components that would contribute to the recovery of listed species or maintain the viability of SCC within the plan area (219.9 (b) (1)) (U.S. Department of Agriculture, Forest Service, 2012) are included in the plan.

Terrestrial wildlife species are important as contributors to biological diversity and ecosystem integrity, as well as providing benefits to humans.

Organization of the terrestrial wildlife section

This section is organized by key ecosystems or groupings of vegetation systems or their characteristics, such as size or structural class, that provide habitat for associated wildlife species. Although all wildlife species ultimately rely on vegetation, various aspects of that vegetation are the key components of habitat. Some species are associated with a particular cover type or group of cover types, whereas others may be associated with a structural stage (e.g. early seral openings, large dead trees, etc.), or with a combination of type and structure. Some species are more strongly associated with certain landscape features, such as cliffs, streams, or caves. For the purposes of analyzing how the alternatives provide for the ecological conditions required by terrestrial wildlife species, this section discusses wildlife species in the context of the vegetation group, structural stage, or landscape feature most often associated with their requirements or that contributes to a key or critical part of their life history. That discussion provides an analysis of the ecological conditions (coarse filter) expected to maintain the diversity of native wildlife species.

Most native wildlife species' needs are evaluated in the context of the habitat groupings as described in the above paragraph, so most wildlife species are not discussed individually. For some species, however, species-specific or habitat-specific plan components were considered necessary to mitigate potentially negative impacts of management actions or activities occurring on NFS lands. The effects of those plan components are described within the section where the species is discussed, even where that section may not relate to the species-specific components. For example, bighorn sheep are discussed under the section "Species Associated with Grass and Shrub Habitats", because that vegetation type is critical for bighorn sheep foraging and movement. The revised plan includes components for separation of bighorn sheep from domestic sheep; those components are not related to the vegetation group, but the consequences of those components are discussed within the section "Species Associated with Grass and Shrub Habitats" because that is where bighorn sheep are otherwise addressed. Similarly, species currently designated by the Regional Forester as sensitive (RFSS) are discussed briefly in the section for the vegetation or landscape feature group with which they are associated. A detailed analysis of potential effects to species currently listed as sensitive will be provided in a separate BE to be prepared when a preferred alternative is selected. The BE will be completed concurrent with the FEIS.

The sections that address species associated with specific vegetation groups, structural stages, or landscape features are followed by a discussion about the potential effects of plan components guiding management of specific resources or broad programs (e.g., livestock grazing, recreation, minerals and energy development, etc.).

3.14.2 Regulatory framework

Please refer to the introductory regulatory framework section of this chapter (3.3).

3.14.3 Assumptions

The primary assumption underlying the analysis in this section is based on the 2012 Planning rule and the directives for implementing the rule: that plan components developed for ecosystem integrity and ecosystem diversity would provide for ecological conditions necessary to maintain the persistence or contribute to the recovery of native species within the plan area (FHS 1909.12, 23.13). Therefore, we assume that effects to vegetation systems and characteristics as described in the terrestrial vegetation

section provide the basis for understanding most of the potential effects to wildlife species associated with those systems.

The directives for implementing the planning rule state that "ecological conditions include habitat and the effects of human uses (for example, recreation, grazing, and mining)" (FHS 1909.12, 23.13). We have incorporated this assumption into this section.

The analyses discussed in the terrestrial vegetation section rely on two analytical models, SIMPPLLE and Spectrum, which are described in that section and in appendix B. Those models "use numerous assumptions to simplify ecosystem processes as well as treatment implementation". The assumptions that are a part of the vegetation analysis are inherently part of the analysis of impacts to wildlife species using those vegetation systems.

3.14.4 Best available scientific information used

A thorough review of the scientific information was completed, and the BASI was used to inform the planning process and develop plan components. Key information on the population, life history, and status of animal species on the HLC NF was obtained from the Montana Field Guide (http://fieldguide.mt.gov) as well as from other sources listed in the references section of this document. Published, peer-reviewed articles and data in which reliable statistical or other scientific methods were used, where those were available. For best relevance, studies conducted in north-central or north-western Montana, western North America, or other areas with habitat conditions similar to those in the plan area where used, where those were available. When not available, articles that considered ecological processes or conditions similar to those in the plan area were used. The planning rule acknowledges that the BASI may include expert opinions, inventories, or observation data prepared and managed by the FS or other agencies, universities, reputable scientific organizations, and data from public and governmental participation. Those sources of information were relied upon when published, peer-reviewed information was not available or when needed to provide additional information specific to the plan area. Where needed in the assessment and in this section, specific discussion may be included regarding contradictory science, why some information is used to the exclusion of others, and regarding areas for which scientific information is lacking.

Because the number of terrestrial wildlife species present on the HLC NF is vast, it is not feasible nor useful to summarize here the large body of current scientific literature or other information available. Sources that were used regarding the presence, distribution, requirements, or impacts to various species are cited throughout the text of this section. Because of the programmatic level of this analysis, however, detailed discussion of the life histories and drivers of terrestrial wildlife species and populations are generally not provided here. The information in this analysis relies heavily on information in the Assessment of the Helena and Lewis and Clark National Forests (U.S. Department of Agriculture, Forest Service, Northern Region, 2015) regarding both terrestrial wildlife species and vegetation. That document contains extensive citations and bibliographies of the science used to determine life history, status, presence and distribution, threats, and drivers of terrestrial wildlife species and terrestrial vegetation. Additional discussion of science regarding terrestrial wildlife and vegetation is found in supporting materials in the project file.

Please also refer to the terrestrial vegetation and aquatic ecosystems sections. Analysis for those resources forms the foundation of analysis of terrestrial wildlife species considered in this section.

3.14.5 Affected environment

Species associated with aquatic, wetland, and riparian habitats, affected environment

This vegetation group includes the riparian/grass shrub cover type along with aquatic and wetland environments where that cover type occurs, and some associated forested areas. Riparian associated vegetation and systems are identified and categorized in a variety of ways, making description of the affected environment somewhat complex. The affected environment for the riparian/grass shrub cover type is described in the terrestrial vegetation section and as a component of the non-forested cover type. Additional description of the riparian/wetland habitat type is provided in the assessment (U.S. Department of Agriculture, Forest Service, Northern Region, 2015) in the Riparian Species Guild section.

Aquatic, wetland, and riparian habitats are inherently limited in the plan area. Estimates vary depending on the data sources used. Slightly more than 20,000 acres of riparian/wetland habitat type occur on the HLC NF (U.S. Department of Agriculture, Forest Service, Northern Region, 2015). River or riverine systems make up 1% or less of the administrative area in each GA, with the exception of the Highwoods, where they make up over 5% (ibid).

Many wildlife species use aquatic, wetland, or riparian habitats during all or a portion of their life cycle, and riparian areas can be of particular importance in maintaining connectivity within watersheds. Examples of terrestrial wildlife species that are dependent on these habitats for all or part of their life cycle and that occur on the HLC NF include several amphibian and small mammal species, a variety of waterfowl, shorebirds, and migratory birds, garter snakes, several bat species, beavers and moose. Low-elevation riparian areas may be important to black and grizzly bears, particularly during spring or during hot dry periods in the summer months.

Species that are currently identified as Regional sensitive species (RFSS) and that rely on aquatic, wetland, or riparian habitats for all or part of their life cycle include bald eagle (forages and nests near rivers and lakes), harlequin duck (breeds on fast-moving, low-gradient mountain streams), northern bog lemming (found mainly in peatlands and wet meadows with sphagnum component), and western toad (breeds in shallow, silt-bottom ponds with emergent vegetation).

Stressors under Forest Service control

Stressors to these systems that can be influenced by FS management actions include livestock grazing, invasive species, pattern and timing of motor vehicle use, draining or diversion, administrative or recreational facility development, harvest of adjacent timber, and prescribed fire. Not all of these processes or actions are stressors to all species using these habitats.

Stressors not under Forest Service control

Threats to these systems that are not under control of FS management include drought, climate change, alterations to hydrology occurring on connected or adjoining non-NFS lands, and alterations to water chemistry resulting from pollution, sedimentation, or other inputs originating outside of FS control. Threats to terrestrial wildlife species using these habitats may include those as well as some types of human disturbance.

Species associated with grass and shrub habitats, affected environment

This vegetation group comprises the grass, dry shrub, and mesic shrub cover types described in the terrestrial vegetation section. The affected environment for this cover type is described in the terrestrial vegetation section, and as a component of the non-forested cover type. Although the grass and shrub cover types are included within the non-forested type for the purposes of vegetation analysis, wildlife species using these habitats may also use adjacent forested areas.

In general, the non-forested cover type represents less than 15% of the area on the HLC NF, with the grass and shrub types representing less than that. Many grassland or grass/shrub areas occur at or near the boundary of HLC NF lands, extending onto adjoining private and other lands that comprise a larger extent of these cover types.

Many wildlife species use these habitats during all or a portion of their life cycle. Grass and shrub vegetation types may be important to some species for forage, particularly in winter. Species dependent on grasslands or shrub habitats are often not yearlong residents on HLC NF lands. Terrestrial wildlife species that are dependent on grass or shrub cover types for at least a part of their life cycle include elk, mule deer, and pronghorn, all of which depend more heavily on these habitats during winter, and all of which may spend a portion of winter on lower elevation, non-NFS lands. Elk and mule deer are found in all GAs. Gray wolves, currently listed as RFSS, rely on ungulate prey and so are indirectly dependent on the habitats that support big game. Additional factors, such as legal hunting and trapping, and depredation-related mortality on non-NFS lands also influence gray wolf numbers and distribution. Other species depending on these habitats include a number of migratory bird species (for foraging and/or nesting), several small mammal species, red foxes, coyotes, and others. Mesic shrub types may be important to both black and grizzly bears, providing forage in early spring before other foods are available, and berries as a key food source during summer months.

Bighorn sheep, currently listed as a RFSS, use primarily nonforested habitats, with some use of savannahs or open forest where visibility is good and in proximity to escape terrain (generally cliffs or steep, rocky hillsides). This species occurs in a metapopulation structure, with herds scattered throughout western and central Montana, connected by occasional movement of individual sheep among separate herds. Bighorn sheep herds currently occur on the Rocky Mountain Range, Big Belts, and Elkhorns GAs. Bighorn sheep occupied the Little Belts GA historically, and have been observed there recently (Pers. Comm. D. Kemp, 2017) after a prolonged absence. The Elkhorns herd was reduced to fewer than 20 animals as a result of a disease-related die-off in 2008. Respiratory disease epidemics are considered a primary limiting factor for bighorn sheep populations, and research has confirmed that healthy domestic sheep can carry the disease and transfer it to bighorn sheep (Besser et al., 2012; Wehausen, Kelley, & Ramey, 2011; WSWG, 2012). Separation between domestic and wild sheep is considered an effective way to minimize the risk of disease transmission from domestic to wild sheep.

Stressors under Forest Service control

Threats to grass/shrub vegetation types that may be affected by FS management activities include grazing impacts to native plant communities, fire management (including fire exclusion), and invasive exotic plant species. Note that management of invasive exotic plants is likely affected by FS management only to a limited degree in many areas. Although not a stressor to the habitat group discussed here, grazing of domestic sheep and goats in proximity to wild sheep is a stressor to bighorn sheep that use these and other habitats.

Stressors not under Forest Service control

Threats outside of FS management influence that may affect grass/shrub vegetation types include habitat conversion and alteration and climate change. Stressors such as fire management (including fire exclusion) and grazing that occur off-NFS lands may also impact these vegetation types where they occur on adjoining NFS lands. Grazing of domestic sheep and goats on private land adjoining or near NFS lands where bighorn sheep occur is a stressor to wild sheep populations.

Species associated with hardwood tree habitats, affected environment

As noted in the terrestrial vegetation section, persistent hardwood-dominated plant communities are rare on the HLC NF. Aspen and cottonwood are by far the main hardwood tree species. Aspen may occur as a persistent community in riparian areas, or it may be a transitional stage in upland sites, where it may

dominate the early stages of succession following major disturbance. As such, aspen-dominated habitats may vary widely in location, spatial extent, and overall distribution over time. Cottonwood is confined to riparian areas on the HLC and is more common on lower-elevation private lands outside the forest boundary. Cottonwood exists to a very limited extent on the HLC NF.

Although hardwood habitats make up a small proportion of the vegetation communities on the HLC NF, these habitats are important for a variety of wildlife species, including several woodpecker species (Lewis's woodpecker, a SCC on the HLC NF, is discussed in the at-risk species section), other migratory birds, several bat species, black bears, flying and red squirrels. Ungulate species such as elk, moose, and deer may forage on young aspen during certain times of year, as well. Aspen and to a larger extent cottonwood communities in riparian areas may provide habitat connectivity within drainages, as well as across the forest boundary onto adjoining lands, by providing a more complex vegetation structure and composition to support animals transitioning across otherwise unsuitable habitats.

Stressors under Forest Service control

Threats that may be affected by FS management actions include grazing and fire exclusion.

Stressors not under Forest Service control

Threats outside FS control include excessive herbivory by ungulates, climate change, insect infestations, disease, forest succession (conifer encroachment), changes in groundwater or stream flows, and human development.

Species associated with dry conifer habitats, affected environment

This group of habitats includes the cover types identified in the terrestrial vegetation section as ponderosa pine, some dry Douglas-fir, and some xeric ecotones and savannahs. Dominant tree species tend to be ponderosa pine, limber pine, and some Douglas-fir, with Rocky Mountain juniper and interspersed dry shrub in some areas (see terrestrial vegetation section). These vegetation types generally occur at lower elevations or on south and west-facing aspects that maintain lower snow levels during winter, providing key winter habitat for a number of ungulate species. In some areas these habitats form the transition from conifer forest to grass/shrub or grassland types, and as such may be relatively rich in wildlife diversity. Savannahs may be important foraging areas for bighorn sheep where they occur in proximity to escape terrain (cliffs and rocky outcrops). Flammulated owls and Lewis's woodpeckers, both identified as SCC, use stands of large-diameter ponderosa pine and occasionally Douglas-fir. Clark's nutcrackers forage on seeds from ponderosa pine and limber pine. Other species using these vegetation types include numerous migratory bird species including a wide variety of songbirds and several types of hawks and owls, small mammals, mountain lions, bobcats, and wolves. Dry conifer habitats may be important foraging and daytime roosting areas for fringed myotis, a bat species currently identified as a RFSS. Limber pine is often found in the area of transition from mid-elevation conifer forest to low-elevation grasslands, which means it is also often present at the transition of NFS lands to adjoining lands under other ownership. As such, limber pine forests may be an important transitional habitat used by grass/shrub associated wildlife species as well as by montane conifer forest associated wildlife species. Intact limber pine forest in some areas may provide important connectivity between NFS and other lands.

Stressors under Forest Service control

Fire exclusion may influence the abundance, distribution, and composition of dry conifer types. Vegetation management practices may also influence this vegetation group through selection of species or size classes for harvest.

Stressors not under Forest Service control

Climate change, wildfire, beetle infestation, and disease are all processes that can influence the abundance, distribution, and composition of dry conifer forests.

Species associated with mixed conifer habitats, affected environment

This vegetation group encompasses a broad array of habitats occurring in the montane conifer environment, which is the dominant land cover on the HLC NF. It includes habitats within the warm dry, cool moist, and cold broad PVTs. Cover types (see terrestrial vegetation section) include dry Douglas-fir (this cover type may also be included in the dry conifer group discussed above), mixed mesic conifer, western larch mixed conifer, lodgepole pine, spruce-fir, and to some extent whitebark pine (but see section on species associated with high elevation habitats, below). The trend in amount and distribution of these cover types, as well as trend in structural characteristics such as tree size and density, varies by type as shown in the terrestrial vegetation section. In general, forested cover types have increased compared to their historic range, with greater tree density and smaller average tree size for many cover types (U.S. Department of Agriculture, Forest Service, Northern Region, 2015).

In addition to the varied mix of tree species and corresponding understory, wildfire, insects, and disease have historically created a variety of seral stages, structures, and mix of species within the broad area of coniferous forest. Coniferous forest on the HLC NF is often intermixed with open grasslands/shrublands, wetlands and riparian areas, creating a mosaic of habitat types. Therefore this vegetation group provides a diversity of habitats used by a correspondingly wide diversity of wildlife species. Wildlife species that use mixed conifer habitats for all or part of their life cycle include ungulates (deer, elk, and moose), pine marten, a variety of hawks and owls including northern goshawk, Cooper's hawk, sharp-shinned hawk, and great gray owls, a variety of small mammal species including snowshoe hare and red squirrel, a diversity of migratory birds, and several bat species, including three that are currently identified as RFSS: fringed myotis, long-eared myotis, and Townsend's big-eared bat.

Canada lynx, currently listed as threatened under the ESA, are dependent on boreal forests that provide their primary prey species (snowshoe hare), secondary prey (red squirrel), and have deep, fluffy snow during the winter. Lynx rely largely on the spruce/fir cover type. Canada lynx are discussed separately in the at-risk species section.

Fisher are currently listed as a RFSS that could be found on the HLC NF. There have been two observations of fisher on the Rocky Mountain Range GA, possibly of the same individual, and four in the Upper Blackfoot GA, three of which were harvested. Recent mapping, however, has shown that very little fisher habitat exists on the HLC NF, likely not enough to support a fisher population or enough individuals to contribute to supporting a fisher population in Montana (USDA, 2014).

Stressors under Forest Service control

Stressors on mixed conifer habitat are similar to those described for dry conifer habitat. Fire exclusion may influence the abundance, distribution, and composition of conifer forests directly and by influencing the size and severity of future fires. This vegetation group is the focus of most of the harvest activity that occurs on NFS lands; therefore vegetation management practices may also influence this vegetation group through selection of species or size classes for harvest, fuels reduction, or other management activity.

Stressors not under Forest Service control

Climate change, wildfire, beetle infestation, and disease are all processes that can influence the abundance, distribution, and composition of mixed conifer forests.

Species associated with high elevation habitats, affected environment

High elevation habitats are those generally occurring in the subalpine and alpine zone, characterized by the alpine and herbaceous shrub habitat type group described in the assessment (U.S. Department of Agriculture, Forest Service, Northern Region, 2015). This habitat also includes expanses of non-vegetated area, and the whitebark pine cover type. Alpine herbaceous types have minimal soil development and consequently sparse vegetation, generally in the form of grasses, forbs, and some low shrubs, with trees

occurring in some protected and moist microsites. These habitats are usually affected by climate and weather, with wind, extreme temperatures, unstable rock, and avalanches all shaping habitat. High elevation habitats are often within designated wilderness or IRAs, in part because of their relatively inaccessible nature and location with respect to historic resource extraction efforts, as well as a lack of merchantable timber. Most ecosystems that occur at high elevations are not substantially altered from historic conditions, with the exception of declines in whitebark pine. Whitebark pine is an important component of some high elevation ecosystems, with mature trees producing seeds that are a key food for species such as Clark's nutcrackers and grizzly bears. Whitebark pine has experienced extensive mortality due to a variety of factors, including white pine blister rust, and consequently occurs less frequently and as younger trees than it historically occurred throughout much of its range. The species is a candidate for listing under the ESA (for more information refer to the terrestrial vegetation and at-risk plants sections).

Species that use high elevation habitats for all or part of their life cycle include mammals such as pika, golden-mantled ground squirrel, hoary marmot, mountain goat, and wolverine (refer to terrestrial wildlife species at risk section), and birds such as white-tailed ptarmigan, and various migratory bird species including black rosy finch and gray-crowned rosy finch. In addition to feeding on caches of whitebark pine seeds, grizzly bears may also feed on army cutworm moths found in high elevation rock and talus. Some wildlife species, such as wolverine, have evolved to rely on high-elevation snowpack for shelter, cover, or denning.

Stressors under Forest Service control

Most habitats occurring at high elevations are not substantially influenced by forest management. Recreation can impact habitat through stock and foot travel impacting thin, fragile soils.

Stressors not under Forest Service control

Climate change may play the most important role in affecting high-elevation habitats by altering the timing and levels of snowfall and snowmelt. Whitebark pine is affected by blister rust, which may have a profound effect on the amount and distribution of that cover type on the HLC NF and throughout Montana.

Species associated with late successional forest including large trees and old growth, affected environment

Large and very large trees, late successional forest, and old growth provide habitat for a variety of wildlife species. Much of the literature regarding wildlife associated with old growth habitats originates from west of the continental divide, often in the wetter, milder, more productive forests of the northwestern United States. In the northern Rocky Mountains, wildlife species usually associated with old growth habitat may be associated with individual components of old growth (e.g., very large live, decayed, dead or downed trees) in stands or areas that do not meet identified old growth criteria in their entirety. This may be particularly true on the HLC NF, the majority of which occurs east of the Continental Divide, where there is relatively low annual precipitation and a short growing season, and where wind and frequent fire are important factors shaping vegetation.

Wildlife species associated with large or very large trees include pileated woodpeckers and northern flickers, which may excavate cavities used by birds such as Lewis's woodpeckers, and flammulated owls. Barred owls, and several migratory songbird species use standing large diameter trees or rely on the multi-layered canopy often associated with late-successional stage forest. American marten, various small mammal species, salamanders and other amphibians use downed and decaying large trees for cover and forage, particularly in late-successional and old growth stands.

Stressors under Forest Service control

Harvest or other vegetation management can remove large trees, alter stand characteristics and dynamics, and fragment large tree and late-successional forest habitat. Fire exclusion can also influence stand characteristics and development and alter natural fire regimes. Other stressors may include other fire management activities, road construction, recreation site development, and firewood gathering.

Stressors not under Forest Service control

Existing old growth and late-successional forest is vulnerable to moderate or high severity fire, insect infestations, and disease.

Species associated with snags, affected environment

Dead, dying, and decaying trees provide nesting sites for a variety of birds; these include several woodpecker species such as pileated woodpecker, northern flicker, northern three-toed woodpecker, and Lewis's woodpecker (see terrestrial wildlife species at risk species section), a large number of migratory songbird species such as mountain bluebird and brown creeper and others, and various owl species such as flammulated owl (see at-risk species section), screech owl, boreal owl, and others. Snags also provide foraging habitat for a number of bird species that include many of those above, as well as black-backed woodpecker (currently listed as a RFSS), nuthatch, and others. A variety of bat species, including long-eared myotis (currently identified as a RFSS), silver-haired bat and others use snags for roosting, either in cavities or under loose bark. Other species that use or rely on snags and snag habitats include northern flying squirrel, short-tailed weasel, pine marten and others. Various wildlife species tend to prefer specific sizes and species of snags, as well as different stages of hardness or decay. Therefore a variety of species, sizes, densities, and conditions of snags is needed to provide for the needs of the wide variety of wildlife species that use them.

