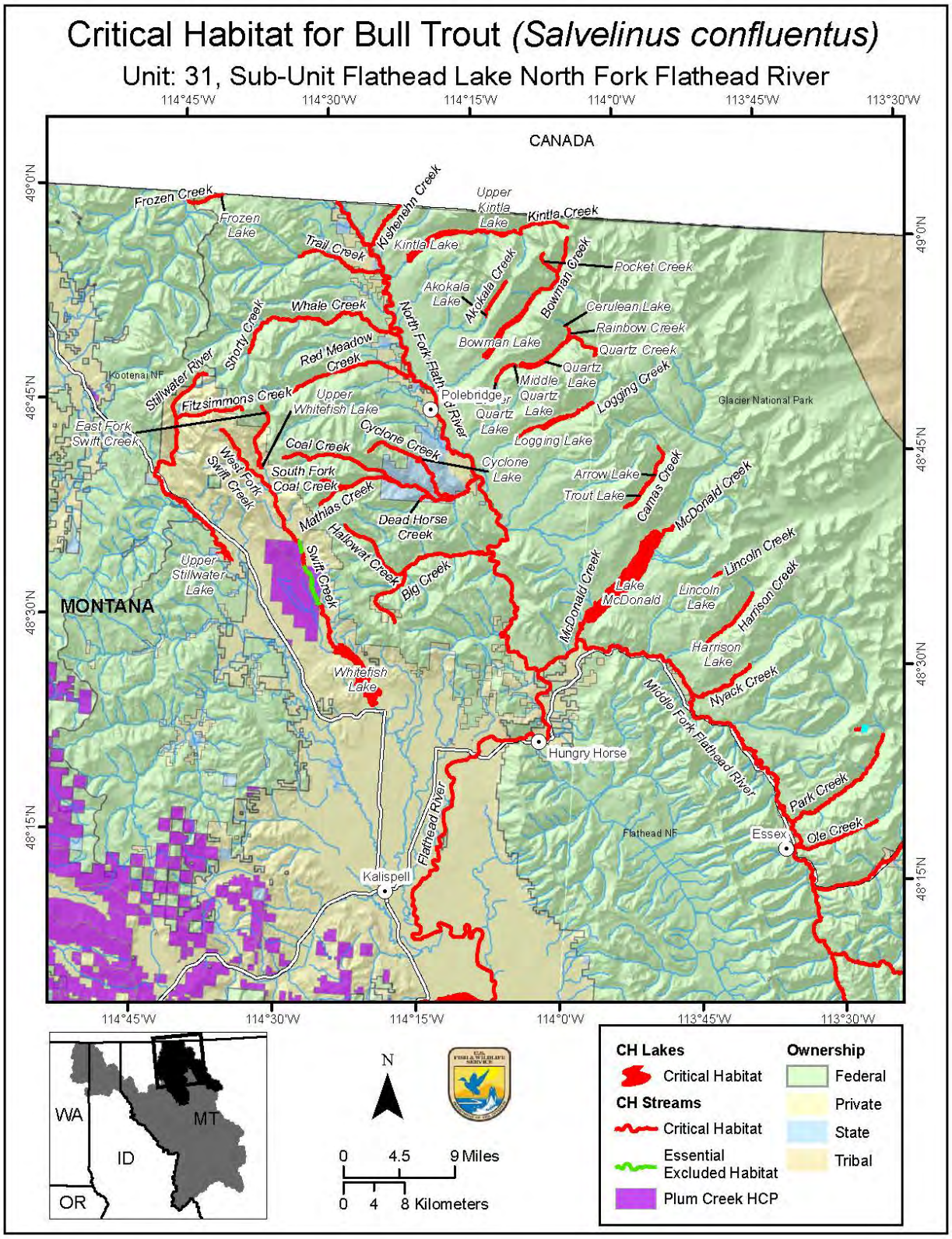


Figure E-4. Critical habitat for bull trout, unit 31, sub-unit Flathead Lake North Fork of the Flathead River.

Appendix F: Bull Trout Baselines

The bull trout baselines are updated with the 2017 GIS runs from the Bull Trout Conservation Strategy.

The maps at the end of this appendix display the following:

- Figure F-1. 2017 Barrier call in bull trout priority watersheds.
- Figure F-2. 2017 Large woody debris call in bull trout priority watersheds.
- Figure F-3. 2017 Sediment call in bull trout priority watersheds.
- Figure F-4. 2017 Temperature call in bull trout priority watersheds.
- Figure F-5. 2017 Integrated call in bull trout priority watersheds.

Acronyms

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

Flathead Lake Core Area

Local Population: Trail Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
30-50	Stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Unknown potential impacts forthcoming from Cline Mine in British Columbia (BC), Canada. Large groundwater influence keeps spawning gravels cleansed. Trail Creek subs naturally at caves near Thoma Creek. This prevents upstream spawners in fall. Juvenile bull trout are primarily non-existent above this point. Very little impact seen from 2003 Wedge Canyon Fire. Slump on Rd. 114 fixed in 2007. Very little habitat restoration needs to occur in this drainage. No improvements proposed at this time as habitat conditions appear to be optimum.

Confidence in your assessment (high, medium, low): High

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

HUC6 (name and #): Trail 311							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Pop: Low, primarily provides clean water, spawning is in HUC below							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FAR	NA				
Barriers	FA	FA	NA				
Pools	FAR	FAR	NA				
Sediment	FAR	FAR	NA				
Integrated	FAR	FAR	NA				

Temperature: GIS rating= FA, data and professional judgment = FA. Temperature in Trail Creek is largely regulated by the underground springs that surface near Thoma Creek. The majority of bull trout spawning occurs just downstream of this reach.

Barriers: GIS rating = FA and FA, data and professional judgment = FA. There are no man-made barriers to bull trout waters in Trail Creek.

Pools: GIS rating = FAR in Trail, professional judgment = FA. There hs been no riparian harvest along Trail Cr. and surveys conducted during annual redd counts reveal high pool numbers in high quality.

Sediment: GIS rating = FAR in Trail, professional judgment = FA. Percent fines as measured by McNeil core samples have fluctuated little over the last decade despite a major fire in 2003.

HUC6 (name and #): Tuchuck 310							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, Primary spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Whale Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
95-105	Stable	Adfluvial	2	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. There are no bull trout above Whale Falls in HUC 204. Unknown potential impacts forthcoming from Cline Mine in BC. Large groundwater influence keeps spawning gravels cleansed. Very little impact was seen from 2003 Wedge Canyon Fire. Shorty Creek Rd. was decommissioned in 2010 other than that no barriers or improvements are needed except for some decommissioning low in the drainage. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Shorty-404							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, Primary spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FA	FA					
Integrated	FA	FA					

HUC6 (name and #): Upper Whale -405							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Pop: Low, primarily provides clean water, spawning is in HUC below. Natural barrier at Whale Falls.							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	5	1			
Barriers	FA	FA	5	1			
Pools	FA	FA	5	1			
Sediment	FA	FA	5	1			
Integrated	FA	FA	5	1			

HUC6 (name and #): Lower Whale-406
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve

% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, Primary spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FAR	FA	5	1	10k	L	H
Integrated	FAR	FA	5	1			

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Temperature: GIS rating = FA, data and professional judgment = FA. In 2009, a relatively warm summer, stream temperature varied little over 9 miles from upstream to downstream. Downstream temperatures remained cool due to the tremendous ground water effect.