The snags and downed wood section provides estimates of current snag abundance by size class, GA, and wilderness vs. non-wilderness. It notes that snags are a dynamic resource influenced by numerous factors both natural and human-related, and in an ongoing state of development and loss. Historic or natural snag abundance can only be estimated currently by inference, comparing snag abundance in wilderness areas with that of non-wilderness. It appears that snags may be more abundant in wilderness overall, possibly as a result of recent large fires. Aside from the influence of fire, it is not clear whether snags are more or less abundant now than they were historically. The difference between wilderness and non-wilderness does not exist for large and very large snags, which may be naturally rare on the HLC NF (Bollenbacher et al., 2008).

Stressors under Forest Service control

Salvage logging can be a primary influence on snag presence in some areas, reducing abundance and altering distribution of snags following fire or insect infestation. Fire exclusion may also reduce snag abundance and distribution. Other stressors that have impacts in more localized areas include firewood cutting, hazard tree management, and certain vegetation management practices.

Stressors not under Forest Service control

Climate and weather may degrade snags or cause them to fall, while fire may consume previously existing snags. Climate change may impact snag development, abundance and distribution by altering fire regimes, and influencing precipitation cycles.

Species associated with coarse woody debris, affected environment

Coarse woody debris is defined as wood of 3 or more inches in diameter that is on the ground. Coarse woody debris may be an important habitat component for some wildlife species, particularly debris of larger diameter. This habitat feature is present in a variety of vegetation types and situations, although

debris that has greatest value to wildlife is more often associated with late successional stages and less often associated with dry forest types. Discussion of the various vegetation groups and structural stages that create woody debris will not be repeated here, nor will discussion of plan components noted above that would ensure the appropriate distribution and abundance of various tree species, size classes, densities, or successional stages. Coarse woody debris is a product of processes that are the same as or similar to those that create snags.

Wildlife that use coarse woody debris varies according to the size, structure, and habitat in which the debris occurs. Amphibians such as salamanders may use rotten and hollow logs that retain moisture. Small mammals such as certain voles and shrews, as well as mid-sized mammals such as squirrels use this habitat for cover and sometimes food caching, and mammals such as weasel and marten may use it for both cover and foraging. Canada lynx (see terrestrial wildlife species at risk section) and mountain lion may use piles of woody debris for denning.

The snags and downed wood section provides information on the estimated status of coarse woody debris by GA. There is currently no way to estimate the NRV of this type of habitat. The trend for downed wood is tied to the disturbances and drivers that affect vegetation, and therefore will vary according to those factors.

Stressors under Forest Service control

Timber harvest, and fuels management may reduce the amount of coarse woody debris in some areas, and can create pulses in debris by creating even-aged stands. Fire exclusion may also impact the amount and distribution of this habitat, increasing it in some areas and vegetation types.

Stressors not under Forest Service control

Insect and disease outbreaks may create dead trees that eventually become coarse woody debris. Fire can create this habitat by weakening or killing trees, or reduce it through burning existing debris on the ground or removing trees entirely as occurs with more intense fires. Fire can create pulses of debris by killing large numbers of trees in an area and by creating even-aged stands in some areas.

Species associated with cave, cliff, rock or other geologically-determined habitats, affected environment

Cliff, cave, and rock habitats are created and changed primarily by geologic forces, although subsurface mineral extraction and associated mining activities can create underground structures that may function as habitat for some wildlife species. Use of these habitats by wildlife depends on the structure of the site and its associated characteristics, as well as by proximity to habitat required for activities such as foraging. This section will address only those aspects of these habitats or the species that use them that could be affected by NF management. The portion of this habitat that is comprised of rock and scree is represented by the “sparse” areas mapped in VMap. This type occurs on roughly 5% of the administrative area (U.S. Department of Agriculture, Forest Service, Northern Region, 2015). The majority of the “sparse” type occurs on the Rocky Mountain Range GA. Although many caves have been identified on the HLC NF, a complete inventory of caves and of mines or associated structures that may provide habitat for wildlife species does not exist, and therefore the distribution, abundance, and characteristics of cave and cave-like habitats on the HLC NF is not known. Similarly, no estimate exists for the amount, distribution, or characteristics of cliff habitats.

Cliff habitats may be used by birds such as peregrine falcon (currently listed as a RFSS) and golden eagle for nesting, and by bighorn sheep (currently listed as a RFSS) and mountain goat for escape terrain and as general habitat. Rocky habitats such as boulder and talus fields and slopes may be used by species such as pika, golden mantled ground squirrel, hoary marmot, bushy-tailed woodrat and wolverine (see at-risk species section for detailed discussion of this species) for shelter, hibernation, or denning. Caves and

some mines or related structures may be used by a number of bat species, including fringed myotis, long-eared myotis, and Townsend's big-eared bat (all three species are currently listed as RFSS), for roosting, hibernation, and maternity habitat. Several bat species, particularly those in the genus Myotis, are vulnerable to a disease (White-Nose Syndrome) that is caused by a fungus that can be transmitted by other bats as well as by humans visiting caves where bats are roosting.

Stressors under Forest Service control

Removal of rock from surface areas for personal or commercial use by humans could impact some localized areas. Cave and mine habitats may also be impacted by changes in temperature or humidity caused by the creation or alteration of openings to the surface, or by changes to actual structure. Although not a stressor to the habitat itself, human activities that disturb bats or that introduce the fungus associated with White Nose Syndrome may be significant stressors to bats using caves or mines on NFS lands. Recreational use of NFS lands by the public is not regulated by forest plans, although procedures exist for managing those uses in specific situations.

Stressors not under Forest Service control

Cave, cliff and rock habitats are physically affected primarily by natural, geologic forces. Species that use these habitats may also be affected by changes to adjacent or nearby vegetation, caused by the various stressors discussed in the vegetation group sections above. Bats may be affected by transmission of diseases from other bats travelling among different roosts. Pikas, wolverines, hoary marmots, and other species that use rock habitats at high elevations may be affected by alterations in seasonal temperature and precipitation associated with climate change (see also "species associated with high-elevation habitats" section above).

3.14.6 Environmental Consequences

Effects common to all alternatives

Aquatic, wetland, and riparian habitats

Aquatic, wetland, and riparian habitats are characterized by a combination of hydrology, geology, and vegetation and as such would continue to occur in the same amount and distribution under all alternatives.

Grass and shrub habitats

The terrestrial vegetation section notes that predicted warm and dry climate, which may be affected by climate change, along with vegetative succession, wildfires, and insect and disease activity would be the primary shapers of vegetation under all alternatives. Under all alternatives, nonforested vegetation, particularly in the xeric vegetation types, is expected to initially increase and then decline slightly, with overall abundance slightly higher over the next five decades than current abundance. That trend is not consistent across all GAs, with increases largely occurring in the Castles, Divide, and Little Belts GAs. Some decreases relative to current levels are predicted in other GAs, with the largest decrease predicted in the Rocky Mountain Range GA.

Plan components in the Grizzly Bear Amendment, which would be incorporated into all alternatives, require no increase in the number of active sheep allotments or in permitted sheep animal unit months in the primary conservation area and in zone 1 (Rocky Mountain Range and north half of Upper Blackfoot GAs), and guide managers to reduce the number of open or active sheep grazing allotments in that area. Although these components are intended to reduce potential conflicts with grizzly bears, their effect would also be to limit or reduce the risk of disease transmission from domestic to wild sheep.

Hardwood tree habitats

Broad-scale modelling predicts that both aspen/hardwood and cottonwood would increase slightly over time under all alternatives (terrestrial vegetation section), with some variation among GAs.

Dry conifer habitats

Broad-scale modelling estimates that under all alternatives, the ponderosa pine, limber pine, and Rocky mountain juniper cover types would increase, while dry Douglas-fir would decrease with some variation among GAs. These trends could benefit some species that rely on the dry conifer forest type and would ensure that this habitat continues to exist in the plan area.

Mixed conifer habitats

Broad-scale modelling predicts that the mixed mesic conifer cover type would likely decrease over time across the HLC NF under all alternatives, with some variation among Gas (see appendix B). However, this cover type is predicted to remain within or above the estimated NRV. Lodgepole pine is predicted to have a similar trend, remaining below the estimated NRV only within the Crazies and Rocky Mountain Range GAs. The spruce/fir cover type is predicted to increase slightly under all alternatives, and remain above the estimated NRV. The estimated NRV roughly approximates the range of conditions under which wildlife species using these habitats evolved or originally occupied this niche. Because the cover types comprising this habitat group would contine to be within or near the estimated NRV, they would continue to provide habitat for wildlife species that use them for all or part of their life cycle.

High elevation habitats

Because the primary influences on this type of habitat are climate, weather, geology and topography, most forest management actions are not expected to have substantial influence on these habitats or on the species that use them. Under all alternatives, whitebark pine is estimated to remain fairly static over time, with some variation among GAs. Clark's nutcrackers may be affected by current or future declines in whitebark pine under all alternatives, but on the HLC NF ponderosa pine and limber pine provide additional food sources. Wolverine are thought to be affected primarily by climate-caused changes in the amount and distribution of snowpack that remains throughout the spring, which would be the same under all alternatives. The availability of both whitebark pine seeds, and army cutworm moths as food sources for some bears could change as a result of changing climate, or in the case of moths, as a result of agricultural practices occurring in other areas during other phases of their life cycle. Refer to the terrestrial wildlife species at risk section for a more detailed discussion of wolverine and grizzly bear.

Late successional forests

Broad-scale modelling estimates that under all alternatives the large tree size class would increase in abundance, as would concentrations of large trees, while the very large size class would remain relatively static, below the estimated natural range. Multistoried structure, which in some cover types can be a component of late-successional stage forest and old growth, would likely increase over time under all alternatives, particularly in some cover types and broad potential vegetation groups. Although it is not possible to effectively model old growth, proxy indicators described in the old growth section lead to predictions that old forests would increase over time under all alternatives.

Snags

The majority of the HLC NF is in wilderness, RWAs, or IRAs where harvest, including salvage, would be prohibited or greatly limited and natural disturbances would be predominant, including fire that creates abundant burned forest conditions.

Coarse woody debris

The majority of the HLC NF is in wilderness, RWAs, or IRAs where natural processes, including those acting on the amount and distribution of coarse woody debris, would predominate.

Cave, cliff, rock or other geologically-determined habitats

The majority of the HLC NF is in wilderness, RWAs, or IRAs where disturbance to species using cave, cliff and rock habitats would be minimal. The Federal Cave Resources Protection Act of 1988 would provide assurance under all alternatives that caves listed as significant would be protected and maintained, through cooperation with other entities, and through participating in research, protecting information about the location of significant caves, and mapping and evaluating significant caves.

Effects of the action alternatives

Aquatic, wetland, and riparian habitats

All action alternatives include direction to establish RMZs, intended to protect the integrity and function of those areas. Although vegetation management, livestock grazing, or other activities could occur within riparian habitats, these activities would be constrained by plan components designed to protect watershed integrity, riparian habitats, and hydrologic function. RMZs are identified as not suitable for timber production. The adoption of RMZs would substantially increase protection of water quality and habitat conditions, particularly in areas east of the continental divide, where existing INFISH guidance does not apply. Establishment of RMZs would also be expected to increase the total acreage of riparian-influenced area in which protections for water and habitat quality would apply as compared to the no-action alternative. Management direction for RMZs would contribute to wildlife habitat connectivity and protection of plant species and animal communities associated with wetlands.

Direction for RMZs in the action alternatives is clearer and more flexible regarding vegetation management in riparian areas compared to the no-action alternative. This would allow for more likelihood in achieving desired conditions in vegetation associated with these areas. The plant species at risk section also provides a brief summary of potential effects to wetland-riparian, peatland, and aquatic vegetation guilds, noting that the revised plan provides more explicit protections for aquatic ecosystems than provided by the existing plans. Habitat quality is expected to improve for at-risk plant species in the peatland, wetland-riparian, and aquatic habitats under these alternatives. Those improvements in habitat quality would also likely represent improvements in habitat quality for terrestrial wildlife species that rely on those habitats.

Under all action alternatives, plan components describing specific desired conditions for aquatic, wetland, and riparian habitats would improve the likelihood of maintaining their integrity, resiliency, and connectivity. Delineation of RMZs (FW-RMZ-STD-01), clear and specific management direction for those zones (FW-RMZ-STD-03-07), plan components for maintaining key habitat components (FW-RMZ-GDL-01, 02), and components for minimizing impacts to riparian and aquatic habitats (FW-RMZ-GDL-03-12) all would maintain or contribute to the long-term persistence of species dependent on these habitats.

All action alternatives include some species-specific or habitat-specific (fine-filter) plan components that would minimize impacts to certain wildlife species or groups of species using aquatic habitats. Table 62 displays those plan components and includes a brief description of the component and its effect on terrestrial wildlife species or habitats. For the exact wording of each component, refer to the draft plan.

Table 62. Draft plan components that would directly affect terrestrial wildlife species associated with aquatic, wetland, and shrub habitats

Plan component	GA where applies	Summary of expected effects
FW-WL-GDL-03	Forestwide	Would protect western toad breeding sites from livestock trampling, and would direct livestock management so that emergent vegetation would be retained at those sites. This plan component would help maintain the integrity of these sites for western toads and for other species, including amphibians, birds, and small mammals.
FW-WL-GDL-04	Forestwide	Would help prevent the spread of pathogens to and among western toad breeding sites.
FW-WL-GDL-15	Forestwide	Would minimize the risk of impacts to amphibians from use of piscicides for fisheries management.
FW-WTR-DC-08; FW-WTR-GDL-03	Forestwide	Would direct managers to retain, where possible, beaver presence and complexes to maintain watershed and wetland habitat and resilience. Many wildlife species, such as moose, swans, migratory songbirds, amphibians, waterfowl, and others use habitats created and maintained by beavers.
RM-WL-DC-03; RM-WL-GDL-02; UB-WL-DC-03; UB-WL-GDL-02	Rocky Mountain Range; Upper Blackfoot	Would minimize management-related disturbance to and displacement of harlequin ducks on known breeding streams

Grass and shrub habitats

All action alternatives include desired conditions to generally maintain or increase the non-forested cover types to within the estimated natural range (FW-VEGNF-DC-03) with most of that increase in the grassland or shrubland cover types. All action alternatives also include plan components that emphasize the use of fire to achieve some vegetation objectives, and in some areas allowing fire to play more of its natural role as a process shaping ecosystems (FW-VEGNF-DC-04). Fire is an important process in maintaining many grasslands and some shrublands, through removal of tree encroachment, and rejuvenation or restoration of some grass and shrub species. All action alternatives include plan components stating that "forage use by livestock should maintain or enhance the desired structure and diversity of plant communities on grasslands, shrub lands…" (FW-GRAZ-GDL-01), and include components that constrain grazing where not compatible with vegetation desired conditions, maintaining forage for wildlife, or other resource objectives.

The revised plan includes a guideline to emphasize restoration of sagebrush where it historically occurred (FW-VEGNF-GDL-02), which may benefit a number of bird species, including Brewer's sparrow. -FW-VEGNF-GDL-01 emphasizes treatments to maintain or restore grasslands in areas that are important for use by big game species and pollinators. This emphasis would help to maintain or restore key winter habitats for use by elk, mule deer, and bighorn sheep where they occur. Emphasis on sagebrush as noted above may benefit wintering mule deer and in some areas pronghorn.

All action alternatives include some species-specific or habitat-specific plan components that would minimize impacts to certain species or groups of species using grass and shrub habitats. FW-WL-DC-05 and FW-WL-GDL-05 establish desired conditions and guidelines to minimize disturbance to big game on winter ranges, and FW-WL-DC-06 and FW-WL-GDL-06 call for maintaining or improving the availability of cover on or adjacent to big game winter ranges. FW-WL-GDL-01 calls for livestock management to maintain forage for wildlife use, and FW-WL-GDL-15 guides managers to manage identified seasonal habitat on NFS lands consistently with similar identified habitat on adjoining lands managed by other agencies, when those adjoining lands are managed for wildlife values. In general, this guideline is intended to foster consistent and coordinated management on big game winter ranges that consist of a mix of NFS land and state-owned wildlife management areas.

Plan components for the Big Belts, Little Belts, and Elkhorns GAs include a standard requiring adherence to interagency recommendations for separation of bighorn sheep from domestic sheep and goats. Plan component RM-WL-STD-01 for the Rocky Mountain Range GA prohibits domestic sheep grazing on NFS lands, in order to minimize risk of disease transmission and to prevent potential conflicts with grizzly bears. These plan components, along with those discussed above that would maintain or restore grass and shrublands, would maintain bighorn sheep presence on NFS lands to the extent that NFS management actions are able to do so. Introduction of disease from domestic sheep could still occur, as a result of bighorn sheep moving among areas or using areas not under NFS management where domestic sheep or goats are grazed.

Hardwood tree habitats

The amount of hardwood tree habitat, which includes mainly aspen and cottonwood on the HLC NF, is lower than it likely was historically in some GAs on the HLC NF. The desired condition is to maintain or in some areas increase the amount of these vegetation types. The desired condition specific to aspen is to generally increase its presence throughout the plan area, with more emphasis in some GAs (e.g. the Big Belts, Little Belts, and Snowies GAs) that are less in line currently with the historic range or where increasing aspen has been identified as desirable for other reasons, including as wildlife habitat. Modelling predicts a slight increase in aspen over time forestwide. Hardwood tree habitats on the HLC NF are often associated with wetlands and riparian areas; refer to the watershed section and to the section above on species associated with aquatic, wetland, and riparian habitats for a discussion of how plan components in the revised plan would maintain or restore function and resilience of aquatic, wetland, and riparian habitats.

As a result of components that would maintain or restore function in wetland and riparian habitats, and those that would maintain or restore hardwood (particularly aspen) types, habitat for wildlife species using this vegetation group would continue to be provided in the plan area, and is predicted to increase slightly at a forestwide scale. Refer to the terrestrial wildlife species at risk section for information about Lewis's woodpeckers; refer to sections below on snags for information pertaining to cavity-nesting birds, as that section includes consideration of all cover types, including aspen.

Dry conifer habitats

The revised plan includes components that identify desired conditions for the cover types that are included in the dry conifer habitat group. Forestwide desired conditions are to generally increase ponderosa pine and decrease Douglas-fir, as well as to increase the amount and distribution of large and very large trees in the warm dry broad PVT (FW-VEGF-DC-01, FW-VEGF-DC-02, FW-VEGF-DC-05, and FW-VEGF-DC-06). All action alternatives include plan components to allow fire to play a more natural role, where possible, in shaping ecosystems (FW-FIRE-DC-01, FW-FIRE-GDL-03 and 04). Ultimately those components might allow fire to occur in a manner that promotes and maintains open-understory, mature ponderosa pine and limber pine forests in areas where those types historically occurred. This would improve habitat for species such as flammulated owl, Lewis's woodpecker, and other species that rely on mature, open-understory ponderosa pine as well as on snags. Increasing this type of habitat, as well as maintaining the amount of limber pine, could also increase the amount of transitional and winter range for ungulates such as elk and mule deer, and could improve connectivity between escape terrain and foraging areas in some areas for bighorn sheep. Maintaining or increasing limber pine at lower elevations may maintain or improve habitat for a wide variety of wildlife species associated with either grassland or montane conifer habitat types. Maintaining or increasing the amount and distribution of ponderosa pine and limber pine would provide a food source for Clark's nutcrackers that could be of increasing importance if whitebark pine continues to decline as a result of blister rust (refer to high-elevation habitat discussion below).

Modelling of the estimated trend of limber pine, ponderosa pine, and Rocky Mountain juniper shows a slight increase in these cover types and tree species presence under these alternatives that would be likely indistinguishable from the trend estimated for the no-action alternative, although estimated trend varies somewhat by GA.

In summary, specific desired conditions for the cover types and tree species that comprise the dry conifer forest habitats would be more likely to result in moving the abundance and distribution of this type toward the historic or NRV. Plan components specifically aimed at maintaining or increasing dry conifer types, particularly ponderosa pine and limber pine, would result in maintaining or increasing available habitat for species that use dry conifer vegetation types.

Mixed conifer habitats

The revised plan includes components that identify desired conditions for the cover types that are included in the mixed conifer habitat group. Forestwide desired conditions provide specific direction to move toward the historic or NRV for conifer types (FW-VEGF-DC-01, FW-VEGF-DC-02) and structure within those types (FW-VEGF-DC-03, FW-VEGF-DC-04, FW-VEGF-DC-05, FW-VEGF-DC-06, and others) would provide conditions that allow populations of species dependent on mixed conifer forest to persist over the long term. Some species, such as pine marten, Canada lynx, red squirrel, and others that rely on certain structural or seral stages, cover types, or combinations of those would be affected by trends in those specific habitat components. The revised plan identifies desired conditions for some key structural components, which are addressed separately (see below regarding large and very large trees, old growth, snags, and downed woody debris). In summary, specific desired conditions for the cover types and tree species that comprise the mixed conifer forest habitats would be more likely to result in moving the abundance and distribution of these types toward the historic or NRV. Consequently, the range of habitats would be maintained that support the full variety of wildlife species using mixed conifer forest for all or part of their life history.

A more detailed analysis of potential effects to species currently listed as sensitive and that are mentioned above in the affected environment section will be provided in a separate BE to be prepared when a preferred alternative is selected. The BE will be completed concurrent with the FEIS.

High elevation habitats

The revised plan includes desired conditions for non-forested vegetation types, which includes alpine ecosystems (FW-VEGT-DC-01 and FW-VEGF-DC-01). The desired conditions describe the components of healthy, resilient alpine ecosystems and the desired prevalence of non-forested types, providing managers with clear direction for restoring or maintaining these systems. The revised plan also includes desired conditions for whitebark pine (FW-VEGF-DC-01, FW-VEGF-DC-02, FW-PRISK-DC-01, 02 and FW-PRISK-GDL-01), providing managers with clear direction to maintain or restore functional whitebark pine systems. These plan components would ensure that habitat continues to be available for species that use alpine ecosystems.

Late successional forests

Unlike the no-action alternative, the revised plan includes specific desired conditions for large and very large trees, at the forestwide and where appropriate at the GA scale (FW-VEGF-DC-03, FW-VEGF-DC-06), as well as by broad PVT (FW-VEGF-DC-05). The revised plan includes standards for retaining large and very large trees (FW-VEGF-GDL-01), as well as retaining snags based on size and vegetation group (FW-VEGF-GDL-01). Those desired conditions would be more effective than the current plans in maintaining or restoring large and very large trees as habitat on the HLC NF. The revised plan also includes desired conditions for old growth that are based on broad PVT (FW-VEGF-DC-07), recognizing that not all areas or vegetation types have the inherent capability to produce large and very large trees, or old growth as currently defined. The revised plan includes guidelines for management of old growth (FW-

VEGF-GDL-04 and 05) designed to retain or enhance existing old growth and to promote development of old growth in the future. Thus, rather than trying to meet a numeric standard that may not be applicable in a particular area or vegetation type, the revised plan ensures that stands meeting the criteria for old growth are retained or are managed to retain or enhance their old growth characteristics. The result of that management would be to conserve all existing old growth and promote the development of old growth in the future, which would be more effective at maintaining old growth habitat than management under the existing forest plans.

In sum, plan components for large and very large trees and for old growth would ensure that large and very large trees, both alive and dead, along with late successional forests and old growth would continue to move toward desired conditions. In turn, adherence to the plan components, and movement toward desired conditions for these structure types would ensure that these habitats would continue to be available at current levels or in greater abundance than currently in the plan area.

Snags

The revised plan includes components regarding snag management that would ensure development and retention of snags at an appropriate scale during vegetation management and other activities. FW-VEGF-DC-08 displays the desired condition for snags by size class and by broad PVT and other vegetation type, based on current understanding of the estimated abundance of snags. FW-VEGF-GDL-02 recommends retention of at least a minimum number of snags per acre within vegetation management project areas, which would ensure availability of snags for use by wildlife at an appropriate scale for management. This guideline is specific to size class as well as vegetation type, recognizing that some size classes may be key but less abundant naturally, and that different vegetation types or groups naturally have differing snag abundance. Specific information for implementing this guideline also includes information about implementation and lists exceptions to snag retention guidelines that focus on human safety in specified areas or situations. These exceptions would help to limit the situations and the extent to which snags may be removed for safety reasons, thus ensuring a relatively conservative approach to maintaining snag habitat for wildlife. FW-TIM-GDL-04 guides managers implementing salvage harvest to retain clusters of burned trees of a variety of sizes to provide habitat for wildlife.

These plan components, in addition to the fact that much of the HLC NF would be continue to be subject to natural forces such as wildfire, insect and disease (see effects common to all alternatives above), would ensure that adequate numbers, distribution, and variety of snags would continue to exist throughout the plan area, providing habitat for species that use snags for all or part of their life history requirements.

Coarse woody debris

The revised plan includes components regarding retention of coarse woody debris that would ensure development and retention of this type of habitat at an appropriate scale during vegetation management and other activities. FW-VEGF-DC-09 establishes desired conditions for coarse woody debris based on broad PVT, recognizing that certain vegetation types have different inherent capability to produce woody debris. FW-VEGF-GDL-06 guides vegetation management projects to retain a minimum amount of coarse woody debris based on the desired conditions. The guideline also provides specific guidance for retention that includes emphasis on large diameter debris that is of higher value to wildlife. The guideline also includes exceptions to provide for management of fire risk in some areas.

Specific desired conditions for coarse woody debris and the guideline emphasizing retention of large-diameter debris for wildlife, in combination with the large amount of area on the HLC NF in which natural processes predominate, would ensure that this habitat continues to be available for wildlife species that use it for a portion of their life history needs.

Cave, cliff, rock or other geologically-determined habitats

The revised plan includes a number of components that provide direction for management of and relating to caves and cave habitats. The following plan components are relevant to this habitat:

- FW-WL-DC-08 establishes the desired condition that caves, mines, and underground habitats are relatively free of human disturbance.
- FW-WL-GDL-10 guides managers to avoid disturbing roosting, hibernating, or pup-rearing bats.
- FW-WL-GDL-11 guides managers to use measures to prevent disease spread in caves or mines used by bats.
- FW-WL-GDL-12 and 13 guide managers to not create new views of caves or access to caves known to be used by bats.
- FW-EMIN-DC-03 and FW-EMIN-OBJ-01 establish a desired condition and an objective for the number of abandoned mines to be reclaimed.
- FW-EMIN-GDL-02 states that seismic or other surveys or actions that use explosives not be carried out over or close to caves known to be used by bats.
- FW-BRDG-GDL-01 guides managers to time bridge removal or reconstruction to minimize impacts to nesting or roosting wildlife.

These plan components would increase the likelihood that cave habitats would continue to support populations of bats and other species that rely on them.

The revised plan also includes a plan component (FW-WL-GDL-09) guiding managers to avoid disturbance at known raptor nesting and fledging areas, which would include cliffs used by peregrine falcons, golden eagles, prairie falcons, and other birds associated with those cliff habitats.

These plan components, combined with the fact that cave, cliff, and rock habitats are relatively inaccessible, and are affected primarily by geologic forces, would result in these habitats continuing to be available for species that use them for all or part of their life cycle. The plan components listed above would provide more protections for species using these habitats than would be provided under the no-action alternative.

Effects of forest plan components associated with:

Aquatic ecosystems and soils

The effects of these plan components are discussed under the section “species associated with aquatic, wetland, and riparian habitats” above.

Fire and fuels management

Plan components for fire and fuels management are intended to achieve the desired condition to maintain and enhance resources and allow fire to function in its natural ecological role (FW-FIRE-DC-01). Specific plan components are designed to provide for public and firefighter safety, reduce risk to high value resources such as adjacent communities, and minimize impacts to designated wilderness, recommended wilderness, and other areas that are managed to allow natural processes to predominate. Terrestrial wildlife species on the HLC NF evolved in ecosystems largely shaped by fire, so allowing fire to play its natural role, to the extent possible, would be expected to sustain ecosystem components and characteristics on which they depend. Some fire management activities could affect individual animals or local populations of some species that have small home ranges or use areas, through temporary displacement from areas where and when activities (such as fire suppression or fuels reduction) are taking place.

Terrestrial vegetation; plants at risk, and invasive species

Plan components for management of terrestrial vegetation are largely designed to maintain or move toward the NRV for ecosystem composition, structure, and function, and to maintain resilience in the face of disturbance (FW-VEGT-DC-01). Vegetation-related plan components also are intended to "provide habitat requirements to support populations of… native and desired non-native species… based on the inherent capability of lands" (FW-VEGT-DC-02) and to "provide connectivity and allow genetic interchange to occur" (FW-VEGT-DC-03). Specific objectives, standards, and guidelines for vegetation, including forested and non-forested vegetation types, are designed to maintain or move toward desired conditions within the NRV for cover types, species or community presence, and vegetation structure; these are incorporated into and discussed in the specific habitat sections above. Plant species at risk, including whitebark pine, are to be recovered or sustained. Invasive species are to be contained, controlled, suppressed, or eradicated (FW-INV-DC-03). In sum, plan components for management of vegetation would sustain healthy, resilient plant communities on which terrestrial wildlife species depend on for food, cover, breeding/nesting/denning, and movement among different habitats, use areas, or seasonal ranges.

Terrestrial wildlife

Most of the plan components relating to terrestrial wildlife are discussed in the sections above. In general desired conditions would guide managers to provide for a diversity of wildlife habitats that would support most native species within the plan area, provide for connectivity among and within NFS parcels in the plan area, and provide for seasonal or other important wildlife habitats. Goals relating to terrestrial wildlife would encourage coordination with MTDFWP and other agencies that manage wildlife or habitats, which would facilitate effective management across administrative boundaries and throughout the ranges of many species. Standards and guidelines in the draft plan would limit or mitigate potential impacts to wildlife or habitats of a variety of management actions.

Recreation settings, opportunities, access, and scenery

Certain recreation activities have the potential to impact terrestrial wildlife species by the simple fact of humans recreating in their habitat. The draft plan does not directly constrain public uses, but it sets desired conditions, guides placement of recreation facilities, places constraints on permitted recreation activities, and establishes the general types of recreational uses allowed or expected to occur in specified portions of the plan area. Certain types of human recreational activities have the potential to affect various wildlife species, but impacts depend on the type of activity, species present, species' habitat needs and life history factors, etc. Plan components that guide management of recreation activities have the potential to affect the degree to which recreation could impact wildlife, in both positive and negative ways. Table 63 shows the plan components that have some relevance to wildlife or habitats, and a brief summary of the potential effects of those components on wildlife or habitats.

Table 63. Plan components for management of recreation that could affect terrestrial wildlife species or habitats

Plan Component	Description	Potential Effect to Wildlife or Habitat
FW-ROS-DC-01	Desired distribution of ROS classes, desired condition within those classes and standards and guidelines to meet desired conditions	More than half of HLC NF in the two non-motorized categories would provide large amount of habitat with no potential disturbance or displacement by motorized travel. Vegetation management in these areas would be largely by natural processes, and developed recreation would be minimal. Over half the HLC NF lands would provide habitat with minimal human influence. Other ROS classes have defined desired conditions and varying impacts to wildlife depending on site-specific factors within those areas.
FW-REC-DC-03; FW-REC-DC-04;	Desired conditions for developed recreation sites	Establishes desired conditions that help concentrate developed recreation, minimize impacts to threatened and

Plan Component	Description	Potential Effect to Wildlife or Habitat
FW-REC-DC-06; FW-REC-DC-07;	and facilities and dispersed recreation camping sites	endangered wildlife and to vegetation, and minimize conflicts with other resources. However, providing for recreation opportunities potentially brings humans into wildlife habitat.
FW-REC-OBJ-02	Remove or relocate number recreation facilities out of RMZs	Would improve riparian habitat at those sites and in vicinity; also may improve connectivity within and among riparian habitats
FW-REC-GDL-01	Management of developed recreation is responsive to environmental changes	Directs management to address issues that may arise regarding various factors, potentially including changes in amount, distribution, or location of wildlife habitats or other wildlife-related issues
FW-REC-GDL-03; FW-REC-GDL-04; FW-REC-GDL-05	Constraints on developed recreation facilities and impacts related to groundwater-dependent ecosystems and riparian zones	Components would maintain water quality and flows, and reduce impacts to riparian areas. Would maintain or improve habitat in or associated with those sites, may improve riparian habitat connectivity
FW-REC-GDL-07	Use native seed for plantings	Would minimize potential of wildlife to be attracted to non-native vegetation and potentially come into conflict with humans near access roads and developed sites; also maintains native vegetation and minimizes risk of potentially invasive plant species
FW-RSUP-DC-01; FW-RSUP-DC-02; FW-RSUP-DC-03	Provide for opportunities, experiences, services, and jobs	Providing for recreation special uses potentially brings humans into wildlife habitat
FW-RSUP-GDL-01	Recreation special uses mitigates conflicts with other resources	Would minimize or reduce potentially negative impacts occurring to wildlife or habitats
FW-ACCESS-DCs (all); FW-ACCESS-GO-01; FW-ACCESS-GDL-02	Provides system of roads, trails, and airstrips for public access to NFS lands	Providing access to humans potentially brings humans into wildlife habitat. Total mileage, density, and other characteristics of access routes would have varying potential impacts to wildlife species and habitats that vary according to site, area, species, and type of habitat. Refer also to grizzly bear section of At-Risk Species section for details regarding impacts of motorized access to bears.
FW-ACCESS-GDL-01	Rehabilitation of unauthorized routes	Would restore habitat and remove human impacts on a site-specific basis

In summary, plan components for management of recreation would potentially result in some impacts to some individual animals where specific facilities exist or activities occur, but would minimize impacts to individual animals and to wildlife populations by including constraints designed to reduce conflicts, disturbance, displacement, or negative impacts to habitat. Some components would improve wildlife habitat by moving facilities out of sensitive areas such as riparian areas, and by rehabilitating unauthorized access routes.

Designated areas, including recommended wilderness

Plan components for designated areas vary in potential effects on wildlife and habitats, depending not only on species and habitat but also on type of designated area. Plan components for designated wilderness areas (FW-WILD) support the provisions of the Wilderness Act of 1964, providing areas free of mechanized and motorized uses, where natural processes would be the primary forces affecting vegetation. FW-WILD-DC-03 establishes the desired condition that designated wilderness areas would contribute habitat and connectivity for wildlife species with large home ranges. FW-WILD-GDL-01 would protect aquatic and riparian habitats from recreational livestock use, and FW-WILD-GDL-02

would ensure that caves (which may provide habitat for bats) would be protected from exploitation by recreational users.

Plan components for RWAs are similar to those for designated wilderness; FW-RECWILD-DC-02 establishes that these areas would have a natural environment where ecological process are the primary forces affecting the environment, and FW-RECWILD-SUIT-02-08 identify activities, such as timber production and harvest, commercial uses, and road construction that should not occur in these areas. FW-RECWILD-SUIT-01, which is included in alternatives B and D, states that mechanized and motorized uses are not suitable in RWAs, but some such uses may be allowed for specified purposes or if already existing in these areas. This could result in a somewhat lower potential for disturbance or displacement of certain wildlife species in those alternatives compared to alternatives C and E. In alternative C, existing motorized and mechanized uses would be allowed to continue in RWAs, while in the other alternatives those uses would be disallowed. The amount and distribution of RWAs would also vary by alternative (refer to Draft Plan section on Designated Areas). In general, however, plan components for RWAs would provide for wildlife habitats similar to that described above for designated wilderness areas. Furthermore, because RWAs overlap with IRAs (see below), the differences among alternatives would likely be slight.

Plan components for IRAs support the provisions of the FS Roadless Area Conservation Rule (USDA, 2001). Plan components establish IRAs as large, undisturbed, unfragmented areas of land (FW-IRA-DC-01) where natural processes predominate (FW-IRA-DC-02. As such, these areas provide for wildlife habitats similar to that described above for designated wilderness areas and RWAs.

Plan components for eligible WSRs are intended to support or maintain the outstanding remarkable values for which the segment is identified. Plan components vary according to those values (FW-WSR-GDL-01), which include wildness, scenic value, or recreational value. Whether wildlife habitat would be emphasized for eligible WSR segments depends on the segment, each of which is described in the Draft Plan. Where the primary emphasis is recreation, wildlife habitat value would not be emphasized but that does not mean wildlife habitat values could not be maintained or improved (refer to discussion of effects of plan components for management of recreation, above). Where the primary emphasis is fish or wildlife, maintaining or improving those habitats would likely be a primary management emphasis. Effects to wildlife or habitats would primarily occur at a site-specific level or at the scale of the river segment, and would depend on the species and habitat present or potentially present in the area.

Plan components for national recreation trails, the Continental Divide Scenic Trail, the Lewis and Clark Historic Trail, and the Lewis and Clark Interpretive Center all support the specific purposes of those trails and the interpretive center. The management emphasis of these designations is specific recreational or interpretive opportunities, which potentially brings humans using these areas into wildlife habitat. Management of recreation occurring in these areas would be subject to the plan components discussed above (refer to discussion of effects of plan components for management of recreation, above). Plan components for the Continental Divide National Scenic Trail provide for minimizing human impacts and evidence of modern human activities, including motorized travel, but the presence and management of this trail also attracts a substantial number of forest visitors using portions of the trail. Therefore, impacts of plan components that manage for these characteristics would likely have mixed impacts to wildlife that would vary according to location, habitat, species, and level of human activity.

Plan components for management of RNAs support the purposes for which these areas are designated, which vary by individual area but that emphasize research, education, and/or maintenance of biological diversity. Most RNAs are relatively small in size, but often support unique or unusual plant communities that may provide correspondingly unique or uncommon habitat features. Plan components constrain management actions to ensure that natural processes predominate in these areas with limited human influences (FW-RNA-DC-01). Therefore these areas contribute relatively undisturbed habitat for the species that inhabit them, which varies by area (refer to the Draft Plan).

Cultural, historic, and tribal resources

Few plan components for these resources would have effects to terrestrial wildlife species or habitats. FW-OFP-DC-01 establishes a desired condition of "healthy, sustainable, and harvestable populations of culturally significant flora and fauna are available to ensure the rights reserved by Native Americans". This plan component would provide for maintaining those plant and animal species or habitat of cultural importance, but would also provide for harvest of some of those species.

Land status and ownership and land uses

Plan components for these resources include providing public access to NFS lands (FW-LAND-DC-02 and FW-LAND-OBJ-01), which could potentially bring humans into wildlife habitats, depending on the location of the access points. FW-LAND-DC-03 and 04, and FW-LAND-GDL-02 guide managers to protect wildlife habitat, riparian areas, and other natural resource values when managing lands. Plan components for Land Uses accommodate the needs for various uses such as utility and energy corridors and road uses, all of which could have impacts to wildlife depending on their location relative to specific habitats and the nature and timing of activities in those areas. Guidelines for land uses direct managers to maintain riparian habitat conditions (FW-LAND USE-GDL-03 through 05), as well as to consolidate utility infrastructure and activities that would potentially reduce impacts of land use activities on wildlife species and habitats.

Infrastructure

Desired conditions for infrastructure are to provide for a safe and effective transportation system that is sustainable and has minimal impacts on other resources. Other components establish objectives for decommissioning some roads while maintaining, reconstructing, or improving others. Standards and guidelines establish or constrain certain management practices for the purposes of limiting impacts to riparian and aquatic systems, soils, and some wildlife habitats. Roads and other infrastructure may impact wildlife by occupying former habitat. Activity associated with roads, bridges, and other infrastructure may displace wildlife and may inhibit connectivity. Standards and guidelines regarding placement, decommissioning, and other management of roads, bridges, and other infrastructure may help to limit those impacts.

Livestock grazing

Desired conditions for livestock grazing are to provide for sustainable grazing opportunities while supporting stable soils, diverse plant species composition, and wildlife habitat and forage needs. Standards and guidelines for grazing management would maintain or improve riparian and aquatic habitats, consider the forage and other habitat needs of wildlife species, and support coordination with Montana Fish, Wildlife and Parks. Although livestock grazing can impact wildlife through direct competition for forage or through displacement from some habitats, plan components for management of grazing would help to ensure that adequate forage and other habitat needs for native wildlife species would be met.

Timber harvest

Desired conditions for timber harvest are to contribute to sustainable harvest, improve resilience of the timber resource, and contribute to local and area economies. Objectives establish anticipated sale quantities by alternative, with alternative E generally offering more timber and wood sale quantity. Standards and guidelines for management of timber harvest would constraint harvest activities to protect soils and watersheds, promote restocking, limit clearcutting and even-aged harvest, manage opening sizes, and promote the achievement of vegetation desired conditions. Although activities associated with timber harvest may displace wildlife, and harvest alters habitat used by wildlife, plan components relating to timber harvest would limit some impacts to wildlife, particularly those tied to certain harvest practices that create openings or even-aged stands. Plan components for timber harvest would also move vegetation toward desired conditions, which are generally consistent with the estimated NRV.

Special Uses

Plan components for special uses support authorizing uses of NFS lands and resources for public benefit. The impacts of these components would vary in their effects to wildlife or habitats, depending on the type and nature of uses authorized. Most activities associated with special use permits would also be subject to additional plan components relating to the specific activity authorized.

Geology, energy and minerals

Plan components relevant to wildlife and relating to management of caves and mines are discussed above in the section on species associated with cave, cliff, and rock habitats.

Desired conditions for management of energy and minerals include contributions to the economy as well as contributing to the supply of mineral and energy resources. Standards and guidelines direct management of superfund sites, and constrain management actions to minimize impacts to aquatic and riparian resources and wildlife habitats. Extraction or production of minerals or energy resources could impact wildlife or habitats through direct displacement due to infrastructure or activities associated with those activities, but plan components for managing minerals and energy resources would help to limit those impacts.

Effects of alternative A

Aquatic, wetland, and riparian habitats

The aquatic ecosystems section summarizes the management direction for aquatic and riparian systems in the existing Helena National NF and Lewis and Clark NF plans, and discusses potential impacts to aquatic and riparian systems of continuing to implement those plans. Briefly, the current Lewis and Clark NF plan includes forestwide direction for riparian management areas (MA-R); MA-R is not specifically delineated nor mapped, and would likely continue to be identified and managed on a site-specific basis during project planning. The existing Lewis and Clark NF plan also includes standards that would guide or limit certain management actions in order to maintain water quality, sustain soil and site productivity, and revegetate some disturbed areas. The current Helena NF plan includes general guidelines to delineate and buffer riparian areas on a site-specific basis prior to management activities; west of the continental divide (the Upper Blackfoot GA and a portion of the Divide GA) the INFISH would continue to apply. Management Areas established in the Helena NF plan include standards and goals for protecting watershed, soil, water quality, and fisheries and riparian areas.

Under alternative A, aquatic, wetland, and riparian habitats would mostly be identified and managed on a site-specific basis, because the existing plans do not incorporate a watershed approach to management of hydrology and watershed processes, Desired conditions for these habitats would not be as clearly identified as in the action alternatives. The likely result of continuing to implement these plans would be the continued protection of areas currently in satisfactory condition, while areas in unsatisfactory condition would likely remain unchanged. Lack of watershed-level desired conditions and plan components could lead to disruptions in existing connectivity, or to not restoring connectivity within and among these habitats. These two factors would likely result in variability in the long-term integrity of these types of habitats. West of the Continental Divide, direction provided under INFISH would provide somewhat more protection for water quality and riparian habitat conditions than areas east of the divide.

Plan components for managing identified riparian areas, implementation of existing BMPs, and plan components for protecting some wildlife species and sensitive habitats would likely minimize impacts on a project-by-project basis, with the result that species dependent on aquatic, wetland, and riparian habitats would persist over the long term, as they have during the thirty years of implementing the forest plans.

Grass and shrub habitats

Standards, guidelines, and recommendations to minimize impacts of various human activities on identified big game winter range, which includes this vegetation type, are found throughout the existing forest plans. Both existing plans identify certain management areas where management emphasis is on maintaining big game winter range or other foraging habitat, both of which include the grass/shrub vegetation type. The existing plans, however, lack specific desired conditions or objectives for the amount and distribution of the grass/shrub vegetation type, that could result in variability or unpredictability in the degree to which these types would be maintained or restored in the future. During the thirty years in which the current plans have been in place, grass and shrub types appear to have decreased somewhat in overall acreage from the historic condition due at least in part to lack of specific desired conditions for this type, and lack of emphasis on certain natural processes, such as fire, that historically maintained this type. Conversely, a warming climate could result in an increase in grass and dry shrublands in some areas.

Both the Helena NF and the Lewis and Clark NF plans include standards and guidelines intended to ensure presence of big game, especially elk, during the hunting season. These plan components are largely aimed at providing hiding cover or other security from disturbance by humans in order to maintain hunting opportunities. A detailed discussion of the effects of these plan components on elk can be found in the elk section.

Gray wolves, listed currently as a RFSS, would continue to be considered sensitive under this alternative. Wolves may prey on a variety of mammals found in a variety of habitats, but ungulate prey is likely key to wolf presence. Under this alternative, the continued presence of ungulate species, supported in part by grass and shrub habitats, would continue to support wolves in the plan area.

Bighorn sheep are identified as a RFSS under the current plan, and would continue to be considered as such under the no-action alternative. The current plans do not have components specific to bighorn sheep; there are no standards or guidelines regarding separation of bighorn sheep from domestic sheep and goats in the existing plans. Although policy could be created to address this issue, the lack of plan standards or guidelines could make it less likely that effective separation of bighorn sheep and domestic sheep is created or maintained, presenting a slightly higher risk of disease transmission and consequent impacts to bighorn sheep herds than that of the action alternatives.

Hardwood tree habitats

The existing plans lack specific desired conditions or objectives for the amount and distribution of the hardwood tree vegetation types, which could result in variability or unpredictability in the degree to which these types would be maintained or restored in the future. Aspen and other hardwood tree habitats appear to be below historic levels, particularly in some GAs (Big Belts, Snowies, and Upper Blackfoot), although the wide variance in the estimated NRV makes it difficult to discern whether current levels are below the NRV. Forestwide, aspen distribution is below NRV, especially in the Little Belts, Snowies, and Upper Blackfoot GAs. These declines relative to historic levels have likely occurred over a long time period, but have included the time in which current plans have been in place. The estimated declines in aspen and hardwood types have likely been a result of fire exclusion and changing climate, but the absence of desired conditions or plan components for this vegetation type does not provide managers with specific guidance to maintain or restore hardwood habitats.