Barriers: GIS rating = FA, data and professional judgment = FA. There are no man made barriersin Whale Creek affecting bull trout.

Pools: GIS rating FA, data and professionl judgment = FA. Riparian harvest has occurred in Whale Creek over the past. However, recruitment of wood has been substantial over the last decade primarily from the 2003 Wedge Canyon Fire. Based upon surveys when conducting redd counts on an annual basis, pools are abundant and of high quality, i.e., depth and size.

Sediment: GIS rating = FAR in Lower Whale, data and professional judgment = FA. Percent fines have varied little over the last 2 decades, increasing slightly following the 2003 fire.

Local Population: Red Meadow Creek

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
10	Depressed	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	**Vulnerability to Climate Change**	**Unique Population Attributes**
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Unknown potential impacts forthcoming from Cline Mine in BC. Redd counts only during basin-wide years, unsure why counts are down. Rd. 1684 will be decommissioned under Red Whale Decision (2009). BMPS have been updated on most other roads. No bull trout culvert barriers. Habitat restoration is not recommended at this time.. Main road RD 115 will not be decommissioned to provide fire escape route over Whitefish Divide. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Red Meadow- 208
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve

% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Pop: Low, Red Meadow population is small.							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA	15				
Barriers	FUR	FA	15				
Pools	FUR	FA	15				
Sediment	FUR	FAR	15				
Integrated	FUR	FAR	15	3	10K	L	M

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Temperature: GIS rating FAR, data and professional judgment rating = FA. The turnover in the lake is reflected by the cooling temperatures at the beginning of September. Groundwater affects appear to be less than in other drainages.

Barriers: GIS rating = FUR, data and professional judgment = FA. There are no known man made barriers in Red Meadow that affect bull trout distribution and thus GIS rating appears to be an error.

Pools: GIS rating = FUR, data and professional judgment = FA. Pools are abuundant and in high quality based upon basin wide redd surveys.

Sediment: GIS rating = FUR, data and professional judgment = FA. There are no McNeil Core samples for Red Meadow Creek, however substrate scores have been taken by Tom Weaver, MFWP since 1988. A score over 10 exhibits good rearing conditions for juvenile salmonids as interstitial spaces between gravels are not filled. The higher the score the better the rearing conditions.

Local Population: Coal Creek

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
0-5	Stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	**Vulnerability to Climate Change**	**Unique Population Attributes**
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Unknown potential impacts forthcoming from Cline Mine in BC. Large groundwater influence keeps spawning gravels cleansed and temperatures regulated. Population has reached a bottle neck due to low redd counts over an extended period of years. We contracted with Traci Sylte, hydrologist on the Lolo National Forest, to look at restoration opportunities due to low redd counts but none were found other than some road decommissioning options. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Upper Coal-505
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve

% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Pop: Low, primarily provides clean water, spawning is in HUC below							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	5	1			
Barriers	FA	FA	5	1			
Pools	FAR	FA	5	1			
Sediment	FUR	FAR	5	1			
Integrated	FUR	FAR	5	1	15K	L	H

HUC6 (name and #): SF Coal -504							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, Primary spawning reach							
Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA	5	1			
Barriers	FA	FA	5	1			
Pools	FA	FA	5	1			
Sediment	FA	FA	5	1			
Integrated	FA	FA	5	1		L	H

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Temperature: GIS rating = FA, data and professional judgment rating = FA. Temperatures are cooler downstream once again due to the groundwater influence. Very few days were over 55 degrees despite a warm summer in 2009.

Barriers: GIS rating = FA, data and profesional rating = FA. There are no man made barriers in Coal Creek that affect bull trout distribution. A culvert on road 10801 in the very headwaters of Coal Creek was removed in 2009.

Pools: GIS rating = FA, data and professional judgment rating = FA. There is a large amount of bedload in Coal Creek that ahs caused stream braiding anc channel avulsions. Many pools have been filled due to aggradation. Large Wood is abundant despite a fair amount of past riparian harvest.

Sediment: GIS rating FA, data and professional judgment rating = FA. Core samples have been consistently belwo 35% over the last 20 years.

Local Population: Big Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
55-65	Depressed	Adfluvial	2	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Unknown potential impacts forthcoming from Cline Mine in BC. Habitat was heavily impacted from 1950s-era logging and road building. Numerous channel avulsions and aggradation have occurred. Moose Fire 2001 impacted the Hallowat Creek spawning reach; however a LWD addition project in 2008 has increased the number of juvenile bull trout within the reach. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Upper Big-604							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High, spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	15	1			
Barriers	FA	FA	15	1			
Pools	FAR	FA	15	1			
Sediment	FAR	FA	15	1			
Integrated	FAR	FA	15	1	10K	L	M

HUC6 (name and #): Lower Big- 605							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 50%							
Functional Significance to Local Pop: Mod. Below spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	15	1			
Barriers	FA	FA	15	1			
Pools	FAR	FA	15	1			
Sediment	FAR	FA	15	1			
Integrated	FUR	FAR	15	1	20K	L	m

HUC6 (name and #): Hallowat- 603							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	15	1			
Barriers	FA	FA	15	1			
Pools	FAR	FA	15	1			
Sediment	FAR	FA	15	1			
Integrated	FAR	FA	15	1	20K	L	M

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Temperature: GIS rating = FA, data and professional rating = FA. Temperatures were about 8 degrees warmer on average at the lower site compared to the upper site in Big Creek.

Barriers: GIS rating = FA, data and professional judgment rating = FA. There are no man made barriers that affect bull trout distribution in Big Creek.

Pools: GIS rating = FAR, data and professional judgment rating = FAR. Big Creek functions similar to Coal Creek in terms of aggraded reaches and multiple channels. LWD is abundant in most reaches and was added to Hallowat Creek in 2008. Quality of pools are impacted.

Sediment: GIS rating = FAR, data and professional judgment rating = FA. Percent fines have been below 35% since 1994.

Local Population: Strawberry Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
10-15	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Strawberry-101							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Basin and Bowl Creeks

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5-10	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Basin & Bowl- 103							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Clack Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5-10	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving Factors Determining Bull Trout Population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Clack- 107							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				

Local Population: Schafer Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5-10	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Schafer- 106							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Dolly Varden Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5-10	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Dolly Varden- 106
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve
% Forest Service Ownership in HUC: 100%
Functional Significance to Local Population: High- spawning reach

Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Morrison and Lodgepole Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
30-40	stable	Adfluvial	2	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Headwaters are out of wilderness. Beaver Dam affects upstream migration. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (H, M, L): High

HUC6 (name and #): Morrison and Lodgepole Creeks- 201							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Granite Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
15-25	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Headwaters out of wilderness. Downstream reaches are in wilderness. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Granite Creek- 203							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Temperature: GIS rating = FA, data and professional judgment rating = FAR. Challenge Creek is about a mile upstream of the spawning reach. A thermograph just upstream of the spawning reach in 2010 was out of water.

Barriers: GIS rating = FA, data and professional judgment rating = FA. There are no known man made barriers that affect bull trout distribution in Granite Creek.

Pools: GIS rating = FA, data and professional judgment rating = FA. Pools are abuindant and of high quality throughout Granite Creek as observed during annual bull trout redd surveys.

Sediment: GIS rating = FA, data and professional rating = FA. The soils in the Granite Creek area are highly erosive and it can be expected that the sediment levels are near base level.

Local Population: Long Creek

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
10-15	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	**Vulnerability to Climate Change**	**Unique Population Attributes**
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Wilderness Stream. Long-term declining trend due to lake trout in Flathead Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Long- 205
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve

% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FAR	FAR	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Bear Creek

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
10-15	stable	Adfluvial	1	Lake Trout in Flathead

Significance of geographical location	**Vulnerability to Climate Change**	**Unique Population Attributes**
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Long-term declining trend due to lake trout in Flathead Lake. Other impacts associated with HWY 2. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Bear- 301							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FUR	FA	NA				
Pools	FAR	FA	NA				
Sediment	FAR	FA	NA				
Integrated	FUR	FAR	NA				

Local Population: Upper Stillwater River and Fitzsimmons

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
2 year average is 28 x 3.2= 90 adults	Stable?	Migratory Connected	2 reaches	EB, high LT, high NP, high

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Disjunct core population that is thought to be a fraction of historic size	Unknown	May have experienced genetic bottleneck but still persists. Fluvial rather than adfluvial?

Driving factors determining bull trout population: This core population was once thought to occupy both Upper and Lower Stillwater Lakes but is now greatly reduced due to non-native species. May have experienced genetic bottleneck in the 1990s but still seems to persist. Redd count surveys are intermittent. Some uncertainty if population is mostly fluvial now since bull trout are rarely observed in lakes. Confidence in your assessment (high, medium, low): Low

HUC6 (name and #): 170102100505							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive Restoration							
% Forest Service Ownership in HUC: Flathead 10%, Kootenai 20% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low?							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA						
Barriers	FA						
Pools	FA						
Sediment	FAR	FA					

Only available data is coring data in spawning reach of Stillwater River (up until 2007). 5 year average is 25% fines. No other information. Spawning habitat entirely within Stillwater State Forest ownership.

Hungry Horse Reservoir Core Area

Local Population: Danaher Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
100	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

HUC6 (name and #): Danaher- 101, 102, 103, 107							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Youngs Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
100	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving Factors Determining Bull Trout Population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Youngs- 104, 105, 106
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve
% Forest Service Ownership in HUC: 100%
Functional Significance to Local Population: High- spawning reach

Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Gordon Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
100-140	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Gordon- 201, 202							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: White River

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
70-90	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): White River- 207, 208, 209, and 210							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA				
Barriers	FA	FA	NA				
Pools	FA	FA	NA				
Sediment	FA	FA	NA				
Integrated	FA	FA	NA				

Local Population: Little Salmon

# Spawning Adults	**Short-Term (5yr) Pop Trend**	**Life History, Connectivity**	**# Known Spawn Reaches**	**Nonnative Species, threat**
30-60	stable	Adfluvial	1	None

Significance of geographical location	**Vulnerability to Climate Change**	**Unique Population Attributes**
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Little Salmon- 303							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FA	FA					
Integrated	FA	FA					

Local Population: Big Salmon

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
50-100	stable	Adfluvial Big Salmon Lake	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Adjunct pop. None, wilderness stream. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Big Salmon- 301, 302 Spawning in 301 only							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FA	FA					
Integrated	FA	FA					

Local Population: Bunker Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
10	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Great habitat. Barrier falls just above (1/4 mile) Gorge Cr. Trailhead. Not much is needed for habitat improvement. Roads in upper Bunker except for main road have been decommissioned. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Bunker- 502, 503, and 504
Strategy (Active Restoration, Passive Restoration, Conserve): Passive
% Forest Service Ownership in HUC: 100%
Functional Significance to Local Population: High- spawning reach

Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA	NA	3			
Barriers	FA	FA	NA	3			
Pools	FA	FA	NA	3			
Sediment	FAR	FA	NA	3			
Integrated	FAR	FA	NA	3			

Local Population: Spotted Bear River

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
20-40	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: None, wilderness stream in headwaters. Bull trout spawn below Dean Falls and above any potential affects from roads downstream. 1964 flood had greatest impact and river is still recovering from that due to braided channels. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Spotted Bear- 401, 402, 403, 404, 405, and 406							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA	NA	3			
Barriers	FA	FA	NA	3			
Pools	FAR	FA	NA	3			
Sediment	FAR	FA	NA	3			
Integrated	FAR	FA	NA	3			

Local Population: Sullivan Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
50-75	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: The bull trout population in Sullivan Creek is stable. Ball, Branch, Conner roads are no longer used and could be decommissioned. They have been surveyed in the past and there are no deep fill culverts. Risks of failure are moderate while consequences of the failures are low due to the amount of fill and low number of culverts. Sullivan Creek road has a natural slump that is at the lower end of bull trout spawning. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Sullivan- 601							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	10	1			
Barriers	FA	FA	10	1			
Pools	FAR	FA	10	1			
Sediment	FAR	FA	10	1			
Integrated	FAR	FA	10	1	30K	M	H

Local Population: Quintonkon Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
20-40	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Barrier falls above Rock Cr. BMPS done in 2009 on rd. 381. Large substrate limits spawning. Some opportunities to reduce roads. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Quintonkon- 603
Strategy (Active Restoration, Passive Restoration, Conserve): Passive
% Forest Service Ownership in HUC: 100%
Functional Significance to Local Population: High- spawning reach

Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FAR	FA	10	2			
Barriers	FA	FA	10	2			
Pools	FAR	FA	10	2			
Sediment	FAR	FA	10	2			
Integrated	FAR	FA	10	2			

Individual HUC6 (w/in local population) attributes and strategies, based on above factors:

Local Population: Wheeler Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
15-25	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Limited spawning habitat below waterfall and high road densities. Surveyed Rd 1611 in 2009 which has been decommissioned. Need to survey Mink/Martin drainages. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Wheeler- 604							
Strategy (Active Restoration, Passive Restoration, Conserve): Active							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA	10	1			
Barriers	FA		10	1			
Pools	FAR	FA	10	1			
Sediment	FA	FA	10	1			
Integrated	FAR	FA	10	1	10K	L	H

Local Population: Wounded Buck Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
10-40	stable	Adfluvial	1	None

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Low	Low-Heavy ground water influence	Low

Driving factors determining bull trout population: Large rain event in 2007 scoured channel and took out bridge on Rd 5339. Temp put in 2009. Pipes above have been pulled. Really no habitat improvements needed. Substrate is rather large and spawning is somewhat limited relative to other South Fork of the Flathead tributaries. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): Wounded Buck- 702							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive							
% Forest Service Ownership in HUC: 100%							
Functional Significance to Local Population: High- spawning reach							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	NA	3			
Barriers	FUR	FA	NA	3			
Pools	FAR	FA	NA	3			
Sediment	FAR	FA	NA	3			
Integrated	FUR	FUR	NA	3			

Swan Lake Core Area

Local Population: Elk Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 168 redds x 3.2= 537 adults	Stable	Migratory Connected	1 great big reach	EB, low LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan local populations are fairly close to each other. Elk is the southern most & largest pop	Low. Groundwater system with natural flow regimes	Only local population with almost no EBT.