Species that use this habitat group for all or part of their life cycle continue to exist in the plan area, and habitat would continue to be provided, albeit possibly at lower levels than under other alternatives.

Dry conifer habitats

Mature ponderosa pine appears to have declined over time relative to its historic presence (refer to the terrestrial vegetation section), although this trend likely began well before the current plans were implemented. The existing plans lack specific desired conditions or objectives for the amount and

distribution of the dry conifer vegetation types, which could result in variability or unpredictability in the degree to which these types would be maintained or restored in the future. The lack of specific desired conditions for certain cover types also could result in continued declines in some tree species (such as ponderosa pine or limber pine) or certain age or size classes of some species within this group. Modelling of the estimated trend of limber pine, ponderosa pine, and Rocky Mountain juniper shows a slight increase in these cover types and tree species presence under this alternative that would be likely indistinguishable from the trend estimated for the action alternatives, although estimated trend varies somewhat by GA.

Species that use this habitat group for all or part of their life cycle continue to exist in the plan area, and habitat would continue to be provided. Refer to the terrestrial wildlife species at-risk section for a discussion of impacts of the alternatives to flammulated owls and to Lewis's woodpeckers.

Mixed conifer habitats

The lack in the existing plans of specific desired conditions for certain cover types could result in forest composition and structure that is not reflective of the historic or natural range. Some cover types in this group, such as lodgepole pine and spruce/fir, are above the natural range for those types; refer to terrestrial vegetation section and the assessment (U.S. Department of Agriculture, Forest Service, Northern Region, 2015). Without specific desired conditions or other direction to move these types toward the NRV, this trend could continue. This could benefit some species that rely on this vegetation group, but would potentially decrease habitat for species relying on other types, such as dry conifer forest or open grasslands and shrublands.

Species that use this habitat group for all or part of their life cycle continue to exist in the plan area, and habitat would continue to be provided. Refer to the terrestrial wildlife species at-risk section for a discussion of impacts of the alternatives to Canada lynx.

High elevation habitats

The existing plans do not have specific desired conditions for non-forested habitat types such as alpine ecosystems or whitebark pine. Nevertheless, high elevation habitats are relatively un-influenced by forest management. Therefore habitat would continue to be available for species that use high-elevation ecosystems.

Late successional forests

In addition to the estimated trend of size class and vertical structure predicted under all alternatives, the existing plans include components for managing large trees and old growth. The existing plan for the Helena NF requires a percentage of each third-order drainage to be maintained in old growth, whereas the plan for the Lewis and Clark NF requires a percentage of the commercial forest in each timber compartment to be maintained in old growth. Evaluation of compliance with this requirement occurs during project-level analysis, because old growth is most accurately identified in the field. Forestwide modelling or estimation of old growth is not possible because of the complexity of characteristics that define old growth stands. Therefore, under alternative A the total amount and distribution of old growth would continue to be measured and applied on a site-specific basis, without an overall desired condition based on historic range or on ability of a GA or vegetation type to produce old growth. Compliance with forest plan standards would continue to be difficult to measure, and therefore it could be difficult to predict the amount and spatial arrangement of these habitats that would occur under this alternative. Modelling of some of the components of old forest, as described in the old growth section, indicates that old forest may increase over time under this alternative.

Snags

The existing forest plans have specific standards or guidelines for retention of snags. The Helena NF plan specifies the number of snags per acre to be achieved by third-order drainage, identifies preferred species to be retained as snags, and provides numeric standards for snag retention in "cutting units". The Helena NF plan also recommends that snag standards be met on lands other than those identified for timber production. The Lewis and Clark NF plan recommends the number of snags per acre to be achieved within specified size classes and timber types, and provides guidance about the distribution and location of snags to be retained during harvest or vegetation management activities. Although these plan components provide direction that requires stand retention and management, they have been found to be difficult to implement due to lack of clarity regarding scale of the requirements. Components regarding snag management in the existing plans also are in conflict with plan components or other requirements regarding safety management and desired conditions for certain developed recreation sites. Nevertheless, snag management under the current forest plans has helped to retain snags where management activities occur that could reduce or eliminate snags. In combination with the fact that much of the HLC NF would continue be subject to natural forces such as wildfire, insect and disease (see effects common to all alternatives above), continued implementation of the current plans would ensure that snag habitat would continue to be available in the plan area.

Coarse woody debris

The majority of the HLC NF is in wilderness, RWAs, or IRAs where natural processes, including those acting on the amount and distribution of coarse woody debris, would predominate.

The existing Helena NF Plan does not include components specifically regarding coarse woody debris. The existing Lewis and Clark NF Plan includes only one forestwide standard related to coarse woody debris as wildlife habitat, providing general recommendations for retaining "down trees" for wildlife. Without specific guidance to retain coarse woody debris, the abundance and distribution of this habitat may continue to be driven primarily by other resource needs (i.e., soil development and fuels management) without specifically addressing wildlife habitat values. As noted above, however, the large proportion of the HLC NF that is in areas where natural processes would predominate would likely ensure that coarse woody debris continues to occur throughout the plan area, providing habitat for those species that use this habitat feature for all or a portion of their life history needs.

Cave, cliff, rock or other geologically-determined habitats

The existing Helena NF Plan includes a component requiring managers to identify nesting territories and roosting sites for peregrine falcons and to protect them from "habitat alteration". The plan also includes a requirement that powerlines constructed within peregrine falcon nesting habitat be designed to "protect raptors from electrocution". Plan components for mineral development (including hard rock mining) include only general references to protection of resources, and there are no plan components that specifically address mines as habitat, mine closures, or caves. Under this alternative, therefore, on the Helena NF portion of the HLC NF, there would continue to be lack of specific guidance regarding these habitats, particularly cave and cave-like habitats that may be used by bats.

The existing Lewis and Clark NF plan includes a standard requiring managers to maintain peregrine falcon "essential habitat (currently unoccupied)"; at the time the plan was written, peregrine falcons were listed as threatened under the ESA but have since recovered, re-occupied many former habitats, and been removed from that list. The Lewis and Clark NF plan also includes standard requiring inventory and evaluation of found "caves, sinkholes, and other connected geological features", with protections "based on their resource values and classification". The plan requires development of individual cave management plans for caves classified as significant, and evaluation of those caves before ground-disturbing activities to determine effects on "the cave structure and its ecosystem". The plan includes a standard stating that caves with high resource values may be withdrawn from mineral entry. The cave-

related standards on the Lewis and Clark NF portion of the HLC NF would increase the likelihood of caves used by bats being identified and those habitats potentially protected, as compared to the Helena NF portion.

Current standard practice on the Helena NF portion of the HLC NF is to conduct bat monitoring surveys (e.g., visual, acoustic, or live trapping) at individual inventoried abandoned mine features before closure, to determine whether RFSS (fringed myotis, long-eared myotis, and Townsend's big-eared bat) may be present. Similar surveys on the Lewis and Clark NF side are often, but not always carried out. The type and extent of survey conducted by Forest staff is dependent on factors such as extent of mine workings, timing of mine activity, proximity to water and forage opportunities, timing of closure, method of closure (i.e., grate, culvert, hard closure) and review of past area or site specific bat surveys. These practices, although not mandated by current plans, would likely continue under this alternative.

Because most cave, cliff and rock habitats are relatively inaccessible, and are affected primarily by geologic forces, habitat for species that use them for all or a portion of their life history needs would likely continue in the plan area under this alternative.

Cumulative Effects

The cumulative effects analysis area for terrestrial wildlife diversity considers management of adjoining lands. Portions of the HLC NF adjoin other NFs, each having its own forest plan. The HLC NF is also intermixed with lands of other ownerships, including private lands, other federal lands, and state lands. Some adjacent lands are subject to their own resource management plans. The cumulative effects of these plans in conjunction with the HLC NF revised forest plan are summarized in Table 64, for those plans applicable to terrestrial wildlife diversity.

Table 64. Summary of cumulative effects to terrestrial wildlife diversity from other resource management plans

Resource plan	Description and Summary of effects
Adjacent National Forest Plans	The forest plans for NFS lands adjacent to the HLC NF include the Custer-Gallatin, Lolo, Flathead, and Beaverhead-Deerlodge NFs. The Flathead and the Custer Gallatin plans are currently being revised under the 2012 Planning Rule; plan components are similar and complementary to the revised HLC NF plan, with components to maintain wildlife species diversity. The existing plans for all adjacent forests provide for wildlife diversity and include components specific to particular wildlife species or habitats, depending on concerns or needs specific to those areas.
BLM Resource Management Plans (RMP)	BLM lands near the HLC NF are managed by the Butte, Missoula, and Lewistown field offices. The Butte plan was recently revised (2009) while the existing plans for the Missoula and Lewistown areas are under revision. Primary issues for the Butte area plan included vegetation communities, wildlife and wildlife habitat, wildlife and plan species with special status or identified as priority for management, travel and access management, recreations, and special designations. Components for the revised Missoula plan are expected to be similar to those in the Butte plan but specific to needs of that resource management area.
National Park Service - Glacier National Park General Management Plan 1999	The general management plan for Glacier National Park calls for preserving natural vegetation, landscapes, and disturbance processes. The philosophy is to manage for the wild character and integrity of the natural heritage of the park, while providing for visitor services and facilities in areas managed for those uses. Management for natural vegetation and processes on lands that are immediately adjacent to lands on the Rocky Mountain Range GA of the HLC NF provides relatively consistent management of wildlife habitat across a large area.
Natural Resources Conservation Service – Montana Sage Grouse Initiative 2016	Portions of the eastern part of the HLC NF adjoin identified general habitat for sage grouse. Conservation focus is on private lands. Primary threats include cultivation of grazing lands, exurban development, improper grazing, nonnative plants, range management infrastructure, mesic area loss and degradation, conifer encroachment, and

Resource plan	Description and Summary of effects
	fence collisions. Conservation of sage grouse habitat also provides habitat for grass/shrub associated species that use HLC NF lands for part of life history needs.
Montana Statewide Forest Resource Strategy (2010)	MT conducted a Statewide assessment of forest resources and identified issue-based focus areas with implementation strategies and deliverables for each. Focus areas include biodiversity and resilience, including management and recovery of species diversity. Strategies supporting this focus area are consistent with management to provide for native species diversity on adjoining or nearby NFS lands. Focus areas also include changing ownership patters, and include strategies to minimize fragmentation of habitat, by prioritizing "at-risk" areas for management. This would complement HLC NF draft plan components to work with other entities to maintain or restore connectivity among landscapes.
Montana State Parks and Recreation Strategic Plan 2015-2020	These plans guide the management of state parks, and are generally focused on specific recreational, historic, cultural, or scenic values, depending on the specific park. Goals include managing for those values in a manner consistent with available resources; these goals could be consistent with maintaining wildlife diversity on NFS lands, but would not necessarily contribute to the desired conditions as described for the HLC NF.
Montana's State Wildlife Action Plan	Identifies community types, focal areas, and species in Montana with significant issues that warrant conservation attention. Communities include aquatic and terrestrial habitats. Specific regional focus areas found in proximity to the plan area include the North Fork of the Blackfoot (Scapegoat Wilderness). Several of the amphibian, bird, fish, mammal, and reptile species identified of greatest conservation need that may be found in the HLC NF plan area. This plan is complementary to, and provides information in support of desired conditions to maintain wildlife diversity, and supports recovery and conservation of species identified as 'at-risk' in the HLC NF plan.
County wildfire protection plans	Some county wildfire protection plans map and/or define the WUI. The HLC NF notes that these areas may be a focus for hazardous fuels reduction, and other plan components (such as NRLMD) have guidance specific to these areas. Managing for open forests and fire adapted species may be particularly emphasized in these areas. Overall, the effect of the county plans would be to influence where treatments occur to contribute to desired vegetation conditions.
County Growth Policy Plans	The HLC NF comprises 10 counties, each of which has individual growth plans of varying complexity. In general, most include support for recreation and tourism opportunities, many of which are based on natural landscapes and resources, including wildlife resources. Some plans include focus on access to public lands, and some focus on economic development through resource extraction. As such, plans may support some aspects of wildlife diversity while potentially having a negative impact on others.

Conclusions

Desired conditions for a variety of vegetation systems would bring habitat conditions throughout the HLC NF closer to the estimated NRV, and would provide a diversity of habitats used by native wildlife species. Plan components to maintain ecological integrity and ecosystem diversity would be sufficient to support all non-at-risk species on the landscape. Plan components for management of other resources would limit impacts to wildlife species and habitats by constraining certain activities that could have negative impacts on wildlife or habitats. Components in the draft plan (action alternatives) provide more specific desired conditions and other guidance that would better help managers achieve those conditions than components in the existing forest plans and alternative A.

3.15 Terrestrial Wildlife Species at Risk

3.15.1 Introduction

This section addresses the impacts of the draft plan, including alternatives, to at-risk species. The directives (USDA, 2015) for implementing the 2012 Planning Rule define 'at-risk species' as federally

recognized threatened, endangered, proposed, and candidate species, and SCC (FHS 1909.12, Chapter 20, 23.12).

The planning directives describe the context for assessing plan components affecting at-risk species: "Plan components that provide for ecological conditions for ecosystem integrity and ecosystem diversity…are the primary context for the evaluation of at-risk species". For most species, the only practical quantitative evaluation of their required ecological conditions is an assessment of habitat conditions. Additional information is provided in the terrestrial wildlife section, organized by vegetation groups.

The 2012 Planning Rule (USDA, 2012a) states that, where plan components designed to provide for ecosystem integrity do not sustain the ecological conditions required by an at-risk species, species-specific plan components may be needed. For some at-risk species, specific components have been included in the draft plan in order to sustain the ecological conditions (including but not limited to specific amount or distribution of habitat features, protection from human disturbance, etc.) required by that species.

At the time this report was prepared, there are five at-risk terrestrial wildlife species found on the HLC NF. Those species are as follows:

- Federally listed, proposed, or candidate species:
  - Grizzly bear – Threatened
  - Canada lynx – Threatened
  - Wolverine – Proposed
- Species of Conservation Concern (identified by Regional Forester for the DEIS and draft plan):
  - Flammulated owl
  - Lewis's woodpecker

Federally listed and proposed species will be analyzed in a Biological Assessment for consultation with the USFWS after a preferred alternative is chosen and concurrent with preparation of a FEIS.

3.15.2 Regulatory framework

Please refer to the introductory regulatory framework section of this chapter (3.3).

3.15.3 Assumptions

A key assumption in this section is rooted in the 2012 Planning rule and the directives for its implementation: "Plan components developed for ecosystem integrity and ecosystem diversity … are expected to provide for ecological conditions necessary to maintain the persistence or contribute to the recovery of native species within the plan area, including at-risk species identified in [the] assessment. … Ecological conditions include habitat and the effects of human uses (for example, recreation, grazing, and mining)." (FHS 1909.12, 23.13). The directives also state that "Plan components that provide for ecological conditions for ecosystem integrity and ecosystem diversity are the primary context for the evaluation of at-risk species." (FSH 1909.12, 23.13). We assume that the plan components for maintaining or restoring terrestrial ecosystems as described in the terrestrial vegetation section will provide for the basic habitat needs (foraging, denning, breeding, movement) of at-risk species, as they do for most terrestrial wildlife species (refer to the terrestrial wildlife diversity section). That information will be summarized or referred to as needed in this section.

The Rule also states that species-specific plan components must be included when the coarse-filter plan components described in the above paragraph are insufficient to ensure conservation or recovery of at-risk species (USDA 2012).

3.15.4 Best available scientific information used

This section relies primarily on information in the scientific literature, and in published and unpublished reports regarding the presence, distribution, and requirements of at-risk wildlife species and potential impacts on them of existing and proposed management actions. Because of the programmatic level of this analysis, life histories and drivers of at-risk wildlife species and populations are generally not discussed in detail. Information provided here is relevant to the factors that put these species at risk, and that are the focus of plan components. The information in this analysis relies in part on information in the Assessment (U.S. Department of Agriculture, Forest Service, Northern Region, 2015), which contains extensive citations and bibliographies of the science used to determine life history, status, presence and distribution, threats, and drivers of at-risk wildlife species. Additional discussion of science regarding at-risk wildlife species is found in supporting materials in the project file. The BASI used in development of the Northern Continental Divide Ecosystem Grizzly Bear Conservation Strategy (U.S. Department of Agriculture, Forest Service, 2013c) and in development and implementation of the NRLMD (U.S. Department of Agriculture, Forest Service, 2007c) are incorporated in this analysis both directly and indirectly through reference to those documents and their supporting materials.

Where needed in the assessment and in this section, specific discussion may be included regarding contradictory science, why some information is used to the exclusion of others, and regarding areas for which scientific information is lacking.

The terrestrial wildlife diversity and terrestrial vegetation sections also provide information about the BASI used for those resource areas. Analysis for those resources forms the foundation of the coarse-filter level of analysis referenced in this section. Appendices B and D contain more BASI for grizzly bear and Canada lynx.

3.15.5 Grizzly bear, affected environment

Scale and Scope of Analysis

Most impacts of the draft plan and alternatives to the draft plan are discussed at the scale of the planning area (entire HLC NF), because most plan components are to be applied forestwide. However, the HLC NF plans to incorporate the “Forest Plan Amendments to incorporate relevant direction from the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy” into the existing Helena NF and Lewis and Clark NF plans (Grizzly Bear Amendments) (HLC NF Draft Plan appendix I). Management direction in the Grizzly Bear Amendment would subsequently be incorporated into the revised HLC NF forest plan. The Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy (USFWS, 2013b), hereafter referred to as the Draft Conservation Strategy, and the Grizzly Bear Amendments describe management zones that will be established with specific expectations regarding occupancy by grizzly bears. These management zones are based on available habitat, patterns of land ownership and management, proximity to the recovery zone and source population, existing grizzly bear distribution, and other factors that are relevant regardless of whether the Grizzly Bear Amendment were to be implemented. Therefore, the management zones provide an appropriate scale and reference point for describing some impacts to grizzly bears, particularly those that relate to components in the amendments or those that are specific to areas where grizzly bears occur. Some impacts may also be discussed at the scale of the GA, where appropriate to the specific issue.

The biology and ecology of grizzly bears in the Northern Continental Divide Ecosystem and on the HLC NF have been described extensively in several other documents (USFWS, 2013a); (U.S. Department of Agriculture, Forest Service, Northern Region, 2015); USDA 2017b), as has information on habitat use and availability on the HLC NF. Discussion here will focus on grizzly bear distribution on the HLC NF, and aspects of grizzly bear life history and habitat requirements that are relevant to analysis of the potential impacts to grizzly bears of the draft plan and alternatives to the draft plan.

Status

The grizzly bear is currently listed as a threatened species under the ESA. There are six Grizzly Bear Recovery Zones identified in the Grizzly Bear Recovery Plan (USFWS, 1993), five of which are currently considered occupied(C. M. Costello, R. D. Mace, & L. Roberts, 2016). The entire Rocky Mountain Range GA and the portion of the Upper Blackfoot GA that is north of Highway 200 are within the Northern Continental Divide Ecosystem Recovery Zone.

Distribution

Grizzly bears are widely distributed throughout the Northern Continental Divide Ecosystem, including on the Rocky Mountain Range and Upper Blackfoot GAs of the HLC NFs. The Northern Continental Divide Ecosystem is contiguous with the grizzly bear population in the Rocky Mountains of Canada. The grizzly bear population in the Northern Continental Divide Ecosystem appears to be expanding in distribution, with the most marked expansion occurring to the southwest, and to the east onto the short-grass prairie on non-NFS lands (Mace & Roberts, 2012; USFWS, 2013b). They have been observed occasionally in the Divide GA, and in September 2017 the USFWS updated information regarding where grizzly bears may be present to include the Elkhorn Mountains, Big Belt Mountains, Little Belt Mountains, and Highwood Mountains. At least one grizzly bear has been observed in the Elkhorn Mountains and one in the Big Belt Mountains, although it is not known whether those are separate bears, or whether they have remained in those areas. In June 2017 two subadult bears were captured and euthanized on private land in the vicinity of Stanford, Montana, several miles north of NFS lands in the Little Belt Mountains and southeast of NFS lands in the Highwood Mountains.

The Draft Conservation Strategy (USFWS, 2013b) and the Grizzly Bear Amendment describe expected occupancy by grizzly bears of the different grizzly bear management zones. The primary conservation area, which is the same as the existing recovery zone, is expected to continue to function as a source population with continual occupancy by grizzly bears. The Rocky Mountain Range GA and the north half of the Upper Blackfoot GA fall within this area. In zone 1 (south half of the Upper Blackfoot GA on the HLC NF) continual occupancy is expected, but at lower densities than in the primary conservation area. Grizzly bears in zone 1 are considered part of the Northern Continental Divide Ecosystem population for the purposes of demographic monitoring. Zone 2 includes the Divide, Big Belts, and Elkhorns GAs, and has an objective of maintaining existing resource management and recreation activities while maintaining the opportunity for grizzly bears to move between the Northern Continental Divide Ecosystem and other ecosystems to the south and southwest. Occupancy by grizzly bears may occur in zone 2, but at lower densities than in zone 1 and in the primary conservation area, and management would be focused almost entirely on conflict prevention. Zone 3 includes the Highwoods, Little Belts, Castles, and Crazies GAs and large areas of private and other lands. Long-term survival and occupancy of grizzly bears is not expected in zone 3, due to lack of sufficient suitable habitat (USFWS, 2013b).

Food Habits

Grizzly bears use a wide variety of habitats within the Northern Continental Divide Ecosystem, and on the HLC NF. Availability of food and forage has not been identified as a key issue with respect to grizzly bear recovery in the HLC NF portion of the Northern Continental Divide Ecosystem. More detailed information about grizzly bear food habits can be found in the Assessment (U.S. Department of Agriculture, Forest Service, Northern Region, 2015) and in other documents cited there and in this section.

Key Drivers and stressors

The Draft Conservation Strategy (USFWS, 2013b) identified population management and habitat management as the key factors needed to successfully manage and conserve grizzly bears in the recovery ecosystem. Secure habitat has been identified as important to the survival and reproductive success of

grizzly bears, with motorized access identified as a stressor that may have a negative impact on the availability of secure habitat for bears (USFWS, 2011). Motorized access can affect bears by increasing human interaction and potential for conflict, displacing bears from important habitats, increasing the chance of habituation to humans, and increasing energetic requirements related to disturbance by humans (USFWS, 2011). This stressor (the amount and pattern of motorized access in grizzly bear habitat), can be influenced by FS management of NFS lands. This stressor also occurs on private lands that are not influenced by FS management.