Driving factors determining bull trout population: This is a large, secure local population with good habitat. This is only local population with minimal brook trout invasion. The only threat is the lake trout invasion in Swan Lake. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): 170102110201 - Elk Creek							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Maybe 80 %, soon to be 85% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: None. No restoration needs							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA					
Barriers	FA	FA					
Pools	FAR	FA					
Sediment	FA	FA					

Temperature: 2008 data found MWMT in rearing at 10C.

Barriers: 2002 inventory found no barriers.

Pools: 1997 r1/r4 survey found 24.9 pools per mile, optimal is >18 per mile. Many deep pools observed as well.

Sediment: 2001-2006 coring average 31.34%

Local Population: Cold Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 6.5 redds x 3.2=21 adults	Decreasing	Migratory, mostly connected. Several isolated tributaries may harbor fish?	1 long reach with scattered redds. May also support small resident population.	EB, High LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Medium. Some groundwater input but unnatural flow regimes	If residents exist, that would be unique

Driving factors determining bull trout population: This population declined substantially since 1995 (unlike others), and likely has brook trout hybrids. Older data suggests possibility of resident fish, but relatively little investigations or monitoring has taken place. Watershed is heavily roaded and logged. Habitat restoration may help but main threat is brook trout. More investigation on status and a recovery plan is needed. Confidence in your assessment (high, medium, low): Low

HUC6 (name and #): 1701021100202 – Cold Creek							
Strategy (Active Restoration, Passive Restoration, Conserve): Active Restoration							
% Forest Service Ownership in HUC: Currently about 30%, soon to be about 85% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Moderate							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA	30 years	3	$0	L	L
Barriers	FAR	FA	5 years	2	$150K	L	H
Pools	FAR	FA					
Sediment	FUR	FA	10 years	2	$150K	M	H

Temperature: 2008 MWMT just above spawning is 8.8C. However 2005-2007 monitoring at mouth (rearing habitat) found increasing MWMT from 15 to 17C. Suspected impacts from old harvests and numerous roads which altered channel shape, but may also be natural. Riparian area should passively heal over time. Decommissioning roads may also slightly help channel shape but should not be done solely for temp restoration.

Barriers: 2002 inventory found 7 barriers on tributaries and one marginal one within spawning habitat. Since migratory fish currently pass this marginal pipe, does not seem a high priority to fix. Several barriers already fixed, more investigation is needed before fixing others. Some funding potential to fix since this area is acquired by Legacy Land Act. However, even if all barriers are fixed, this would probably have little impact to bull trout since they are on tributary streams.

Pools: 2007 and 2008 PIBO surveys (in different locations) found 36-60 pools per mile. Optimal range is >18. Fairly good depths of pools noted too.

Sediment: No coring data available. 2007 and 2008 PIBO surveys have 22-40% fine sediments based on pebble counts. 1994 Plum Creek visual surveys estimated 17.9% fine sediments. These values are on the high side but just barely within 1 SD of similar wilderness streams. Substrate looks very embedded in lower 3 miles of stream spawning reach. Local citizens comment that stream has more fines than earlier. Culprit is likely legacy of old road construction. Several chronic erosion sites are known, a restoration plan is needed. Opportunities to reduce road surface sediment and remove constricting culverts especially due to new land acquisition. However, it is unclear if this would have a significant benefit to bull trout since data does not suggest serious habitat limitation. It is concluded reducing sediment would have a modest benefit and bull trout may respond. The primary threat of brook trout remains.

Local Population: Jim Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 54 redds x 3.2= 173 adults	Stable? Was stable until 2009. Currently sharp decline	Migratory, connected	1 reach	EB, medium LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Medium. Has groundwater but also beaver ponds	

Driving factors determining bull trout population: Redd counts highly variable, bounce around from 30s to 90s. Several large beaver dams may occasionally block migratory fish and increase water temperature. TMDL listed stream. MT DEQ cites sedimentation from past logging. Plum Creek has been critical of this determination and submitted reports stating habitat is unimpaired. Confidence in your assessment (high, medium, low): Medium

HUC6 (name and #): 170102110204 – Jim Creek							
Strategy (Active Restoration, Passive Restoration, Conserve): Active Restoration							
% Forest Service Ownership in HUC: Roughly 50%, soon to be about 90% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA					
Barriers	FUR	FA	10 years	3	$100K	L	M
Pools	FUR	FA					
Sediment	FUR	FA	10 years	3	$25	L	L

Temperature: 2008 inventory in spawning found MWMT at 10C. Although dataset is small, this seems fairly accurate. Uncertain if any restoration is possible, this may be natural.

Barriers: 2002 inventory found 2 barriers on tributary. Unlikely they are blocking bull trout but investigation is needed. Potential to fix since it is newly acquired land.

Pools: 1994 Plum Creek survey found 45 pools per mile, 2003 PIBO found 89 per mile and 2008 PIBO (different location found 85 per mile). Optimal range is > 18-23 per mile.

Sediment: Coring data indicates declining fine sediments since the 1990s (when DEQ listed the stream). Average from 2001-2006 (most recent data) is 35.7%. Pebble counts in PIBO surveys also found sediments on edge of 1 SD of wilderness streams. Sediment source was likely controversial PCTC riparian logging in late 1980's. This is healing over time. A partial road inventory in 2002 suggested very little sediment coming from roads. A more thorough inventory might uncover some spot opportunities but impact to bull trout would be minor.

Local Population: Piper Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 6.2 redds x 3.2= 20 adults	Declining. No redds in 2009	Migratory, connected	1 reach	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Medium, relatively little groundwater, medium elevation	

Driving factors determining bull trout population: This local population appears to have never been very large and declined in recent years. No redds found in 2009. Brook trout seem to be primary limiting factor. Hybrids have been observed. Confidence in your assessment (high, medium, low): Medium

HUC6 (name and #): 170102110206 - Piper							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Roughly 80%, soon to be 90% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA					
Barriers	FA	FA					
Pools	FUR	FA					
Sediment	FUR	FA					

Temperature: 2002 MWMT in spawning was 13C. 2008 MWMT just above spawning is 10.5C. There is one beaver dam on stream that may have some impact. Temperature situation is assumed natural.

Barriers: 2002 inventory found no barriers.

Pools: 1994 Plum Creek watershed assessment found avg 79 pools per mile in spawning reaches, goal is 48. 2008 PIBO subsample found 67 pools per mile, goal is 23.

Sediment: No coring data. 2008 PIBO found 15.3% fines, well within range of reference streams. Road sediment survey by Plum Creek in 1994 found very few erosion point sources.

Local Population: Lion Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 116 redds x 3.2=371	Stable	Migratory, Connected	1 big reach	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Low. Groundwater system with natural flow regimes	Tolerates higher than average sedimentation

Driving factors determining bull trout population: This is large, stable population. Only threats are from brook trout (and lake trout in Swan Lake, of course). Habitat in natural condition. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): 170102110207 – Lion Creek							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Roughly 75%, soon to be 95% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FAR	FAR					

Temperature: MWMT is 8.8C.

Barriers: 2002 inventory found no barriers.

Pools: 2009 PIBO found 23.3 per mile, goal is 18.

Sediment: Coring data since 1987. Peaked at 45% in 1991 and has since stabilized between 35-40%. Believed natural. DEQ seems to agree and removed stream from 303 list.