Human developed sites have been identified as another potential stressor (USFWS, 2011) by contributing to habituation and food conditioning that may result in direct mortality of bears. Management of developed recreation sites on NFS lands is under FS control, but the activities occurring outside NFS boundaries are not.

Direct human-caused mortality, which can be associated with bear-human conflicts as well as with hunting (mistaken identity) and with illegal kills is another stressor (USFWS, 2011). Bear-human conflicts on private lands due to livestock depredation and due to conflicts related to attractants on private lands continues to be a primary source of mortality and is outside of NFS control. As the grizzly bear population expands, the availability of secure habitat outside NFS boundaries that is not heavily influenced by agriculture or other human activities may become an increasingly important driver of grizzly bear distribution and persistence outside the Northern Continental Divide Ecosystem and in management zones 2 and 3.

The Draft Conservation Strategy provides management recommendations intended to limit mortality and to provide secure habitat through actions or constraints that would be implemented across a number of resource management activities. Recommendations are specific to grizzly bear management zones and are based on goals and expected grizzly bear presence in those areas. Recommendations for the primary conservation area (recovery zone) are focused on the key issues of 1) limiting mortality by preventing or reducing bear-human conflicts, and 2) providing habitat security through limiting motorized access density and maintaining 'secure core' (see glossary) habitat in adequate amount and distribution. Habitat security is related to mortality, because habitats that are more accessible to humans have increased risk of bear-human encounters or other conflict situations that can result in mortality of bears. In addition to these issues, habitat connectivity was identified as a concern in the Draft Conservation Strategy (USFWS, 2013b) with respect to the health and trend of grizzly bear populations in other recovery zones. Connectivity it is not considered an indicator of the recovery or persistence of the grizzly population in the Northern Continental Divide Ecosystem or on the HLC NF.

The degree to which plan components address these key issues (mortality, habitat security, and connectivity) serves as indicators to how well the draft plan and alternatives achieve desired conditions related to grizzly bears, and contribute to recovery and long-term persistence of the population on the HLC NF.

Population Trend and Mortality

Research in 2004 (Kendall et al., 2009) estimated a total of 765 bears in the Northern Continental Divide Ecosystem as a whole. MTDFWP (C. M. Costello, R. D. Mace, & L. L. Roberts, 2016) estimates the population has been increasing at a rate of 2.3 – 3% annually since that time, leading to an estimate in 2016 of between 950 and 1,090 grizzly bears in the ecosystem.

Survival of reproductive females is considered a key issue in maintaining a stable or increasing population trend and in recovery and persistence of grizzly bears in the Northern Continental Divide Ecosystem. Human-caused mortality is the most significant factor influencing grizzly bear survival (Costello, 2016; Mace, 2012), with most mortality occurring as a result of conflicts with humans or property on non-NFS lands. To minimize the risk of conflicts related to food and attractants, food storage orders have been implemented on most NFS lands in the Northern Continental Divide Ecosystem. The

HLC NF is in the process of implementing a food storage order on zone 2 lands in the Divide, Big Belts, and Elkhorns GAs.

Habitat security

The Draft Conservation Strategy (USFWS, 2013b) and the 5-year review of grizzly bear status (USFWS, 2011) identified habitat security as a key issue in recovery. Existing levels of motorized route density are a useful and widely used expression of potential habitat security. In 1994 (updated in 1998) the Interagency Grizzly Bear Committee recommended maximum levels of motorized route density in recovery zones (IGBC, 1998), expressed as percentages of bear management unit subunits (see glossary). The existing Helena NF and Lewis and Clark NF plans do not include specific limits for motorized route density or secure core, but management actions on the HLC NF in the recovery zone and other parts of the NF where bears are known to occur have been guided by those recommendations. Motorized route densities and amounts of secure core for subunits on the HLC NF within the recovery zone are reported in the Draft Conservation Strategy (USFWS, 2013b). In September 2017 the USFWS added several GAs on the HLC NF to the area in Montana in which they recognize that grizzly bears may be present. These areas do not have delineated bear management unit subunits. Calculations of motorized route density therefore cannot be done the same way there as within the recovery zone (primary conservation area) nor as reported in the Draft Conservation Strategy, and can't be directly compared to route densities that are reported as recommended by the Interagency Grizzly Bear Committee.

In order to to allow comparison among all management zones and GAs and comparison with some published literature (e.g. (Boulanger & Stenhouse, 2014), motorized route densities were calculated for entire GAs as total miles per GA or portion of GA within each management zone, as shown in Table 65. Due to differences in datasets, the designations of routes included as 'open' or those in the 'total' calculation may not be exactly the same as those used for density assessments reported in the Draft Conservation Strategy (USFWS, 2013b) and elsewhere. Additional methods used for this estimation, including decisions about which routes to consider open or closed, are detailed in the project file. Estimates of motorized route density may differ from those reported in other documents, including other environmental assessments or decisions. These differences are due calculating over a slightly different total area, and/or different methods used. The numbers in Table 65 are intended solely for the purpose of broad comparison to published literature and other sources.

Table 65. Existing levels of open and total motorized route density, by GA and grizzly bear management zone HLC NF.

Grizzly bear management zone	GA	Open motorized route density[1] (mi/sq mi)	Total motorized route density[1] (mi/sq mi)
Primary Conservation Area	Rocky Mountain Range	0.1	0.2
	Upper Blackfoot (part)	0.4[2]	1.4[4]
Zone 1	Upper Blackfoot (part)	1.3[3]	1.4[4]
Zone 2	Divide	0.8	1.7
	Big Belts	0.9	1.6
	Elkhorns	0.7	1.2
Zone 3	Highwoods	0.6	0.7
	Little Belts	0.9	1.7
	Castles	2.1	2.7
	Crazies	0.6	1.6
	Snowies	0.3	0.6

1. Route densities calculated by dividing linear miles of open motorized road and trail by GA acreage, NFS lands only, to facilitate comparison among zones. Details of calculations, including which routes were included, are in the project file.

2. As reported in the Blackfoot non-winter travel management plan decision (USDA, 2013). The area reported for the PCA extends slightly south of the PCA as defined in the draft conservation strategy, and includes the area identified as the grizzly bear distribution zone in previous analyses for the Helena NF.
3. As reported in the FEIS for the Forest Plan Amendments: Incorporating Habitat Management Direction for the Northern Continental Divide Ecosystem Grizzly Bear Population (USDA 2017).
4. Total motorized route densities were calculated for the entire Upper Blackfoot GA and not separated into primary conservation area and zone 1.

Mace and others (Mace, Waller, Manley, Lyon, & Zuuring, 1996) found that female grizzly bears in northwest Montana used home ranges with lower road densities than other areas. They estimated a threshold of roughly 6 km/square km (1 mi/square mile) that differentiated between areas used and not used by female grizzly bears. That study has been used as the basis for management of motorized access route density throughout much of the Northern Continental Divide Ecosystem since that time. Lamb and others (2018) evaluated grizzly bear density relative to a 6 km/square km open road threshold in an area of British Columbia adjacent to the Northern Continental Divide Ecosystem. Their work supported that threshold as a point above which bear density tended to be lower. They noted, however, that other studies (e.g., (McLellan, 2015) found higher densities of bears occurred along with higher open road densities, influenced by road type and use as well as by habitat quality and food availability. Ruby (2014) found that in his study area in northwest Montana human development features, including roads, had little influence over grizzly bear habitat selection. In Alberta, Boulanger and Stenhouse (2014) found that most bears occurred in areas with open road densities below 1.5 km/sq km (2.4 mi/sq mi), and that most mortalities occurred at road densities above 1 km/sq km (1.6 mi/sq mi). They noted that mortality risk associated with roads appeared to be higher for females with cubs or yearlings than for other classes of females. Differences in the effects observed and the recommendations made among these and other studies are important, with differences among methodologies, definitions of roads and differences among classification of roads as open or not, different use types and levels, whether legal hunting of grizzly bears occurs, and different habitat type and quality. Therefore extrapolating precisely from any one study to the HLC NF is not possible. Rather, the range of studies and results provides general context for understanding the potential influence of motorized travel on grizzly bears.

Both the open and total motorized route densities calculated for each GA in its entirety across the HLC NF are well below the threshold road densities at which Boulanger and Stenhouse (Boulanger & Stenhouse, 2014) described decreased occupancy by grizzly bears, including reproducing females. Open road densities in all GAs except the Castles GA are also below that threshold as well as below the threshold identified by Mace and others (Mace et al., 1996) where use by females may decline or be precluded.

The amount and distribution of motorized travel that is allowed on NFS lands is regulated by travel management plans, but recreation settings also provide an indication and description of the amount and pattern of motorized and nonmotorized uses, along with other uses, on the landscape. Recreation settings are the attributes of a place that in combination provide a distinct set of recreation and access opportunities. The semi-primitive non-motorized, and primitive ROS categories differ in a variety of attributes, but are similar in not including motorized travel and in minimizing many types of human influence or development. Therefore, the amount and arrangement of these ROS categories provides another means to describe existing potential habitat security and connectivity for grizzly bears and other wildlife. The amount of those settings that occur under current management is shown by grizzly bear management zone in Table 66.

Table 66. Acres of summer primitive and semi-primitive recreation settings by grizzly bear management zone

Grizzly bear management zone[1]	Total acreage in nonmotorized recreation setting categories	Percent of total management zone on HLC NF
Primary conservation area	878,470	91%
Zone 1	90,464	61%
Zone 2	348,582	52%
Zone 3	378,849	39%

1. The primary conservation area includes the Rocky Mountain Range GA and the north half of the Upper Blackfoot GA. Zone 1 includes the south half of the Upper Blackfoot GA. Zone 2 includes the Divide, Elkhorns, and Big Belts GAs. Zone 3 includes the Highwoods, Little Belts, Castles, and Crazies GAs.

These recreation settings comprise NFS lands that may include areas with specific management designations, such as RWAs, IRAs and others. While motorized travel may be allowed in some designated areas, overall management in some designated areas increases the value of those areas as secure habitat for bears and other wildlife. Both motorized and mechanized travel are prohibited in Congressionally-designated Wilderness Areas ("Wilderness act - public law 88-577 (16 u.S. C. 1131-1136)," 1964). Motorized travel is minimized in WSAs, and is generally restricted to what was allowed prior to the area's designation. RWAs, identified in forest plans, provide areas where the influence of humans is minimal. The law creating the Conservation Management Area (Public Law 113-291), which is entirely on the Rocky Mountain Range GA, does not allow creation of new permanent motorized routes, and allows creation of new temporary motorized routes only for specific purposes and only within one quarter of a mile of existing main roads. Roads may not be constructed or reconstructed and timber may not be harvested in IRAs except under limited circumstances specified in the 2001 Roadless Rule (USDA, 2001). Although portions of some IRAs may have been substantially altered by construction of roads and by harvest of timber prior to enactment of the Roadless Rule in 2001, these areas generally provide security for grizzly bears, as well as connectivity within those landscapes for bears to move among different habitats and areas. The overlap of these designations throughout many areas of the HLC NF creates multiple layers of management requirements or guidance that cumulatively ensure these areas remain relatively free of human disturbance, providing substantial habitat security for grizzly bears and other wildlife. Table 67 shows the acreage of each type of designated area, by grizzly bear management zone. It also shows the acreage of each type overlapping with secure core, which is identified only in the primary conservation area. There is some spatial overlap among area designations, particularly among IRAs, WSAs, RWAs, and the conservation management area (refer to appendix A).

Table 67. Acres of designated areas and percent of total management zone on HLC NF by grizzly bear management zone

Grizzly bear management zone[1]	Designated wilderness[2]	WSA	Recommended wilderness	Conservation management area	IRA[2]
Primary conservation area	537,718 (56%)	0	0[3]	195,073 (20%)	425,647 (44%)
Zone 1	0	0	0	0	86,255 (58%)
Zone 2	28,440 (4%)	0	34,226 (5%)	0	285,895 (42%)
Zone 3	0	82,127 (8%)	0	0	548,982 (56%)

1. The primary conservation area includes the Rocky Mountain Range GA and the north half of the Upper Blackfoot GA. Zone 1 includes the south half of the Upper Blackfoot GA. Zone 2 includes the Divide, Elkhorns, and Big Belts GAs. Zone 3 includes the Highwoods, Little Belts, Castles, and Crazies GAs.
2. Designated wilderness does not overlap with any other categories of designation listed in this table except in small areas on the Rocky Mountain Range GA, where areas were added to Wilderness that are also

identified as IRA. Elsewhere and for most of the Rocky Mountain Range GA, designated Wilderness acres are in addition to acres listed under other designations.

3. The existing Lewis and Clark NF plan identifies RWAs on the Rocky Mountain Range GA. These areas were added to existing designated wilderness in 2014.

Habitat connectivity

Human activities such as roads and developments are the primary causes of grizzly bear habitat fragmentation (Servheen, Waller, & Sandstrom, 2001). Work has been done to assess both habitat and population connectivity within the Northern Continental Divide Ecosystem in terms of habitat, demographics, and genetics. Kendall and others (Kendall et al., 2009) concluded that there are few geographical barriers to the movement of grizzly bears within the ecosystem.

Occupancy by grizzly bears of lands outside the Northern Continental Divide Ecosystem is not identified as a recovery or management goal, but isolation of existing populations (USFWS, 1993) and the potential for ongoing fragmentation have been identified as concerns with respect to the health and recovery of grizzly bear populations in some ecosystems (USFWS, 2011). The Draft Conservation Strategy (USFWS, 2013b) identifies zone 2 bordering the south end of the ecosystem as having value for genetic connectivity between the Northern Continental Divide Ecosystem and the Greater Yellowstone Ecosystem (USFWS, 2013b). Peck and others (2017) provide information supporting that conclusion, noting that the western portion of zone 2 (including the Upper Blackfoot and Divide GAs) and adjoining areas to the west may be more important to grizzly bears moving from the Northern Continental Divide Ecosystem to the Greater Yellowstone Ecosystem than the reverse.

Although management in zone 2 is focused on reducing potential for grizzly bear-human conflict by implementation of food storage orders, the Draft Conservation Strategy acknowledged that existing blocks of HLC NF lands with low road densities or with no roads, such as IRAs and the conservation management area, contribute to potential use by bears. The nature of the island mountain ranges that make up the HLC NF, however, where blocks of NFS lands are separated by large landscapes of low-elevation generally nonforested private lands, often with multiple roads, towns and other human developments as well as extensive blocks of agricultural lands, all likely create some barriers to grizzly bear occupancy and movement between the Northern Continental Divide Ecosystem and the Greater Yellowstone Ecosystem, as well as among the Divide, Elkhorns, and Big Belts GAs.

There are several areas on the HLC NF that may be more likely than others to facilitate movement of grizzly bears and other large carnivores among isolated mountain ranges (GAs) by providing relatively high levels of habitat security on public lands that are immediately adjacent to large blocks of private land. These areas occur in IRAs, RWAs, WSAs, or other areas with low road densities or that have little or no motorized travel that are along the NF boundary. Such areas have greater potential connectivity value where they adjoin other public lands or private lands with little or no development.

3.15.6 Grizzly bear, environmental consequences

As discussed in the terrestrial wildlife diversity section and under the heading ‘assumptions’, plan components to maintain ecosystem integrity and diversity provide for most of the needs (foraging, denning, breeding, and movement) of grizzly bears on the HLC NF. The effects of these coarse-filter components in supporting recovery and sustaining a recovered grizzly bear populations will be discussed under the effects of alternatives, because plan components differ between the no action and action alternatives.

The 2012 Planning Rule states that species-specific, or fine-filter plan components may be required where coarse-filter plan components may not be adequate to ensure conservation or recovery of at-risk species. These fine filter plan components, guiding management of grizzly bear habitat and activities that could impact grizzly bears, are incorporated into all alternatives as the Amendment to Incorporate Management

Direction From the Northern Continental Divide Ecosystem Grizzly Bear Conservation Strategy into the Helena, Lewis and Clark, Kootenai, and Lolo NFs (Grizzly Bear Amendment) (HLC NF Draft Plan appendix I). The plan components found in the Grizzly Bear Amendment focus on minimizing human-caused mortality and on providing security from disturbance by humans, and are discussed under the 'effects common to all alternatives' section below. The potential consequences to grizzly bears of additional fine filter plan components are discussed for the alternatives in the appropriate sections below.

Effects common to all alternatives

Forest plan amendments to incorporate relevant direction from the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy

All alternatives, including the no-action alternative, incorporate the forest plan amendments to incorporate relevant direction from the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy into the existing Helena NF and Lewis and Clark NF plans (Grizzly Bear Amendment) (HLC NF Draft Plan appendix I). The amendments address the key issues of mortality, security and connectivity, so discussion of the consequences of that management direction is summarized here as a whole rather than separated into those categories.

A full analysis of the potential impacts of implementing the management described in the Grizzly Bear Amendment can be found in the Final Environmental Impact Statement, Volume 3: Forest Plan Amendments to incorporate relevant direction from the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy (USDA FS 2017b). The analysis in that document is separate for the Helena NF and the Lewis and Clark NF because there are two separate forest plans being amended. That analysis will not be repeated here, but key parts are summarized here as they relate to the analysis of consequences of the HLC NF draft plan and alternatives to the draft plan.

Grizzly Bear Amendment Alternative 2, with some modifications has been selected in the ROD for that analysis. The amended Helena NF plan under Alternative 2-modified would contribute to maintaining a well-distributed grizzly bear population across the Forest (USDA FS 2017b). The summary of consequences described for the portion of the HLC NF that was formerly the Lewis and Clark NF are nearly identical concluding that the "amended [existing] Lewis and Clark forest plan would maintain a well-distributed grizzly bear population on the Forest and contribute to supporting recovery of the NCDE population." (ibid).

Other management direction common to all alternatives – mortality

Currently, a food storage order exists for NFS lands throughout the primary conservation area, including the Rocky Mountain Range and Upper Blackfoot GAs on the HLC NF. The HLC NF is in the process of developing and implementing a food storage order for the Divide, Elkhorns, and Big Belts GAs (zone 2). A food storage order is also currently in place in specific developed recreation sites in the Little Belts GA (portion of zone 3). These orders are not part of the existing forest plans, but would be retained under all alternatives. The food storage orders minimize the risk of bear-human conflicts on NFS lands resulting from bears obtaining food at human use sites or developing an association between humans and available food.

Other management direction common to all alternatives – habitat security and connectivity

Under all alternatives, it is anticipated that travel management plans would remain the same as they currently are. Therefore in addition to the plan components requiring no net increase of open and total motorized route densities in the primary conservation area and zone 1 (Rocky Mountain Range and Upper Blackfoot GAs), motorized route densities as calculated for the entire HLC NF and displayed in Table 65 would remain the same. Under all alternatives, the amount and location of designated wilderness, WSAs, IRA, and conservation management area would remain as they are currently unless changed by Congress

through separate actions. Where those designations exist, the layers of management that create relative habitat security and potential connectivity for grizzly bears would remain as they currently are.

Effects of alternative A, no action

Discussion of the potential effects of implementing alternative A is limited to those effects that differ from or are not already discussed above under the section 'effects common to all alternatives'.

Coarse filter

Grizzly bears are habitat generalists that use a wide variety of vegetation types and structures to obtain food, find mates, rear young, and den. Refer to the terrestrial vegetation report for a comprehensive discussion of the predicted trend and status of habitat and vegetation types under this alternative.

Grizzly bears rely on foods that may occur in any number of habitat types, with key foods in spring often found in low elevation riparian areas and forest openings, as well as on private lands outside of the NF boundary. Under this alternative, riparian and wetland habitats would persist, although a lack of watershed-level desired conditions and plan components could have a negative impact on connectivity within and among these habitats. Existing plan components for managing identified riparian areas, as well as those for wildlife species and sensitive habitats would likely minimize impacts on a project or site-specific basis, thereby maintaining habitat for species, including grizzly bears, that use or depend on riparian and wetland habitats. Refer also to the aquatic ecosystems, terrestrial vegetation (non-forested vegetation), plants at risk (riparian guilds), and the terrestrial wildlife diversity (species associated with aquatic, wetland, and riparian habitats) sections of this DEIS.

Summer foods may include berries found in a variety of forest types, as well as small mammals, insects, and other foods not confined to any particular vegetation type. These habitats would be maintained under this alternative, although specific desired conditions for particular vegetation types would not guide management toward or away from the natural range or any other abundance or distribution of key habitats. Refer to the terrestrial vegetation section for discussion of specific vegetation types, and to the terrestrial wildlife diversity report for discussion of impacts to species associated with grass/shrub, hardwood tree, mixed conifer, and high elevation habitats, all of which likely provide some elements of grizzly bear spring, summer and fall habitat.

Bears have been documented denning in high-elevation areas with steep slopes and deep snow, but historically bears also denned in the foothills and prairies, where some denning activity has been recently documented. As discussed in the terrestrial wildlife diversity section, high elevation habitats are relatively un-influenced by forest management, so species dependent on this type of habitat would be expected to persist over the long term in the plan area, as they have under the current forest plans.

Habitat Security

The following management direction for grizzly bears would be retained in the Helena NF plan (USDA 2017c):

- Much of the existing forest plan management that is based on the Interagency Grizzly Bear Guidelines (IGBC, 1986).
- Existing forest plan direction for individual management areas, some of which specify limits on open road density.
- The existing Helena NF standard stating that new developed recreation facilities would generally not be constructed.
- Existing forest plan direction to reduce livestock impacts and to minimize grizzly bear – livestock conflicts on NFS lands in the recovery zone (primary conservation area).
- Existing forest plan standards and guidelines for vegetation management.

- Existing forest plan standards requiring no surface occupancy for minerals or energy leases in the recovery zone (primary conservation area).

Similar direction would be retained in the Lewis and Clark NF plan. Differences from that retained in the Helena NF plan described above are (USDA FS 2017c):

- Standards that require coordination of road construction and use with grizzly bear habitat needs, including continuing to apply the Interagency Rocky Mountain Front Wildlife.
- Monitoring/Evaluation program recommendations on the Rocky Mountain Range GA.
- Standards that control the type and intensity of activities, including road management, to benefit other wildlife species such as elk, particularly in the Little Belts, Highwoods, Castles, and Crazies GAs (zone 3).
- A standard requiring that livestock grazing that affects grizzly bears and/or their habitat would be made compatible with grizzly bear needs or be eliminated, in addition to continuing to apply the Rocky Mountain Front Wildlife Monitoring/Evaluation program recommendations specific to grizzly bears and livestock grazing.
- Surface occupancy for minerals and energy development in the recovery zone (primary conservation area) could be allowed, but standards constrain exploration and development activities, and require application of the Rocky Mountain Front Wildlife Monitoring/Evaluation program recommendations specific to oil and gas exploration and development.

The distribution and timing of motorized travel that is allowed on the HLC NF is regulated by travel management plans. Travel plans were completed for most portions of the HLC NF between 2007 and 2017. Although travel planning is a site-specific decision tiered to forest plans, the pattern of motorized use in current travel plans defines the recreation settings in alternative A. The amount and distribution of non-motorized recreation settings, which provide potential habitat security for grizzly bears, would remain as shown in Table 66 above (refer to the ‘affected environment’ section under ‘habitat security’).

Habitat connectivity

The existing forest plans do not provide specific direction regarding connectivity, although as described under the ‘affected environment’ section, the mix of IRAs, conservation management area, and other unroaded or lightly roaded areas likely provides some potential for grizzly bears and other large, wide-ranging species to move among daily and seasonal habitats and potentially across larger landscapes.

Areas such as the Highway 200 corridor through the Upper Blackfoot GA, and the Highway 12 corridor through the Divide GA, in addition to private lands in those areas may provide some impediments to grizzly bear movements through those landscapes, and may limit connectivity between the Northern Continental Divide Ecosystem and the Greater Yellowstone Ecosystem. Without specific plan components to retain habitat security on NFS lands adjacent to those and other areas, connectivity through them could remain limited. However, the majority of fragmentation and impacts to connectivity in those areas occur on non-NFS lands that are not affected by FS management actions.

Effects of the action alternatives

Coarse filter

Under all action alternatives, plan components would guide managers to move most vegetation types toward the NRV identified for each type. This would move habitats toward conditions that have historically sustained a persistent population of grizzly bears.

As discussed in the terrestrial vegetation section, the predicted trend for most vegetation types and structural stages does not differ among any alternatives. Vegetation management, livestock grazing, and other activities would be constrained by plan components designed to protect watershed integrity, riparian

habitats, and hydrologic function, thereby moving riparian habitats toward desired conditions that support functioning and resilient riparian and wetland ecosystems. Identification and management of RMZs, as well as conservation watershed networks, is likely to maintain or improve connectivity on NFS lands within and among these habitats.

Under all action alternatives, the vegetation types within grass/shrub, hardwood tree, and mixed conifer habitats would generally move toward the estimated NRV and toward desired conditions. These habitats currently provide sufficient food and other resources required by grizzly bears where grizzly bears exist, and would be expected to continue to do so under all action alternatives. Specific plan direction for whitebark pine in all action alternatives would conserve and potentially restore this grizzly bear food source in some areas, although the degree to which this occurs would be affected by the prevalence and spread of disease, as well as potential changes in climate.

Mortality

In addition to retaining food storage orders in the primary conservation area, zone 1 and zone 2, all action alternatives contain plan components to minimize the potential for impacts to wildlife resulting from various resource management activities or uses (FW-REC-DC-04, FW-RT-DC-06, RM-WL-STD-01) and to reduce wildlife-human conflicts (FW-WL-DC-04, FW-WL-GDL-02, FW-RSUP-GDL-01). These plan components would add to the benefits of the existing food storage orders by further reducing the risk of bear-human conflicts that may result in grizzly bear mortality.

Habitat security

In addition to law and policy guiding management of those areas, all alternatives include plan components for management of designated areas that would maintain or increase habitat security within those areas. Those include FW-WILD-DC-01 and FW-WSA-DC-01 which states that wilderness areas and WSAs will be dominated by natural processes and disturbances with a limited amount of human influence. FW-WSA-SUIT-02, 03 and 04 prohibit or limit human developments such as utility corridors, new roads, and developed recreation facilities. FW-IRA-DC-01 states that IRAs “provide for secure habitats for a variety of …wildlife species that are dependent upon large, undisturbed, unfragmented areas of land”. These components would maintain or enhance habitat security and connectivity for grizzly bears and other wildlife.

Although the draft plan identifies the desired condition of providing needed access to NFS lands (FW-LAND-DC-01, FW-LAND-OBJ-01, FW-LAND-GDL-01), other plan components emphasize removing or rehabilitating unneeded roads (FW-RT-GDL-15, FW-ACCESS-GDL-02), while components in specific GAs limit road building except for specific, limited purposes (EH-RT-STD-01, 02, EH-RT-GDL-01). Components for specific resources include provisions for limiting the impacts of roads and their use on wildlife (EH-EMIN-GDL-02, EH-RT-GDL-01). FW-LAND-GO-01 encourages the establishment of road user associations in order to limit the number of roads needed to access private land inholdings, and FW-RT-DC-06 states that the transportation system as a whole provides access while also protecting natural resources. While the Grizzly Bear Amendment sets limits on motorized route density in the primary conservation area and zone 1 (the Rocky Mountain Range GA and part of the Upper Blackfoot GA), these plan components would limit and guide road construction and use throughout the rest of the HLC NF. Additional plan components that would contribute to security for wildlife in general that would also contribute to grizzly bear habitat security are listed in Table 68 along with where they would apply. Descriptions in Table 68 paraphrase the actual components, to briefly illustrate the manner by which they may influence habitat security. Please refer to the draft plan for the actual text of plan components.

Table 68. Draft plan components that would contribute to providing habitat security for grizzly bears and other wildlife

Plan component	Grizzly bear management zone where applies	Description
FW-WL-DC-08	All	Low elevation non-forested provides forage intermixed with cover for wintering big game
FW-WL-DC-09	All	Nest and den sites relatively free of human disturbance
FW-WL-GDL-06	All	Vegetation management on big game winter range improves forage and retains cover
FW-ACCESS-GDL-02	All	To protect natural resources… unauthorized routes should be rehabilitated and restored to a natural condition
FW-WSA-GDL-03	All	To protect natural resources… unauthorized routes should be rehabbed and restored
FW-LAND-DC-03	All	Land adjustments enhance or protect resources including habitat for wildlife
FW-LAND-DC-02-05	All	Utility corridors, communication sites and the like occur within already disturbed areas, obsolete ones are removed, and authorizations are consistent with ecosystem desired conditions
FW-RT-DC-02	All	Transportation system has no unneeded roads
FW-RT-DC-06	All	Transportation system has minimal impacts on resources, including threatened and endangered species
FW-RT-GDL-15	All	Decommission unneeded roads, especially if doing so benefits fish and wildlife, including grizzly bears
DI-WL-GDL-01	Zone 2	Divide GA - manage lands to maintain or improve security and connectivity; vegetation management provides hiding cover, no increase in motor access, location of new trails doesn't impact wildlife habitats
DI-WL-GO-01	Zone 2	Divide GA - Acquire ownership and easement to intermingled lands for connectivity and security
EH-WL-DC-02	Zone 2	Elkhorns GA- Habitat provides for species requiring seclusion
EH-WL-GDL-01	Zone 2	Elkhorns GA- Permitted activities have conditions to reduce potential impacts to wildlife, including timing or other restrictions
EH-ACCESS-GDL-01	Zone 2	Elkhorns GA- Access to inholdings protects wildlife habitat through timing restrictions and or location
EH-WMU-GO-04	Zone 2	Elkhorns GA - Acquire private land inholdings when possible
EH-RT-STD-01	Zone 2	Elkhorns GA -New permanent roads allowed only for alleviating resource concerns
EH-RT-STD-02	Zone 2	Elkhorns GA -No trans-mountain road
RM-BTM-DC-01	Primary conservation area	Rocky Mountain Range GA - Maintains values of Badger-Two Medicine as large, undeveloped, non-motorized landscape
RM-CMA-DC-03	Primary conservation area	Rocky Mountain GA – CMA allows primarily non-motorized recreation providing primitive and semi primitive recreation opportunities
RM-CMA-STD-01	Primary conservation area	Rocky Mountain Range GA – In the CMA, no new or temporary roads except very limited purposes near other roads
RM-CMA-STD-02	Primary conservation area	Rocky Mountain Range GA – In the CMA, temporary roads must be restored within 3 years of project completion
UB-WL-GDL-01	Primary conservation area and Zone 1	Upper Blackfoot GA- Resource management activities in west-central and east-central should maintain or enhance wildlife habitat, movement areas, and connectivity; vegetation management provides

Plan component	Grizzly bear management zone where applies	Description
		cover, no increase in motorized use, locate new trails only where minimal impacts occur to wildlife

As described for alternative A, the amount of primitive and semi-primitive nonmotorized recreation setting under each alternative provides one means to measure and compare potential habitat security and connectivity for grizzly bears and other wildlife. The amount of those settings that would occur under the action alternatives is shown in Table 69. Alternative A is included in this table to facilitate comparison.

Table 69. Acres and percent of total management zone of summer primitive and semi-primitive recreation settings (nonmotorized categories) by grizzly bear management zone by alternative

Grizzly bear management zone[1]	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
Primary conservation area	878,470 (91%)	884,018 (92%)	884,018 (92%)	884,018 (92%)	878,472 (91%)
Zone 1	90,464 (61%)	93,387 (63%)	93,387 (63%)	93,387 (63%)	90,427 (61%)
Zone 2	348,582 (52%)	349,705 (52%)	350,014 (52%)	356,127 (53%)	341,374 (51%)
Zone 3	378,849 (39%)	378,940 (39%)	378,995 (39%)	419,669 (43%)	378,805 (39%)

1. The primary conservation area includes the Rocky Mountain Range GA and the north half of the Upper Blackfoot GA. Zone 1 includes the south half of the Upper Blackfoot GA. Zone 2 includes the Divide, Elkhorns, and Big Belts GAs. Zone 3 includes the Highwoods, Little Belts, Castles, and Crazies GAs.

There is not much difference among alternatives in terms of the amount or proportion of area in non-motorized recreation setting in total or by management zone. Most of the primary conservation area would remain nonmotorized and therefore relatively secure for grizzly bears because it occurs largely on the Rocky Mountain Range GA within the overlapping layers of Congressionally-designated wilderness, IRA, and conservation management area. Appropriately, the amount of potential habitat secure from motorized use in all alternatives is less in the zones moving further from the primary conservation area. Zone 3, where continued occupancy by grizzly bears is not expected, however, would still have more than one third of its area in non-motorized recreation settings.

RWAs may also contribute to habitat security for grizzly bears and other wildlife. All action alternatives except alternative E would include several RWAs, with the amount and location varying by alternative. Table 70 shows the amount of RWA by grizzly bear management zone by alternative. Alternative A, which also represents the existing condition, is included to facilitate comparison among all alternatives.

Table 70. Acres and percent of grizzly bear management zones in RWA by alternative

Grizzly bear management zone[1]	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
Primary conservation area	0	30,246 (3%)	30,246 (3%)	30,246 (3%)	0
Zone 1	0	23,315 (17%)	23,315 (17%)	25,315 (17%)	0
Zone 2	34,226 (5%)	47,726 (7%)	47,726 (7%)	98,227 (15%)	0
Zone 3	0	14,490 (1%)	14,490 (1%)	225,501 (23%)	0

1. The primary conservation area includes the Rocky Mountain Range GA and the north half of the Upper Blackfoot GA. Zone 1 includes the south half of the Upper Blackfoot GA. Zone 2 includes the Divide, Elkhorns, and Big Belts GAs. Zone 3 includes the Highwoods, Little Belts, Castles, and Crazies GAs.

The main difference among alternatives is that alternative E would have no RWAs, which is less than even the no-action alternative. Alternatives B, C, and D are similar in terms of the amount and proportion of RWA in the primary conservation area and zone 1, but alternative D would have more than twice as much area in RWA within zone 2 as compared to alternatives A, B and C. Alternative D would have more than fifteen times more RWA than alternative E and the no-action alternative.

Currently, travel management plans provide direction for the amount, distribution, timing, and specific routes where motorized travel is or is not allowed in areas identified in the alternatives as RWA. In alternatives B and D, both motorized and mechanized means of transport would be considered unsuitable in RWA. Implementing either of these alternatives would result in a reduction of the available mileage of motorized routes by 11.8 miles (alternative B) or 82.2 miles (alternative D, which includes roads and motorized trails), and would remove mechanize uses, including mountain bike use, from 205.7 miles (alternative B) or 360.2 miles (alternative D) of nonmotorized trails where mechanized uses are currently allowed. These impacts are not large, but would reduce the overall density of motorized routes very slightly in some areas (refer to congressionally designated areas section for area-specific information) compared to the existing situation and compared to the no-action alternative and alternatives C and E.

Connectivity

In all action alternatives, plan components would help to ensure habitat is maintained that would facilitate movements of grizzly bears and other large, wide-ranging wildlife among seasonal habitats, as well as among larger landscapes, including from one GA to another. Grizzly bear movements are often associated with riparian habitats, although this may be more important in nonforested habitats off NFS lands (Wilson et al., 2005). Nevertheless, plan components that maintain the integrity of riparian habitats (e.g., FW-WTR-DC-02, 04; FW-RMZ-DC-01; FW-RMZ-STD-03, 04; and FW-RMZ-GDL-04, 07, 08, 09, 11) may contribute to habitat connectivity at a watershed or sub-watershed scale. Other plan components (FW-RT-GO-03, FW-WL-DC-03, FW-WL-GO-03, and FW-VEGT-DC-03) guide management of roads and vegetation to facilitate wildlife movement, and to work with landowners and other agencies to identify and manage key areas for wildlife linkages among habitats and areas.

DI-WL-DC-01, DI-WL-GO-01, UB-WL-DC-01, UB-WL-GDL-01, LB-WL-DC-01, RM-WL-DC-01, and HW-WL-DC-01 all set desired conditions or guidance for specific GAs to maintain or enhance connectivity for wildlife species such as grizzly bears. The Upper Blackfoot and Divide GAs are likely potential routes for movement of male bears that may provide genetic connectivity between the Northern Continental Divide Ecosystem and the Greater Yellowstone Ecosystem (Peck et al., 2017). Plan components for the Divide and Upper Blackfoot areas identify specific areas where habitat security should be maintained or improved for grizzly bears and other wide-ranging wildlife species to move along the continental divide and surrounding areas that connect public lands in northern Montana with those in south and southwestern Montana.

Peck et al., 2017 also identified the Big Belts and Elkhorns GAs as possible routes of grizzly bear genetic connectivity between the two ecosystems, noting that the western areas (including the Divide and Upper Blackfoot GAs) may be more important for southward movement of bears from the Northern Continental Divide Ecosystem, and the eastern areas (including the Elkhorns and Big Belts GAs) may be more important for bears moving northward from the Greater Yellowstone Ecosystem. The location of RWAs in alternative D was informed by assessing which areas might provide potential connectivity among island mountain ranges, where habitat on NFS land remains relatively intact and intervening lands either provide minimal disturbance or distances between island mountain ranges are shortest. Alternative D would therefore have slightly increased potential to maintain connections among separate GAs for some wildlife species, although that potential would continue to be greatly affected by land management and uses on intervening non-NFS lands.

Effects of plan components associated with:

Aquatic ecosystems

Plan components for management of aquatic ecosystems support desired conditions to "provide the distribution, diversity, and complexity of landscape-scale features including natural disturbance regimes and the … ecosystems to which native species, [and] populations are uniquely adapted" (FW-WTR-DC-01), to maintain spatial connectivity within and among watersheds (FW-WTR-DC-02), sustain the ecological function of aquatic and riparian ecosystems, and retain their resilience in the face of disturbance (FW-FAH-DC-01). Most of the plan components relating to aquatic ecosystems provide constraints to maintain or enhance aquatic, riparian, wetland, and associated upland habitats. The effect of these plan components would be to maintain or enhance habitats that are used periodically by grizzly bears, particularly during the early spring and late summer periods.

Fire and fuels

Plan components for fire and fuels management are intended to achieve the desired condition to maintain and enhance resources and allow fire to function in its natural ecological role (FW-FIRE-DC-01). Specific plan components are designed to provide for public and firefighter safety, reduce risk to high value resources such as adjacent communities, and minimize impacts to designated wilderness, RWAs, and other areas that are managed to allow natural processes to predominate. Grizzly bears evolved in ecosystems largely shaped by fire, so allowing fire to play its natural role, to the extent possible, would be expected to sustain ecosystem components and characteristics on which grizzly bears depend. Some fire management activities could affect individual bears, through temporary displacement from areas where and when activities (such as fire suppression or fuels reduction) are taking place.

Terrestrial vegetation; plants at risk, and invasive species

Plan components for management of terrestrial vegetation are designed to maintain or move toward the NRV for ecosystem composition, structure, and function, and to maintain resilience in the face of disturbance (FW-VEGT-DC-01). Vegetation-related plan components also are intended to "provide habitat requirements to support … threatened or endangered species… based on the inherent capability of lands" (FW-VEGT-DC-02) and to "provide connectivity and allow genetic interchange to occur" (FW-VEGT-DC-03). Specific objectives, standards, and guidelines for vegetation, including forested and non-forested vegetation types, are designed to maintain or move toward desired conditions within the NRV for cover types, species or community presence, and vegetation structure. Plant species at risk, including whitebark pine, are to be recovered or sustained. Invasive species are to be contained, controlled, suppressed, or eradicated (FW-INV-DC-03). In sum, plan components for management of vegetation would sustain healthy, resilient plant communities on which grizzly bears depend for food and cover. Refer also to analysis in the Forest Plan Amendments to incorporate relevant direction from the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy (USDA 2017c) for discussion of additional plan components for management of vegetation.

Recreation settings, opportunities, access, and Scenery

The effects of plan components relating to recreation on NFS lands are discussed in part under the headings "Effects of alternative A - no action" and "effects of action alternatives" above. Certain recreation activities have the potential to impact grizzly bears by the simple fact of humans recreating in grizzly bear habitat, which creates potential for grizzly bear-human conflicts. Plan components for management of recreation include desired conditions and constraints designed to minimize impacts of recreation facilities on wildlife, including threatened and endangered species (FW-REC-DC-04, FW-REC-GDL-01, FW-REC-GLD-07), minimize or mitigate conflicts with other resources, including wildlife-human conflicts (FW-RSUP-GDL-01), and minimize and remove unauthorized recreation routes (FW-ACCESS-GDL-02). Overall, plan components for management of recreation would potentially result in some impacts to some individual bears where specific facilities or activities occur, but would minimize impacts to individual bears and to the grizzly bear population by including constraints designed

to reduce conflict and potential displacement of bears. Refer also to analysis in the Forest Plan Amendments to incorporate relevant direction from the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy (USDA 2017b) for discussion of additional plan components for management of access and of developed recreation.

Designated areas

Potential impacts of plan components for management of designated areas are incorporated into the discussion under "effects of alternative A - no action" and "effects of action alternatives".

Land status and ownership, and land uses; infrastructure-roads and trails, bridges and facilities

Potential impacts of plan components for management of land and of infrastructure are incorporated into the discussion under "effects of alternative A - no action" and "effects of action alternatives".

Public information, interpretation, and education

Plan components for public information would overall increase forest users' understanding of forest policies, activities, services, and issues (FW-CONNECT-DC-01), including regulations and safety practices for recreating in grizzly bear habitat.

Livestock grazing

Plan components for the management of livestock grazing are designed to maintain the integrity of ecological systems where grazing occurs (FW-GRAZ-DC-02, FW-GRAZ-STD-01) to minimize adverse impacts to wildlife and habitats (FW-GRAZ-GDL-01, 03, and 05). Although livestock presence on NFS lands presents a risk of depredation by individual grizzly bears, that risk is minimal (USFWS, 2013b) and would not necessarily result in adverse impacts to those bears. Refer also to analysis in the Forest Plan Amendments to incorporate relevant direction from the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy (USDA 2017b) for discussion of additional plan components for management of livestock grazing.

Timber

Plan components for the management of timber are intended to support the production of timber on lands identified as suitable for that use, as well as to manage timber harvest for other purposes. Standard FW-TIM-STD-04 would limit clearcutting and require interdisciplinary review of site specific conditions and desired conditions for habitat before clearcutting could be used. Standard FW-TIM-STD-08 would limit the maximum opening size of harvest units, and FW-TIM-GDL-01 would guide harvest activities to "contribute to ecological sustainability and ecosystem health" and to achieve desired vegetation conditions. Timber harvest activities have the potential to temporarily displace individual bears, but plan components would minimize impacts, and would move vegetation conditions toward desired conditions discussed in the terrestrial vegetation section. Some timber harvest could result in improved or increased foraging opportunities for grizzly bears. Refer to the timber section for information on projected harvest acres by alternative.

Fish and wildlife

These plan components pertain to the management of hunting, fishing, viewing, and other recreational opportunities provided by fish and wildlife on NFS lands. Plan components are designed to influence distribution and availability of wildlife for hunting and other uses, while balancing those opportunities with "desired conditions for wildlife populations and habitat security" (FW-FWL-DC-04). Management of habitat to influence distribution of wildlife is focused on providing adequate habitat security for elk (FW-FWL-GDL-01, 02) and other big game species where needed, which would contribute to habitat security for grizzly bears.

Energy and minerals

Plan components for the management of energy and minerals are focused on the desired condition of "supplying mineral and energy resources while assuring that the sustainability and resiliency of other resources are not compromised or degraded" (FW-EMIN-DC-01). Refer also to analysis in the FEIS, Volume 3: Forest Plan Amendments to incorporate relevant direction from the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy (USDA 2017b) for discussion of additional plan components for management of energy and mineral resources.

Cumulative Effects to Grizzly Bears

Table 71 summarizes the cumulative effects to grizzly bears from other resource management plans.

Table 71. Summary of cumulative effects to grizzly bears from other resource management plans

Resource plan	Description and summary of effects
Adjacent National Forest Plans	The forest plans for NFS lands adjacent to the HLC NF include the Custer-Gallatin, Lolo, Flathead, and Beaverhead-Deerlodge NFs. The Flathead NF plan is currently being revised under the 2012 Planning Rule. The existing plan includes amendments that provide habitat security for grizzly bears, and the revised plan would incorporate management direction in the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy (USFWS, 2013b), making it consistent with management discussed above in the Environmental Consequences of All Alternatives section. The Lolo NF plan is currently being amended to also incorporate that direction. Therefore, management of grizzly bear habitat throughout NFS lands in the Northern Continental Divide Ecosystem will be consistent across NF boundaries. Plans for the Beaverhead-Deerlodge and Custer-Gallatin NFs have been amended to incorporate the Greater Yellowstone Ecosystem Grizzly Bear Conservation Strategy, which provides adequate regulatory mechanisms to sustain a recovered grizzly bear population in the Greater Yellowstone Ecosystem. The cumulative effects of these forest plans would be to recover and sustain a recovered grizzly bear population in the Northern Continental Divide Ecosystem, while providing for connectivity among grizzly bear populations and recovery ecosystems throughout Montana.
BLM Resource Management Plans (RMP)	BLM lands near the HLC NF are managed by the Butte, Missoula, and Lewistown field offices. The Butte plan was recently revised (2009) while the existing plans for the Missoula and Lewistown areas are under revision. These plans contain components consistent with those identified in the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Plan, for BLM lands, and would therefore likely be complementary to the plan components for the HLC NF, and provide consistency in management of federal lands within the Northern Continental Divide Ecosystem to support recovery and sustaining a recovered grizzly bear population.
National Park Service - Glacier National Park General Management Plan 1999 and National Park Service – Glacier National Park Bear Management Plan 2010	The general management plan for Glacier National Park calls for preserving natural vegetation, landscapes, and disturbance processes. Glacier National park makes up 20% of the Northern Continental Divide Ecosystem, and is within the primary conservation area. Goals of the Bear Management Plan are to provide for long-term survivability of the grizzly bear in the park and in the Northern Continental Divide Ecosystem, which are consistent with those in the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Plan, which includes recommended management for grizzly bears In Glacier National Park. Management of grizzly bear habitat in Glacier National Park is expected to be complementary to and consistent with management on the HLC NF, and would support recovery and sustaining a recovered grizzly bear population.
Blackfeet Integrated Resource Management Plan (in progress)	In development – documentation not available. The Blackfeet Tribe participated in development of the Northern Continental Divide Ecosystem Draft Grizzly Bear Conservation Strategy, including recommended management of grizzly bears and habitat on the Blackfeet Indian Reservation adjacent to the Rocky Mountain Range GA of the HLC. Intent during development of the Draft Conservation Strategy was to provide management on Blackfeet lands that is consistent with grizzly bear management throughout the Northern Continental Divide Ecosystem as identified for those lands in the strategy.