Local Population: Goat Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 158 redds x 3.2=506	Stable? Squeezer has declined since 2007	Migratory, Connected	2 big reaches, one in Goat and one in Squeezer	EB, medium LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Low. Groundwater system with natural flow regimes	

Driving factors determining bull trout population: This is a large population that seems stable other than Squeezer in recent years. Squeezer drop may be due to difficult surveying conditions in recent years. It is TMDL listed stream due to prior logging but habitat conditions seem much improved. No known habitat restoration needs. PCTC hydrologist reports past road erosion is stabilized. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): 170102110303							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Roughly 45% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FA	FA					
Sediment	FA	FA					

Temperature: only data is at stream mouth. 15 MWMT from 2005-2007. No known temp problems.

Barriers: 2002 inventory found no barriers. 1994 Plum Creek watershed assessment found 79 pools per mile avg, goal is 23. Coring data from 2002-2007 found 28% in Goat and 27% Squeezer avg.

Local Population: Woodward Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 86 redds x 3.2 = 275	Declining	Migratory, Connected	2 reaches. South Woodward and mainstem	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	Medium. Groundwater system but low elevation	Seems to tolerate high percentage of fines in rearing habitat (not spawning)

Driving factors determining bull trout population: This is a large population but was significantly down in 2009. Seems to be persisting in spite of high density of brook trout. Hybrids not common. Seems to tolerate silty/sandy rearing habitat. I do not know enough about watershed to speculate if this is a natural condition or response from DNRC practices. Confidence in your assessment (high, medium, low): Low

HUC6 (name and #): 170102110304 - Woodward							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive Restoration							
% Forest Service Ownership in HUC: Roughly 15% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low? Moderate?							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA	1 year	3	$150	L	L
Pools	FA	FA					
Sediment	FA	FA					

Temperature: no known data. Just have to assume it is adequate in spawning areas.

Barriers: 2002 inventory found 4 barriers but all seem to be upstream of known bull trout spawning. Replacing lowest barrier may have a very slight benefit to juvenile rearing. This is a complicated culvert, will be pricey. Cost estimate is only for lowest barrier.

Pools: 2001 DNRC r1/r4 survey of mainstem found 4.5 pools per mile, well below goal of 18. However 50% of these pools are high quality.

Sediment: Recent work by electrofishing crews noted deep silt and sand beds in rearing areas (lots of storage). 2001 DNRC r1/r4 survey found 24.6% fines in pebble counts, which is within reference range. 5 year average of coring data in spawning habitat on mainstem is 36% but South fork is 26%. No upward or downward trend. I have no clue if condition is natural.

Local Population: Lost Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 23.2 redds x 3.2= 74 adults.	Declining. Last 2 years are down	Migratory, Connected	2 reaches. South Fork monitored annually. North Fork sparsely monitored.	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	High. Limited groundwater input. Naturally dewaters at mouth and vulnerable to further loss	Migratory fish somehow negotiate past dewatered area.

Driving factors determining bull trout population: Bull trout apparently negotiate past chronic de-watered area near the mouth. Perhaps they migrate earlier than others? South Fork appears to contribute about 2/3 of local population. North Fork is monitored infrequently. Brook trout hybrids observed in South Fork. Watershed was subject to severe degradation from 1910 logging but seems to have bounced back. Confidence in your assessment (high, medium, low): M

HUC6 (name and #): 170102110306							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: Roughly 70% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	Current Baseline Condition	Proposed Baseline Condition	Timeframe to change baseline	Recovery Priority (1,2,3)	Estimated Cost to Complete	Expectation of population response (H,M,L)	Timeliness of opps (H,M,L)
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FAR	FA					
Sediment	FAR	FA					

Temperature: 1999, 2002, 2003 readings in North Fork spawning areas found MWMT 10-11C. Groundwater fairly sparse, believed natural condition. 2001-2004 readings in South Fork spawning found MWMT 11-13C. Some groundwater here but daily fluctuations noted. 2006 DNRC EIS characterizes it as a natural condition.

Barriers: 2002 inventory found a single barrier in North Fork headwaters. This was fixed in 2003.

Pools: 2002 r1/r4 inventory of South Fork spawning reaches found 11-24 pools per mile, goal is 39. Cause unknown, stream has plenty of wood. 1998 r1/r4 survey on North Fork spawning reach found 33-41 pools per mile, goal is 39. No pools were of high quality. Possible lingering impact from past harvest. No identified restoration.

Sediment: South Fork road previously contributed 19 tons per year but DNRC moved the road in 2008. 5 year avg of coring data on South Fork is 31% fines, no upward or downward trend.

Local Population: Soup Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 7.7 redds x 3.2=25 adults	Declining	Migratory, Connected	1 reach	EB, high LT in lake, currently low NP in lake, low

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
All Swan populations are fairly close together	High. Stream seems to have little or no groundwater & a small population to begin with.	

Driving factors determining bull trout population: Small population with recent downward trend. Very high densities of brook trout. 2008 effort to collect juvenile bull trout could not find any. Note: Soup Creek does NOT have proposed critical habitat. Confidence in your assessment (high, medium, low): L

HUC6 (name and #): 170102110305 - Soup							
Strategy (Active Restoration, Passive Restoration, Conserve): Conserve							
% Forest Service Ownership in HUC: 20% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Moderate							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FA	FA					
Barriers	FA	FA					
Pools	FAR	FA					
Sediment	FAR	FA	5 years	3	$30K	L	H

Temperature: 2001-2004 measurements found 16-19C MWMT. Cause unknown. DNRC EIS in 2006 suggests some potential impact from past road construction but no restoration identified.

Barriers: 2006 DNRC EIS reports no barriers.

Pools: 2002 r1/r4 inventory by DNRC found 27.8 pools per mile, goal is 48. Plenty of wood. Unknown if this is a natural state or reflection of past land management impacts.

Sediment: 5 year average of coring is 38% and appears to be increasing. 2006 EIS identified about 30 tons per year coming from road network.

Local Population: Upper Swan River Lindbergh Lake

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
5 redds in 2008 x 3.2=16	Unknown	Migratory Connected	1 very short reach. Just 200m	EB, low LT in lake, currently low threat

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Quasi-disjunct core population in headwaters of Swan River valley. Thought to be thermally isolated	Medium. Warm and stable flows but local patch of groundwater.	Juvenile fish rear in lake

Driving factors determining bull trout population: This is a small, somewhat disjunct population. Very limited spawning habitat. Only 4 intermittent redd counts completed in the past 14 years, making it difficult to determine status. If lake trout become established, there is currently no plan to suppress them. Confidence in your assessment (high, medium, low): L

HUC6 (name and #): 170102110102							
Strategy (Active Restoration, Passive Restoration, Conserve): Active Restoration							
% Forest Service Ownership in HUC: Roughly 90%, soon to be 96% (eyeball guess)							
Relative Contribution of Habitat in Limiting Local Population: Low							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FUR	FA					
Barriers	FA	FA					
Pools	FUR	FA					
Sediment	FAR	FA					

No habitat data available. Spawning stream is in wilderness and assumed to be in natural state.