Resource plan	Description and summary of effects
Montana Statewide Forest Resource Strategy (2010)	MT conducted a statewide assessment of forest resources and identified issue-based focus areas with implementation strategies and deliverables for each. Focus areas include such varied things as achieving ecological integrity through recovery of species diversity, managing for wildfire and public safety, supporting forest products infrastructure, and addressing changing forest ownership patterns. Management for these focus areas on state lands would adhere to management plans for specific state-owned lands; within the NCDE most state lands incorporate measures related to management for grizzly bear habitat.
Montana State Parks and Recreation Strategic Plan 2015-2020	These plans guide the management of state parks, some of which lie nearby or adjacent to NFS lands. Goals include managing significant, relevant, and accessible parks and programs in a manner consistent with available resources, as well as emphasizing visitor experience, partnerships, and awareness of the state parks system. These goals are compatible with or do not preclude management for a sustained population of grizzly bears.
Montana's State Wildlife Action Plan	This plan describes a variety of vegetation conditions related to habitat for specific wildlife species. This plan would likely result in the preservation of these habitats on state lands, specifically wildlife management areas. This plan would interact with the MT Statewide Forest Resource Strategy (above). The vegetation conditions described would be complementary to the conditions being managed for with the HLC NF revised forest plan.
Montana State Wildlife Management Areas	Plans are specific to management areas and their established purpose. Most in the plan area were established to conserve big game winter range, with goals to maintain forage, cover, and security during winter use periods. Management is generally compatible with grizzly bear management. Some areas have implemented food storage orders and compliance with management outlined in the Draft NCDE Grizzly Bear Conservation Strategy.
County wildfire protection plans	Some county wildfire protection plans map and/or define the WUI. The HLC NF notes that these areas may be a focus for hazardous fuels reduction, and other plan components (such as NRLMD) have guidance specific to these areas. Managing for open forests and fire adapted species may be particularly emphasized in these areas. Overall, the effect of the county plans would be to influence where treatments occur to contribute to desired vegetation conditions.
City of Helena Montana Parks, Recreation and Open Space Plan (2010)	The City of Helena manages 1,718 acres of open space that lie between the city limits and NFS lands in the Divide GA. The plan includes goals and recommendations for recreation use and trail management; noxious weed management; forest management; interpretive opportunities; wildfire mitigation; wildlife protection; and boundary identification. Could contribute to connectivity in zone 2, but may also contribute to bear-human encounters through management for recreation activities.

Conclusions

Alternative A – no-action

The FEIS for the Grizzly Bear Amendments (USDA 2017c) stated that continuing to implement the existing Helena NF and Lewis and Clark NF plans without the amendments "would be compatible with contributing to a recovered grizzly bear population", but would not allow for de-listing because of a lack of regulatory mechanisms to manage motorized access. Under this no-action alternative, the amendments would be combined with retained direction that provides management for grizzly bears and their habitat, as analyzed in alternatives 2 and 3 in the DEIS for the Grizzly Bear Amendments. The FEIS for the Grizzly Bear Amendments (USDA 2017c) concluded that although some activities could have minor effects on individual bears, implementing either alternative, and therefore implementing this no-action alternative, would contribute to sustaining a recovered population and would provide the necessary regulatory mechanisms to potentially allow grizzly bears to be removed from listing under the ESA. The information here that we have added to that analysis supports that conclusion. A determination of effect

will be made in a BA for consultation with USFWS on a preferred alternative, after that alternative has been selected.

Action alternatives

The FEIS for the Grizzly Bear Amendments (USDA 2017c) stated that implementation of the Grizzly Bear Amendment, which would occur under all action alternatives, would contribute to sustaining a recovered grizzly bear population. In addition to the Grizzly Bear Amendments, plan components included in all action alternatives would:

- contribute to reducing grizzly bear-human conflicts;
- provide specific desired conditions and other guidance for management of designated areas such as RWAs, IRAs, and the Conservation Management area as relatively intact, un-fragmented landscapes where natural processes predominate;
- provide clear constraints on road-building and clear direction for removing unneeded roads;
- identify specific areas in the Upper Blackfoot and Divide GAs to manage for habitat security and potential connectivity; and
- maintain or increase total area in nonmotorized recreation settings as compared to the existing situation.

The sum of that management direction would be to provide additional reduction in mortality risk and increased habitat security that would contribute to grizzly bear recovery and to sustaining a recovered grizzly bear population. The increased area in nonmotorized recreation settings as compared to the existing situation and no-action alternative would be largest in zone 3, providing more security for grizzly bears than may be available currently on HLC NF lands there. Alternatives B, C, and D provide more RWA, but because those areas largely overlap with existing IRAs, there would likely be very little difference among alternatives in terms of potential habitat security. In alternatives B and D, habitat security would be enhanced by removal of motorized travel in RWAs. Alternatives B and D could, therefore, contribute slightly more to grizzly bear recovery and to sustaining a recovered grizzly bear population than the other alternatives. A determination of effect will be made in a BA for consultation with USFWS on a preferred alternative, after that alternative has been selected.

3.15.7 Canada lynx, affected environment

Scale and scope of analysis

As discussed in the terrestrial wildlife diversity section, ‘assumptions’, plan components to maintain ecosystem integrity and diversity provide for most of the needs (foraging, denning, breeding, and movement) of Canada lynx on the HLC NF. Species-specific plan components for management of Canada lynx habitat and activities that could directly impact Canada lynx are incorporated into all alternatives as the NRLMD (hereafter referred to as the Lynx Direction) (USDA, 2007a). The plan components found in the Lynx Direction focus on maintaining sufficient amount and distribution of boreal forest habitat of the type and structural stage that provide foraging habitat for Canada lynx. A full analysis of the potential impacts of implementing the management described in the Lynx Direction can be found in the NRMLD Final Environmental Impact Statement (USDA, 2007b), Biological Opinion (USFWS, 2007) associated with it, and the Biological Assessment (USDA 2017d) and the Biological Opinion (USDI 2017) regarding Designated Critical Habitat for Canada lynx. This report will refer to those analyses and incorporate them into evaluation of the potential consequences to Canada lynx, and its designated critical habitat, of the HLC NF draft plan and alternatives to the draft plan.

The biology and ecology of Canada lynx in the Northern Rocky Mountains and on the HLC NF have been described extensively in several other documents (Ruediger et al., 2000) (U.S. Department of the Interior, Fish and Wildlife Service, 2000); USDI Fish and Wildlife Service 2003, 2006, 2009, 2014).

Ecology and management

Distribution

The plan area is within the Northern Rocky Mountain Range GA for lynx (Interagency Lynx Biology Team 2013). In Montana, lynx are primarily restricted to northwestern Montana. The majority of the plan area is outside of the current known distribution.

In the plan area, Canada lynx occur as a resident population throughout the Rocky Mountain Range and Upper Blackfoot GAs, and in the northern portion of the Divide GA. This portion of their range within the Northern Rocky Mountain Range GA is considered to be within the Northwestern Montana/Northeastern Idaho core area (Interagency Lynx Biology Team 2013, (U.S. Department of the Interior, Fish and Wildlife Service, 2005a). A "core area" is an area "with the strongest long-term evidence of the persistence of lynx populations supported by a sufficient quality and quantity of habitat" (U.S. Department of the Interior, Fish and Wildlife Service, 2005a), which consists of boreal forests with dense horizontal cover supporting snowshoe hare populations (refer to 'Habitat Status and Connectivity' section for a detailed description of lynx habitat). More specifically, core areas have verified evidence of long-term historical and current presence of lynx populations that are persistent despite periodic fluctuations, have evidence of reproduction within the past 20 years, and have boreal forest vegetation types, as described above, of the quality and quantity to support lynx and snowshoe hare (ibid). The northwestern Montana/northeastern Idaho area coincides with the area in which Canada lynx Critical Habitat has been designated and is protected under the ESA.

According to the Lynx Conservation and Assessment Strategy (Interagency Lynx Biology Team 2013) and the Recovery Outline (U.S. Department of the Interior, Fish and Wildlife Service, 2005a), the remainder of the plan area occurs within secondary areas, with the exception of the Highwoods and Snowies GAs, which are considered peripheral. Secondary areas are defined as having "fewer and more sporadic current and historical records of lynx", and no documentation of reproduction (ibid). Peripheral areas have sporadic historical records of lynx, generally corresponding to cyclic population highs in populations in Canada (ibid), and have no records or evidence of reproduction. Both these areas "may contribute to lynx persistence by enabling successful dispersal and recolonization of core areas, but their role in sustaining lynx populations remains unknown" (Interagency Lynx Biology Team, 2013).

The Rocky Mountain Range, Upper Blackfoot, and Divide GAs are currently considered 'occupied' habitat per an amendment (U.S. Department of Agriculture, Forest Service, 2006) to the Canada Lynx Conservation Agreement (U.S. Department of Agriculture, Forest Service & U.S. Department of the Interior, 2005). The island mountain ranges, comprising the remaining seven GAs, are currently considered 'unoccupied' by lynx (see appendix A). An area is considered occupied when there are at least two verified observations or records since 1999 of individuals that are not transient, or by evidence of reproduction (U.S. Department of Agriculture, Forest Service, 2006). This distinction differs from the 'may be present' determination made by the USFWS, which reflects the possibility of individual lynx occurring as either transients or as resident individuals, for the purpose of consultation under the ESA.

Most of the research on lynx in Montana has occurred west of the Continental Divide, so more detailed information regarding lynx distribution in the occupied portion of the planning area is not available. More work has been done to delineate lynx habitat within the plan area, as described under "Habitat Status and Connectivity."

Population trend

No reliable information is available regarding the number of lynx or trend of the lynx population in the plan area or region-wide. Efforts in the region to maintain lynx populations have focused on maintaining habitat (see "Habitat Status and Connectivity" section).

Key drivers and stressors

Food habits

Snowshoe hares are the primary prey of lynx throughout their range (Mowat, Poole, & O'Donoghue, 2000) (Interagency Lynx Biology Team, 2013). Summer diets may contain a broader range of prey species, based on their availability (John R. Squires, Decesare, Kolbe, & Ruggiero, 2010). Red squirrels are an important secondary prey species in many areas, while grouse, northern flying squirrel, ground squirrels, porcupine, beaver, mice, voles, shrews, weasels, fish, ungulates, and ungulate carrion have all been reported in the diets of lynx in various portions of their range ((Interagency Lynx Biology Team, 2013). Lynx diets are limited primarily to snowshoe hare in winter due to snow characteristics and to the ecology of various alternate prey species.

Habitat status and connectivity

Lynx use habitats where their primary prey species are available. Broadly, Canada lynx habitat is defined as boreal forest. More specifically, snowshoe hares occur in boreal forests with dense horizontal cover that reduces their exposure to predators and provides access to food and thermal protection (Interagency Lynx Biology Team, 2013). In western Montana, winter snowshoe hare density was highest in dense, mature forests, and in summer was highest in both dense young and dense mature forest (ibid). Habitat types in the Northern Rockies capable of dense horizontal cover on the forest floor provide habitat for snowshoe hare (Ruediger et al., 2000); ((Interagency Lynx Biology Team, 2013); (John R. Squires et al., 2010); Holbrook et al. 2016), and consist of cover types that include Engelmann spruce, subalpine fir, mixed spruce-fir, mixed aspen and spruce-fir, mixed lodgepole and spruce-fir, and lodgepole pine. Generally snowshoe hare and lynx do not use drier habitats, including lodgepole pine habitat types occurring on drier sites, or dry Douglas-fir habitat types, because these do not provide dense horizontal cover. Habitat used by red squirrels, an important secondary prey species, overlaps snowshoe hare habitat extensively but does not generally extend to young forests that are not yet producing cones.

Lynx habitat maps for the plan area have been created to serve a number of purposes, and have used existing vegetation data derived from remote sensing, aerial photo interpretation, stand exams, or combinations thereof. Those maps were inconsistent across the plan area due to the varied availability of data sources, as well as to slightly different methodology, between and even within the two forests. In 2010 the east-side Forests of the Northern Region (Helena, Lewis and Clark, Custer, and Gallatin NFs) began collaborating on a uniform method to map lynx habitat, along with habitat for some other species. This effort, referred to as the “East Side Assessment”, was intended to develop reliable, consistent habitat mapping and modelling protocols that could be used for mid to large scale assessments of forest and habitat conditions.

Using the methods established in the East Side Assessment but updated to incorporate Regional direction (USDA FS Regional Forester habitat clarification memo Sept 6 2016) and the most recent vegetation data available, Canada lynx habitat was mapped for the plan area (refer to project file for details on mapping methods). Specific vegetation types were selected as potential lynx habitat across the plan area. Mapping also included information on recent disturbances, using assumptions developed by the East Side Assessment team regarding the impacts of those disturbances on lynx habitat. As of the publication of this draft, the mapping method is undergoing some corrections, and results shown below are preliminary and subject to change. Nevertheless, the map and table provide an idea of the overall amount of Canada lynx habitat in the plan area and the relative amounts in the GAs comprising the plan area. This gives a broad picture of the ability of the plan area and GAs to potentially sustain lynx. This also gives a general idea of the amount of habitat forestwide and within each GA to which the standards and guidelines of the Northern Rockies Lynx Managemetn Direction apply.

Table 72 summarizes lynx habitat into categories identified as ‘potentially suitable for snowshoe hare’ or ‘not currently suitable for snowshoe hare’ but that may provide habitat at another time. Categorization of

lynx habitat as ‘suitable’ or ‘not currently suitable’ is based on vegetation composition and structure, whether habitat is a vegetation type that may produce snowshoe hare habitat but is not currently in a stage to do so, and by past disturbances. Currently suitable habitat includes multi-storied and stand-initiation stages of the forest types described above. Habitat categorized as not currently suitable includes the same types in the early stand-initiation and stem exclusion stages. Habitat identified as not currently suitable is expected to become suitable in time, as succession proceeds and horizontal cover develops.

Table 72. Canada lynx habitat on the HLC NF, by GA

GA	Total potential habitat	Potential habitat – snowshoe hare habitat	Potential habitat – not currently snowshoe hare habitat	Percent of total habitat potentially suitable for hares	Percent of GA that is potential habitat	Percent of GA that is nonhabitat
Big Belts	84,900	16,200	68,700	19%	27%	73%
Castles	33,200	7,400	25,800	22%	48%	52%
Crazies	37,400	19,800	17,600	53%	65%	35%
Divide	111,000	30,300	80,700	27%	55%	45%
Elkhorns	55,500	14,000	41,500	25%	34%	66%
Highwoods	7,200	1,700	5,500	24%	17%	83%
Little Belts	501,500	171,200	330,300	34%	62%	38%
Rocky Mountain Range	465,900	78,000	387,900	17%	60%	40%
Snowies	30,000	8,200	21,800	27%	25%	75%
Upper Blackfoot	246,900	70,300	176,600	28%	74%	26%
Forestwide	1,573,500	417,100	1,156,400	27%	55%	45%

Female lynx home range sizes estimates vary from less than 10 mi2 (6,400 acres) in northern Minnesota, to over 50 mi2 (32,000 acres) in the southern Canadian Rockies (Interagency Lynx Biology Team, 2013), with female home range size in northwestern Montana estimated at over 40 mi2. These estimates vary due to differences in methods of measurement and calculation, as well as due to habitat and prey abundance and distribution. The amount of area required to sustain persistent occupation of a female lynx year-round depends on a variety of factors, including the structural quality and arrangement of habitat within the home range, abundance of hares, cycling of hare populations, availability and use of alternate prey species, etc. The Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team, 2013) suggests that in the western U.S. at least 10 mi2 (6,400 acres) of primary vegetation (e.g., spruce/fir) must be present to support a female lynx year-round.

Table 72 provides some idea of the amount of lynx habitat within each GA, and provides a rough point of comparison to the home range sizes and amount of habitat required by female lynx. It appears that the Castles, Crazies, Elkhorns, Highwoods, Big Belts, and Snowies GAs do not contain enough potential habitat to support more than a few individual lynx. Furthermore, these GAs are each isolated mountain ranges, separated from each other and from other lynx habitat by significant stretches of low elevation, often agricultural landscapes that do not support lynx or their primary prey species. Their size, isolation, and habitat characteristics likely preclude them currently or historically sustaining lynx populations. The

degree to which those areas supported lynx historically remains unknown, as does the possible contribution of those areas to the overall lynx population.

The Castles, Crazies, and Elkhorns GAs fall within the broadly drawn 'secondary area' in the Lynx Recovery Outline (U.S. Department of the Interior, Fish and Wildlife Service, 2005a). Secondary areas contain boreal forest, but it may be inherently patchier and/or drier, and have snow or habitat conditions that are not favorable to lynx (ibid). In peripheral areas, such as the Snowies and Highwoods GAs, habitat may occur in small patches not well connected to larger patches of high quality habitat (ibid), such as in island mountain ranges (Interagency Lynx Biology Team 2013). Peripheral areas "are considered to be incapable of supporting self-sustaining populations of lynx" (ibid). It is possible that secondary and peripheral areas may play a role in sustaining lynx populations during times of population fluctuation (ibid), but that possibility remains unclear and speculative. All of the above GAs are also considered currently unoccupied by lynx (U.S. Department of Agriculture, Forest Service, 2006).

The Little Belts GA, also within the secondary area (U.S. Department of the Interior, Fish and Wildlife Service, 2005b), contains more potential lynx habitat than the other GAs that occur east of Interstate 15, but this GA is also an isolated mountain range, and the nearest neighboring mountain ranges (Big Belts and Castles) do not appear capable of sustaining persistent lynx presence. The lack of connectivity with the area of lynx distribution and core habitat in western Montana, combined with the patchiness of currently suitable lynx habitat at any given time in this GA makes it unlikely that lynx would persist over the long term in the Little Belts GA. The Little Belts GA is currently considered unoccupied.

The Divide GA does not contain a large amount of lynx habitat, but what occurs is largely west of the Continental Divide, and is contiguous with the Upper Blackfoot GA and adjoining the Garnet Range, which has the southernmost lynx habitat in Montana known to be currently occupied (Interagency Lynx Biology Team 2013). Core areas identified in the Recovery Outline which include the Rocky Mountain Range and Upper Blackfoot GAs, contain larger patches of boreal forest and more lynx habitat in total. These areas are also well connected to large areas of Canada lynx habitat on the Flathead and Lolo NFs to the west, and Glacier National Park to the north. They may also provide some level of connectivity with the identified core area in the Greater Yellowstone area to the south. The Divide, Upper Blackfoot, and Rocky Mountain Range GAs are all currently considered occupied (U.S. Department of Agriculture, Forest Service, 2006).

The primary factor causing Canada lynx to be federally listed as threatened was the lack of guidance for conservation of lynx and snowshoe hare habitat in NF Land and Resource Plans and BLM Land use plans, since a large amount of lynx habitat occurs on lands managed by those agencies (U.S. Department of the Interior, Fish and Wildlife Service, 2000). Consequently, NFs in Region One amended their forest plans with the NRLMD (U.S. Department of Agriculture, Forest Service, 2007a), which applies to NFs that are considered occupied by lynx (U.S. Department of Agriculture, Forest Service, 2006) (U.S. Department of Agriculture, Forest Service & U.S. Department of the Interior, 2005). The purpose of the NRLMD is to "incorporate management direction in land management plans that conserves and promotes recovery of Canada lynx, by reducing or eliminating adverse effects from land management activities on NFS lands" (U.S. Department of Agriculture, Forest Service, 2007a). The NRLMD established standards and guidelines for managing lynx habitat and for managing projects or activities that occur within occupied lynx habitat. The NRLMD also includes objectives and standards to maintain habitat connectivity within lynx analysis units (LAUs) as well as within and among linkage areas. Potential linkage areas were identified in the NRLMD (USDA 2007b), and included areas connecting the GAs where lynx are found or that are considered either core or secondary areas. Linkage areas between GAs may be somewhat limited by the type of habitat and extent of human development existing between these GAs. Discussion of the relative connectedness or isolation of the GAs within the plan area is incorporated into the paragraphs above.

Forests having lynx habitat in Region One have delineated LAUs to facilitate project-level assessment and impact analysis. LAUs approximate the size of a female home range and were drawn using original habitat maps for each forest, capturing enough year-round habitat (approximately 10 mi^2 or roughly 6,430 acres of primary vegetation, such as spruce-fir forest) to support one female lynx. The Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team 2013) recognizes that new vegetation databases and mapping efforts, such as the East Side Assessment, may result in adjustments or redrawing of LAUs, to preserve the original analysis and management intent.

Changes to LAU boundaries based on updated mapping

Canada lynx was listed as a Threatened species under the ESA in March 2000. In August of that same year, the Canada Lynx Conservation Assessment and Strategy (Ruediger et al., 2000) was published. In compliance with the Conservation Strategy, NFs mapped lynx habitat using available vegetation information, and delineated Lynx Analysis Units (ibid). At the time LAUs were delineated the HLC NFs were separate forests, and the vegetation information available for mapping lynx habitat varied in quality and availability across both forests. In an effort to provide an up–to-date and uniform lynx habitat map across the entire combined HLC NF, lynx habitat was re-mapped in 2017. The re-mapping used the same habitat descriptions from the LCAS (ibid) as the original mapping, but used updated vegetation mapping (VMAP 2014, from 2011 satellite imagery) and the potential vegetation layer developed by Jones (2004).

As described in the Lynx Conservation Assessment and Strategy (Ruediger et al., 2000), the NRMLD ((U.S. Department of Agriculture, Forest Service, 2007a), and multiple documents (Holbrook et al. 2017; (Ruediger et al., 2000), (J. R. Squires, Olson, Turner, DeCesare, & Kolbe, 2012) (John R. Squires et al., 2010); (Kosterman, 2014), lynx habitat on the east side of the Continental divide is composed of subalpine fir forests (primary vegetation) dominated by cover types of spruce/fir, Douglas-fir, and seral lodgepole pine. Moist Douglas-fir habitat types (secondary vegetation) may contribute to lynx habitat where intermingled and immediately adjacent to primary vegetation. The HLC NF queried our current vegetation map product (VMAP 2014) and identified all subalpine fir and Engelmann spruce habitat types (abla1, abla2, abla3, abla4, and picea) as primary vegetation, and moist Douglas-fir types (psme2) within 300 meters of primary vegetation as secondary.