Local Population: Holland Creek

# Spawning Adults	Short-Term (5yr) Pop Trend	Life History, Connectivity	# Known Spawn Reaches	Nonnative Species, threat
3 year average is 8.6 redds x 3.2=27 adults	Stable	Migratory Connected	1 very short reach. Just 280m	EB, low LT suspected in lake, currently low threat

Significance of geographical location	Vulnerability to Climate Change	Unique Population Attributes
Quasi-disjunct core population in headwaters of Swan River valley. Thought to be thermally isolated	High. Very little groundwater. Invasive species (EBT) may get more established.	Juvenile fish rear in lake.

Driving factors determining bull trout population: This is a small, somewhat disjunct population. Very limited spawning habitat. Appears to have a long, gradual decline in numbers and stabilized at lower number. If lake trout become established, there is currently no plan to suppress them. Spawning reach is well-known and vulnerable to poaching. 1980 riparian logging caused some degradation but since then watershed is untouched. Confidence in your assessment (high, medium, low): High

HUC6 (name and #): 170102110103							
Strategy (Active Restoration, Passive Restoration, Conserve): Passive Restoration							
% Forest Service Ownership in HUC: 100%							
Relative Contribution of Habitat in Limiting Local Population: Moderate							
Indicator	**Current Baseline Condition**	**Proposed Baseline Condition**	**Timeframe to change baseline**	**Recovery Priority (1,2,3)**	**Estimated Cost to Complete**	**Expectation of population response (H,M,L)**	**Timeliness of opps (H,M,L)**
Temperature	FAR	FA					
Barriers	FAR	FA					
Pools	FUR	FA	20 years		0	M	L
Sediment	FUR	FA					

Temperature: 2005 measurement found MWMT at 11.6C Since then, a new beaver dam may have elevated it further. Stream appears to have little groundwater to begin with. 1980 logging damaged stream bank cover & shade. Will continue to slowly heal.

Barriers: None. No roads

Pools: No data available. May be still lingering impacts from 1980 logging. As riparian vegetation matures, stream banks should stabilize and new pools develop. Seedlings already growing, so no active restoration needed.

Sediment: 2005 pebble count found 9.6% fines, well within reference condition.

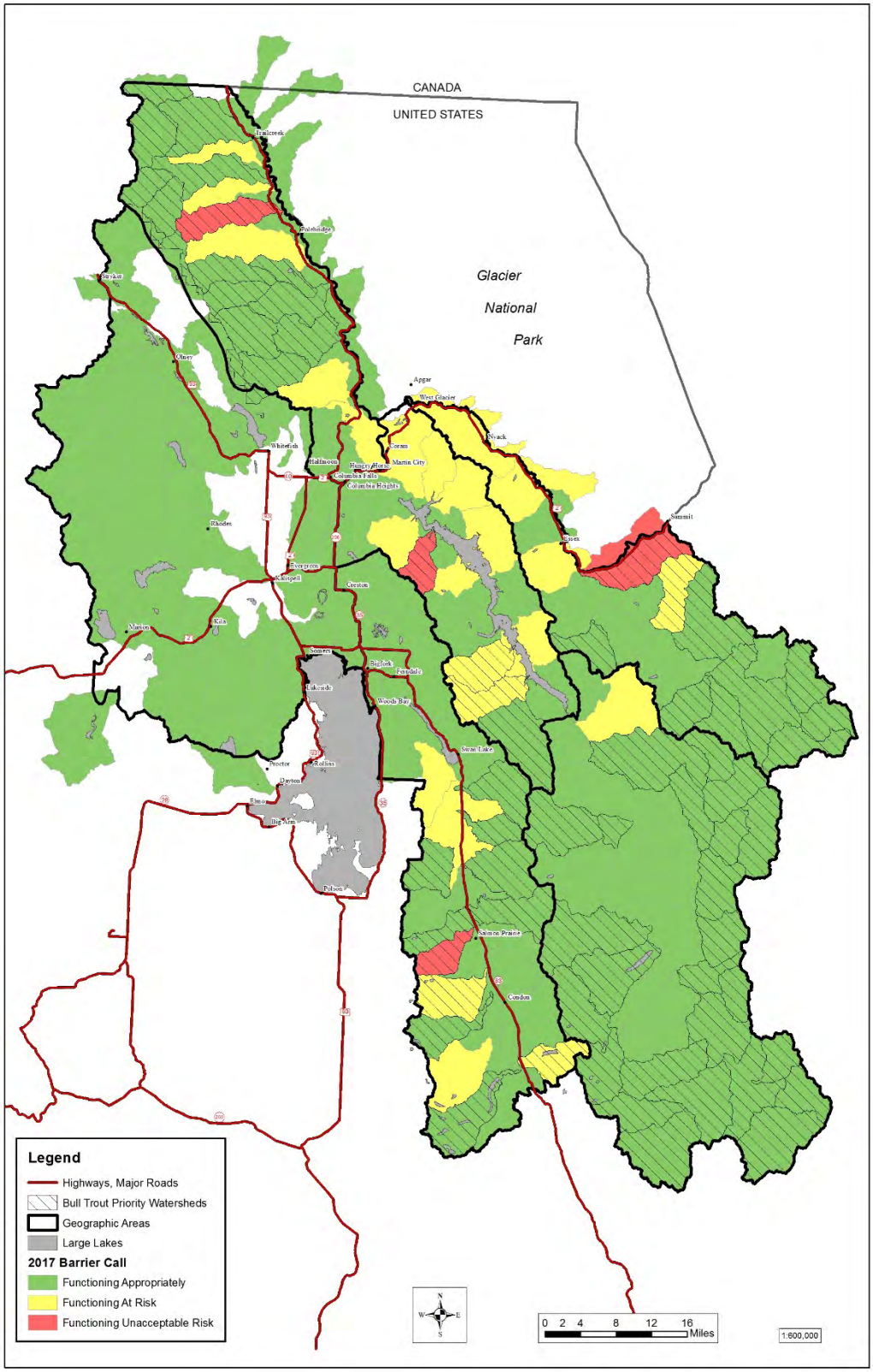


Figure F-1. 2017 Barrier call in bull trout priority watersheds.

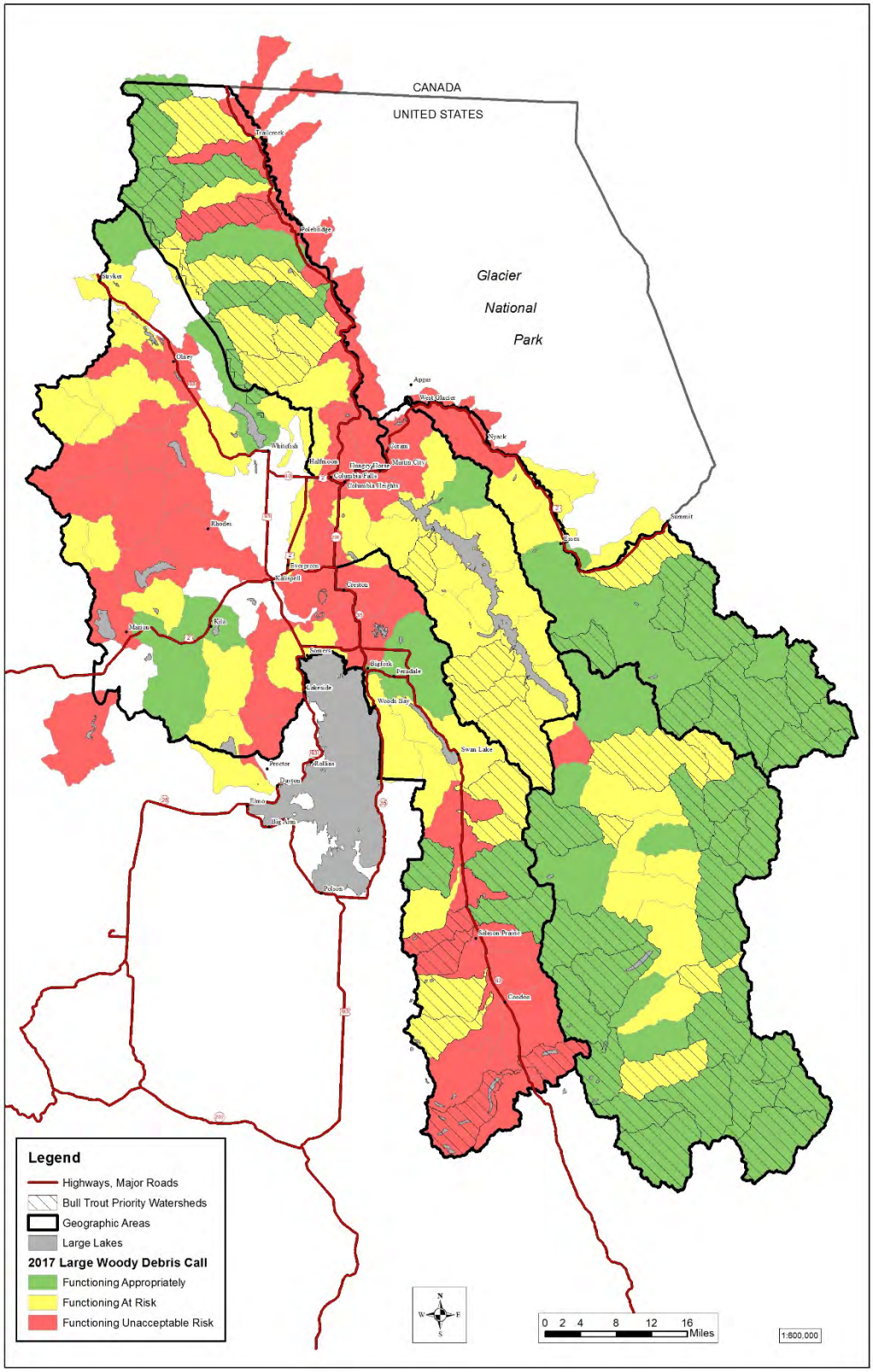


Figure F-2. 2017 Large woody debris call in bull trout priority watersheds.

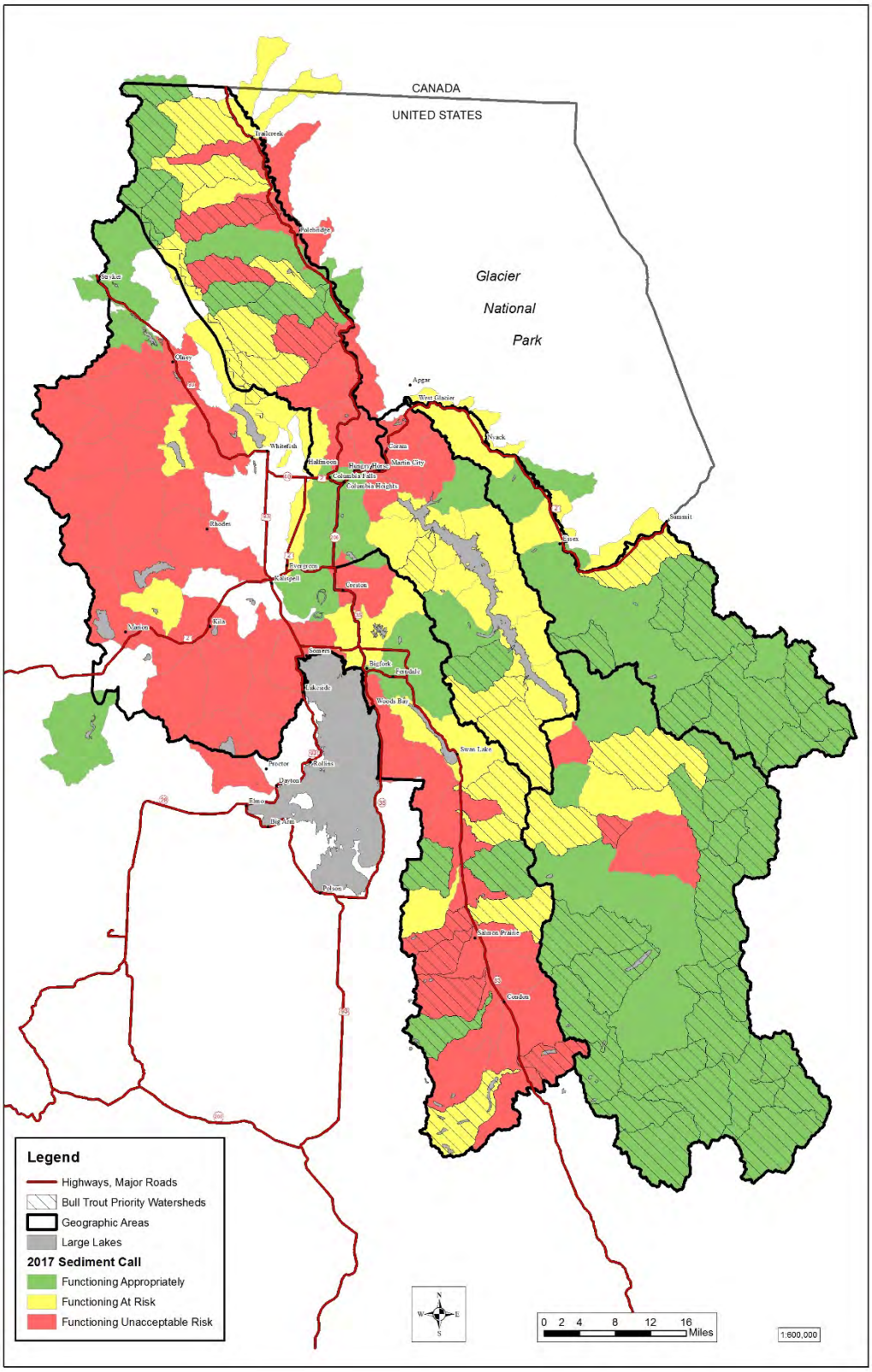


Figure F-3. 2017 Sediment call in bull trout priority watersheds.

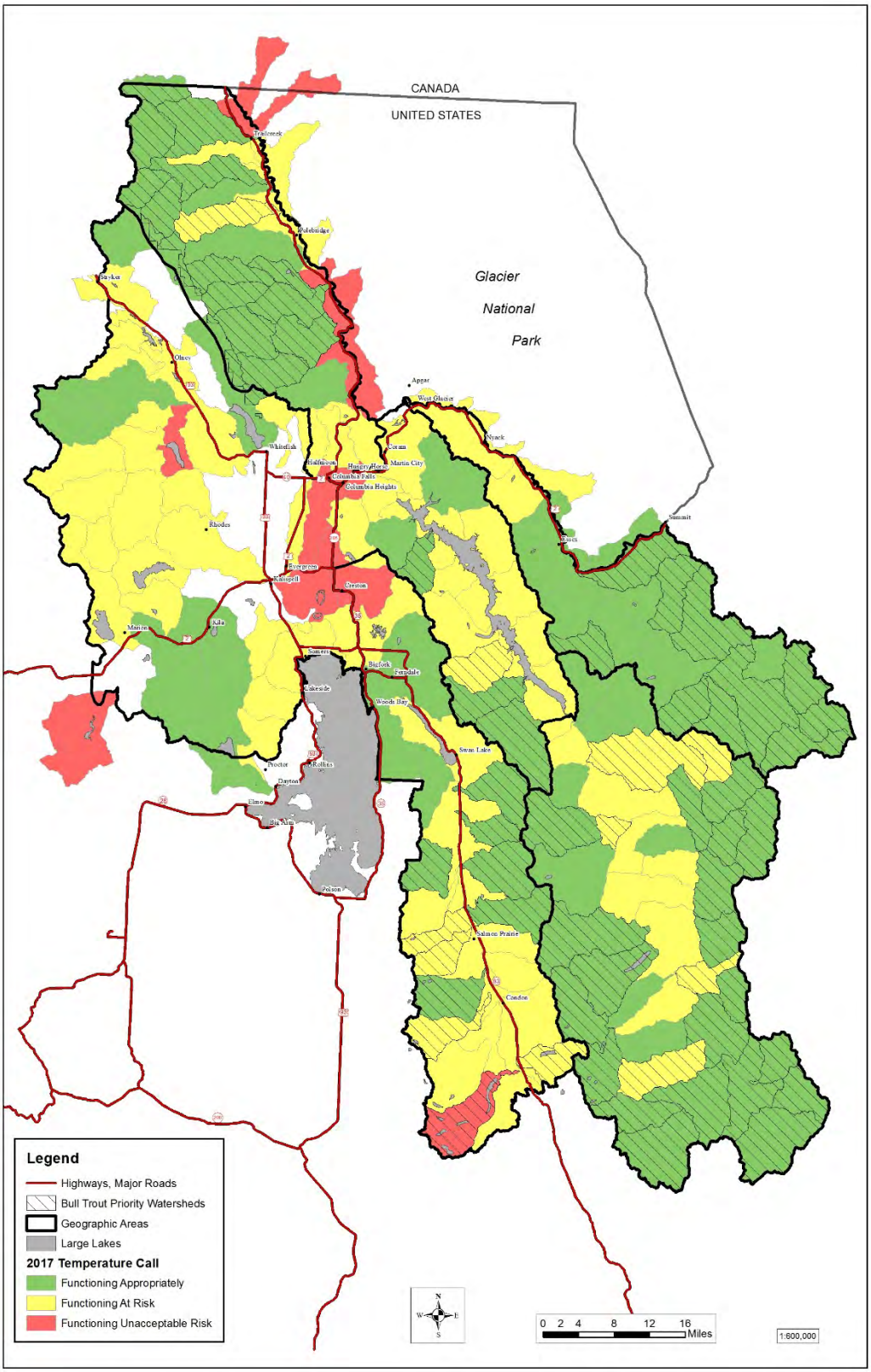


Figure F-4. 2017 Temperature call in bull trout priority watersheds.

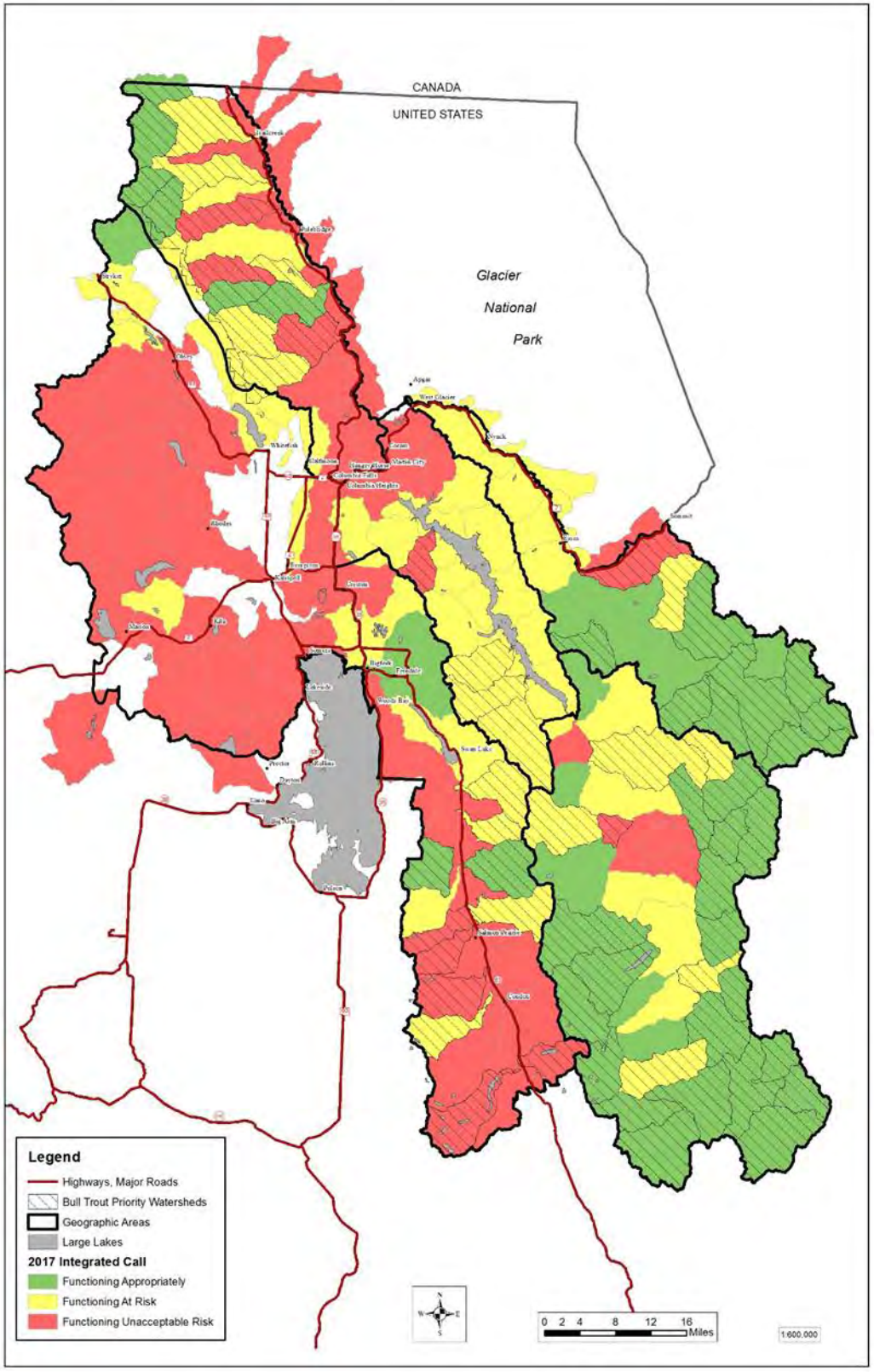


Figure F-5. 2017 Integrated call in bull trout priority watersheds.

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