After mapping the habitat, we reviewed the existing LAU boundaries for consistency with the conservation measures identified in Chapter 7 of the original Lynx Conservation Assessment and Strategy (Ruediger et al., 2000) and Chapter 5 of the 3rd Edition (Interagency Lynx Biology Team 2013), which states that LAUs should: 1) be 16,000 to 25,000 acres in size (larger in less contiguous habitat), 2) follow watershed boundaries, and 3) contain at least 6,400 acres of primary vegetation. The guidance regarding LAU boundaries also suggests that their spatial arrangement be evaluated and LAUs with insignificant amounts of lynx habitat may be discarded or the habitat may be incorporated into neighboring LAUs.

Based on the updated lynx map, and following the guidance for evaluating LAUs as described above, the HLC NF has adjusted LAU boundaries as follows (see maps by GA in appendix A). These adjustments follow Standard LAU S1 of the NRLMD (USDA Forest Service 2007). The standards and guidelines found in the NRMLD, and incorporated into Forest Plan direction, apply to lynx habitat within LAUs.

- Remove DR-01 in the Big Belts GA from the plan area LAUs. There are only 18 acres of primary vegetation in this LAU on private land, and neighboring LAUs are not close enough to this small area of habitat to incorporate it into those LAUs.
- Remove BB-03 within the Big Belt GA and incorporate the habitat into BB-02. LAU BB-03 had only 4,009 acres of mapped primary vegetation. That primary vegetation is closest to BB-02. In addition, redraw BB-02 boundaries to align with watersheds and exclude areas with patchy or no primary vegetation. This brings the amount of primary vegetation in BB-02 to 10,065 acres and reduces the size of the LAU from 248,195 acres (the combined BB-02 and BB-03) to 77,353 acres.

- Remove HW-01 in the Highwoods GA from the plan area LAUs. There are only 1,092 acres of primary vegetation in this LAU, and 1,317 acres in the entire GA. The Highwoods GA is completely isolated from other GAs by intervening low-elevation private lands that are not lynx habitat, so it is not possible to incorporate the small acreage of primary habitat in this GA into the nearest LAUs.
- Within the Rocky Mountain Range GA, incorporate approximately 1000 acres of primary vegetation in the Jones Creek area that was not originally within an LAU into the RM-09 LAU.
- Remove SM-02 and SM-04 within the Snowies GA. Incorporate the habitat into SM-01 and SM-03, and adjust the boundary between the two to provide approximately 6400 acres of primary vegetation in each of the remaining two LAUs. There are only 13,007 acres of primary vegetation within the Snowies GA, therefore only two LAUs should be delineated.
- Within the Little Belt GA, there is over 41,000 acres of primary vegetation outside the current LAU boundary. In some areas that primary vegetation is isolated; however in a number of areas there are concentrated patches near existing LAUs. Create a new LAU in the northeast area, and adjust the boundaries of the new LAU (LB-22) and LB-11 to follow watershed boundaries. LB-11 currently incorporates 17,038 acres of primary vegetation. With the addition of LB-22 the two LAUs would incorporate 28,966 acres of primary vegetation. In addition, several other LAUs (LB-03, LB-05, LB-06, LB-12, LB-15, and LB-19) will be expanded to capture primary vegetation near their existing boundaries.
- In all LAUs, boundaries were adjusted to match current watershed boundaries. This is primarily a mapping cleanup exercise intended to remove slivers in the GIS mapping. In a few cases, the boundary adjustment resulted in changes of less than 100 acres where the watershed boundaries used in the current mapping effort differed slightly from those used in 2000 for the original habitat and LAU maps.

The changes in LAU boundaries occur across a total of approximately 358,300 acres of mapped lynx habitat in 5 GAs. Approximately 35,233 acres of primary vegetation would be added into new or existing (adjusted) LAUs; although the total acres within LAUs would decrease by 141,146 acres. Roughly 10,900 acres on the Rocky Mountains GA are added into LAUs. The Rocky Mountain Range GA is the only GA where adjustments are being made that is currently considered “occupied habitat” (U.S. Department of Agriculture, Forest Service, 2007b); (U.S. Department of Agriculture, Forest Service, 2006), and is within designated Critical Habitat. An additional 29,019 acres of mapped lynx habitat, and 46,435 acres total, will be incorporated into LAUs in the Little Belts, which is currently considered “unoccupied habitat” (ibid.). The management direction in the NRMLD would apply to the added acres on the Rocky Mountain Range GA, and would be considered in all planning and management proposed on the added acres in the Little Belts GA. Slightly more than 3,500 acres of mapped habitat spread across two widely separated GAs (Big Belts and Highwoods) would no longer be within an LAU. These acres occurred within habitat considered “unoccupied” (ibid.), are identified by the USFWS as occurring within secondary and/or peripheral areas (U.S. Department of the Interior, Fish and Wildlife Service, 2005a), and are in isolated areas not connected to other lynx habitat. Mapped lynx habitat that is not within an LAU (secondary vegetation and limited amounts of primary vegetation) would be managed as described in the terrestrial vegetation report, to achieve desired conditions that include components regarding species composition and forest structure (refer to the draft plan components for Terrestrial Vegetation, and to the terrestrial vegetation section). Most desired conditions for vegetation would move forest composition and structure toward or within the estimated NRV. Management to achieve those desired conditions would maintain the ecological conditions necessary to support native wildlife species, including lynx and their prey.

Canada lynx critical habitat

Canada lynx is the only federally listed wildlife species on the HLC NFs that also has designated critical habitat. The Rocky Mountain Range and Upper Blackfoot GAs, and the northern portion of the Divide GA are within Unit 1 of designated Canada lynx Critical Habitat (USFWS, 2014). Critical habitat receives protection under Section 7(a)(2) of the ESA. Areas identified as critical habitat contain the

primary constituent elements, which are specific biological or physical features that provide for a species' life history processes and are essential to the conservation of the species (USFWS, 2014). The primary constituent element for lynx is 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 conditions that provide and maintain deep fluffy snow for extended periods of time;
c) Sites for denning with abundant coarse woody debris, such as downed trees and root wads; and
d) Matrix habitat…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.

The Assessment (U.S. Department of Agriculture, Forest Service, Northern Region, 2015) discusses each of the components above to some extent. Component (a) is addressed in the 'habitat status and connectivity' section, and is modelled as described above. Component (b) is less well-defined and not something that can be realistically modelled. Lynx may use a wide variety of habitats for travel among more suitable patches, depending on proximity to patches of foraging habitat, size, shape, and topography of intervening patches, quality of nearby foraging habitat, etc. Component (c) is not discussed or modelled here, but is addressed broadly in the snags and downed wood section. Component (d) is highly variable in some portions of the plan area (refer to the terrestrial vegetation sections on vertical structure, density, and forest pattern), and may be changing due to climate change (refer to chapter 4, climate change and baseline assessment of carbon stocks) (ibid).

Stressors under Forest Service control

Vegetation Management and Fire

Canada lynx rely on snowshoe hare, which require boreal forest that contains dense, horizontal cover. Therefore, disturbances that alter or remove horizontal cover or convert forest to unsuitable structural stages that have the potential to impact Canada lynx. These disturbances include vegetation management and fire, which can be considered as both stressors and drivers of Canada lynx habitat. In general, treatments used in vegetation management remove trees and/or reduce horizontal cover through thinning or burning. Fires also have this effect, to varying degrees depending on fire intensity and severity.

Fire and certain types of vegetation management can also promote development of Canada lynx habitat by returning a stand or area to an earlier successional stage that may eventually provide habitat (such as dense, young regenerating forest), or by creating openings within existing forest canopies that promote development of multiple canopy layers. Therefore, maintaining a habitat mosaic of different successional stages within the forest types likely to be used by lynx is a key strategy for maintaining lynx presence. Squires et al. (2010) state, "Managers should prioritize retention of a habitat mosaic of abundant and spatially well-distributed patches of mature, multilayer spruce-fir forests and younger forest stands". Vegetation management activities, including prescribed fire, can be designed to increase potential future lynx habitat, to promote or restore connectivity among patches of existing lynx habitat, and to create a mosaic of successional stages as recommended by Squires et al. (2010). Fires that burn with varying intensity and severity also help to perpetuate the mosaic of stages. Vegetation management can be used as a tool to help manage future wildfires by creating breaks or inconsistencies in fuels, thereby altering fire spread rate and direction. Care must be taken in core areas to maintain enough habitat to support a reproductive population of lynx. Managing vegetation within delineated LAUs, as described above and in the Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team, 2013), helps to realize that management goal. The NRLMD specifies the degree to which lynx habitat can be altered in an area.

Stressors not under Forest Service control

Illegal and incidental mortality

Currently trapping and snaring of lynx is prohibited across the contiguous U.S., including Montana. Accidental trapping may still occur, although it appears to have declined since 2000 (MFWP, 2016). A total of three lynx were reported captured between 2008 and 2015 by trappers targeting other species, and all were released uninjured. Overall, lynx mortality related to trapping averaged 1.6 lynx per year, and declined to 0.4 per year after 2008, when more protective regulations were put in place (MFWP, 2016).

Wildfires

Wildfire is one of the primary forces that historically shaped the structure and composition of vegetation on the HLC NF. The HLC NF fire history (refer to fire and fuels section) discusses the amount of fire that occurred historically on each GA since the 1800s. The NRV range of acres burned varies by PVT. The cool-moist type, which includes most lynx habitat, appears to average nearly 200,000 acres of stand-replacing fire, over 50,000 acres of mixed severity fire, and over 25,000 acres of low severity fires per decade forestwide. In recent years, fires have occurred with increasing frequency, size, and severity. Fires can alter lynx habitat by removing canopy or vegetation completely or partly, and by 'resetting' succession such that young regenerating forests occur within a period of years after certain fires. Size, pattern, severity, and vegetation type all play a role in determining the degree to which a given fire may impact lynx habitat. Therefore, fire can be a stressor or a driver of lynx by altering habitat to either make it not suitable, or by creating changes that will result in an increase in suitable habitat in an area. FS managers often influence fire size, location and severity through a variety of practices that include suppression and fuels management, with the result that many ignition have been suppressed or extinguished. Many, however, are not suppressed or extinguished, and burn largely influenced by weather/climate, vegetation, and terrain. Furthermore, the location of wildfire starts is entirely outside NF control.

Climate Change

The Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team, 2013) addresses several possible effects of climate change on lynx. These include potential shifts in lynx distribution in terms of elevation and latitude, changes in hare population cycles, reductions in the amount of lynx habitat due to changes in snow suitability and persistence, and changes in the frequency and severity of disturbances such as wildfire and insects that impact habitat. Rates and magnitude of these changes and the manner in which they may interact are difficult or impossible to predict.

Specific to the HLC NFs, tree species that are key components of snowshoe hare, and therefore lynx habitat, including Engelmann spruce and subalpine fir, may decrease at lower elevations, possibly expand upward in elevation, and potentially become less resilient to disturbance (U.S. Department of Agriculture, Forest Service, Northern Region, 2015). This, combined with likely increased fire frequency and duration, may result in overall decreases in habitat suitable for lynx. For the HLC NFs on the edge of current and historic lynx distribution, lynx habitat could decrease to the point that portions of the plan area that currently support lynx either permanently or as transients are no longer capable of doing so. Areas where habitat is limited or marginal, such as at the edge of a species' distribution are often the first areas to become uninhabited.

3.15.8 Canada lynx, environmental consequences

Effects common to all alternatives

Northern Rockies Lynx Management Direction

All alternatives, including the no-action alternative, incorporate the NRLMD. The amendment incorporates goals, objectives, standards, and guidelines into 18 National Forest plans, including the HLC

NF Plans that conserve and promote recovery of Canada lynx. The direction applies to mapped lynx habitat that is considered occupied by Canada lynx (U.S. Department of Agriculture, Forest Service, 2006) as described in the section above on habitat status and connectivity. Areas currently occupied are the Rocky Mountain Range, Upper Blackfoot, and northern portion of the Divide GAs. The remaining mapped lynx habitat in the planning area is considered unoccupied (ibid), where lynx management direction provided in the NRLMD is to be considered when designing management actions. The lynx direction addresses risk factors affecting lynx productivity (timber management, wildland fire management, livestock grazing, recreational uses, forest backcountry roads and trails, and other human developments) (U.S. Department of Agriculture, Forest Service, 2007c), as originally identified in the Lynx Conservation Assessment and Strategy (Ruediger et al., 2000).

A full analysis of the potential impacts of implementing the NRLMD can be found in the FEIS (U.S. Department of Agriculture, Forest Service, 2007a), the associated BA (USDA 2007d), and the recently completed BA for Canada Lynx Designated Critical Habitat: NRLMD (USDA 2017d). The analyses will not be repeated here, but key parts are summarized here as they relate to the analysis of consequences of the HLC NF draft plan and alternatives to the draft plan.

Under all alternatives the lynx direction would conserve habitat within the plan area and ensure sufficient habitat through time by limiting vegetation management actions that result in newly regenerated forest (Standard VEG S1 and Standard VEG S2). Snowshoe hare habitat is conserved through limits on pre-commercial thinning and treatment in multi-story mature or late successional hare habitat (Standard VEG S5 and Standard VEG S6). Exemptions to these standards for fuel treatment within the WUI are limited to 6 percent of the lynx habitat in the plan area. In addition, no more than 6 percent of the lynx habitat within designated Critical Habitat may be treated under this exemption. Pre-commercial thinning and treatment in multi-story mature or late successional hare habitat are allowed to remove snowshoe hare habitat for a limited number of exceptions outside of the WUI. These acres are counted within the 6 percent limit. Habitat connectivity within and between patches of lynx habitat are controlled by Standard ALL S1 and Standard LINK S1. There are also a number of guidelines that provide for alternate prey species and denning habitat, managing grazing to be compatible with maintaining lynx habitat, and managing human uses to maintain lynx and snowshoe hare habitat, habitat connectivity, and limit snow compaction.

Effects to designated critical habitat are similar to those described for lynx. Primary Constituent Element 1a (snowshoe hare habitat) would be adversely affected as a result of implementing WUI exemptions and limited exceptions from vegetation management standards VEG S5 and VEG S6. Effects to Primary Constituent Element 1b (deep, fluffy snow), 1c (denning habitat) and 1d (matrix habitat) would be insignificant because expansion of areas of snow compaction are limited, and activities that increase snow compaction are discouraged; denning sites have been located in a wide variety of habitat conditions and does not appear to be limited on the landscape; and matrix is not thought to be limiting to lynx (USFWS, 2014).

The NRLMD results in beneficial effects for lynx by providing for and conserving lynx and snowshoe hare habitat in occupied areas (U.S. Department of Agriculture, Forest Service, 2006). The direction is also considered in currently unoccupied areas, thereby conserving habitat across the plan area. However, the exceptions and WUI exemptions described previously would result in reductions in snowshoe hare habitat and temporary adverse effects on up to 6 percent of lynx habitat acres in the plan area and within designated critical habitat.

Effects common to all action alternatives

There are a number of components in the draft plan that would affect lynx habitat. These plan components are consistent through all the action alternatives. The majority of the plan components complement the standards and guidelines of the NRLMD to protect and provide for lynx and snowshoe hare habitat.

Effects of plan components associated with:

Aquatic ecosystems

The desired condition for RMZs (FW-RMZ-DC-01) provides benefits to lynx and lynx critical habitat by providing for habitat needs for lynx, which would include providing snowshoe hare habitat where the potential exists and providing movement corridors both within and between potential habitat (Primary Constituent Element 1d, matrix habitat).

Fire and fuels

Plan components include a desired condition to have low severity fires in the WUI, with an objective to treat 15,000 acres in the WUI a year. This objective would be met by using the WUI exceptions to the NRLMD on up to six percent of occupied lynx habitat. Because we consider the NRLMD in unoccupied lynx habitat, up to six percent of the unoccupied habitat could also be treated. These exceptions allow for temporary reductions of snowshoe hare habitat following treatments in the WUI which can result in reduced prey availability in the area, affecting both lynx and Primary Constituent Element 1a of designated critical habitat. The reduction in available habitat would be temporary, with summer hare habitat re-establishing within approximately 5 years on most sites, and winter hare habitat re-establishing within 15 to 40 years, depending on tree species and site condition. The acres of prescribed burning by decade and alternative are displayed in appendix B.

Terrestrial vegetation

Forestwide vegetation desired conditions and other components in all action alternatives would guide managers to move toward vegetation conditions that are consistent with the estimated NRV. These include components regarding the amount and distribution of cover types (FW-VEGF-DC-01), tree species presence (FW-VEGF-DC-02) , size class (FW-VEGF-DC-03, FW-VEGF-DC-05, FW-VEGF-DC-06, FW-VEGT-GDL-01), density (FW-VEGF-DC-04), and structure (FW-VEGF-DC-08, FW-VEGF-DC-09, FW-VEGT-GDL-06). Plan components for individual GAs would guide managers to move toward vegetation composition and structure that is consistent with the estimated NRV for those GAs (refer to the draft plan), which may differ in some respects from forestwide conditions.

These desired conditions for vegetation could result in adverse impacts to potential lynx habitat and designated critical habitat, although they may be offset by requirements of the NRLMD that would limit the potential impacts of forest management, particularly vegetation management actions, to lynx habitat. The forestwide desired conditions include maintaining or decreasing the Engelmann spruce and subalpine fir cover types (FW-VEGF-DC-01), and decreasing the Engelmann spruce and subalpine fir tree species presence (FW-VEGF-DC-02). The desired conditions for the Divide and Elkhorn GAs are to decrease the spruce/fir cover type (DI-VEGF-DC-01 and EH-VEGF-DC-01), and decrease the Engelmann Spruce and subalpine fir species presence (DI-VEGF-DC-02 and EH-VEGF-DC-02). For most of the GAs the desired condition is to decrease the Engelmann spruce and/or subalpine fir species presence. Desired conditions for the Rocky Mountain Range and Upper Blackfoot GAs, which are the two occupied GAs that are also within designated critical habitat for lynx, specifically call for providing the amount, distribution, and structural conditions of spruce and subalpine fir to ensure that lynx habitat continues to be present (RM-VEGF-DC-03, UB-VEGF-DC-03).

Although the desired conditions described above generally call for decreases in spruce and fir presence, the results of modelling (appendix B) indicate that these conditions may not be met in all GAs in the five decades modelled. In the Divide GA spruce/fir cover increases slightly and in the Elkhorn GA the spruce/fir cover type decreases to within the NRV range. Figures in appendix B also show that spruce species presence decreases in the Elkhorn and Little Belt GAs, but increases in the remaining GAs, including those currently considered occupied by lynx. Modelling shows that while subalpine fir decreases in the Crazies, Divide, and Elkhorn GAs it maintains or increases everywhere else, including areas currently occupied by lynx. Forest wide the spruce/fir cover type increases; Engelmann spruce

species presence maintains or increases slightly; and subalpine fir species presence maintains or increases slightly.

Terrestrial wildlife

The wildlife desired condition plan components are beneficial to lynx and lynx critical habitat. The desired conditions are for lynx habitat to be available throughout the species potential natural range so that life history requirements are met and movement within and between NFS parcels is allowed. The forestwide goal that interagency identified linkage areas facilitate wildlife movement compliments the NRLMD Standard ALL S1, Objective LINK 01, Standard LINK S1, Guideline LINK G1 and Guideline LINK G2.

Designated areas

Designated areas with plan components that affect lynx and designated critical lynx habitat include IRAs, designated wilderness, RWAs, and WSAs.

Desired conditions for IRAs include providing large, undisturbed, and unfragmented areas of land...where natural ecological processes and disturbances are the primary focus affecting vegetation. Within IRAs no permanent roads or trails are allowed to be constructed. However, temporary roads and maintenance and reconstruction of existing roads and trails may be allowed. Vegetation treatment is allowed in limited circumstances, and prescribed fire is allowed. There would be no changes in IRA boundaries from the existing condition, and effects to lynx and designated critical habitat are as described for the NRLMD (U.S. Department of Agriculture, Forest Service, 2007b);USDA 2007a; (USFWS, 2007), USDA 2017d, USDI 2017).

The desired condition for WSAs (FW-WSA-DC-01) benefit lynx and lynx habitat because natural processes are the primary forces; vegetation management is not conducted in the WSA. Plan components for the WSA would not affect designated critical habitat as the WSA does not occur in critical habitat.

Both the desired condition (FW-WILD-DC-02) and the legal requirements for managing designated Wilderness would benefit lynx, lynx habitat, and designated critical habitat because they require that natural forces are the primary factors affecting vegetation. Vegetation management activities are not allowed, except that prescribed fire may be used as a tool in order to allow fire play its natural role in the ecosystem. Prescribed fire can affect snowshoe hare habitat by reducing horizontal cover.

The acres of RWA vary by alternative, as described below. The desired conditions are constant in all alternatives, and like wilderness and WSA, natural processes are the primary forces at work (FW-RECWILD-DC-02). Effects to lynx and habitat are the same as in wilderness. Other differences in plan components between alternatives are described below.

Land status and ownership, and land uses; infrastructure – roads and trails, bridges and facilities

The plan component goal to cooperate with highway managers and other landowners to implement wildlife crossings where needed (FW-RT-GO-03) benefits lynx and PCE 1d by maintaining habitat connectivity and linkage. There would be no direct or indirect effects resulting from plan components for the remaining resources.

Livestock grazing

Plan components for the management of livestock grazing are designed to maintain the integrity of ecological systems where grazing occurs (FW-GRAZ-DC-02), and to minimize adverse impacts to wildlife and habitats (FW-GRAZ-GDL-01). Livestock presence on NFS lands presents a risk of vegetation reductions and changes, and could result in adverse impacts to snowshoe hare habitat and winter lynx habitat by reducing horizontal cover. Refer also to analysis in the NRLMD FEIS (U.S. Department of Agriculture, Forest Service, 2007b) for discussion of additional plan components for management of livestock grazing.

Timber

Plan components for the management of timber are intended to support the production of timber on lands identified as suitable for that use, as well as to manage timber harvest for other purposes. Standard FW-TIM-STD-04 would limit clearcutting and require interdisciplinary review of site specific conditions and desired conditions for habitat before clearcutting could be used. Standard FW-TIM-STD-08 would limit the maximum opening size of harvest units, and FW-TIM-GDL-01 would guide harvest activities to "contribute to ecological sustainability and ecosystem health" and to achieve desired vegetation conditions. Timber harvest activities have the potential to reduce Canada lynx habitat and temporarily displace individual lynx, but plan components, including the NRLMD, would minimize impacts. Timber harvest activities would move vegetation conditions toward desired conditions. Some timber harvest could result in decreased snowshoe hare habitat, and therefore reduced foraging opportunities for lynx. The acres of timber harvest by decade and alternative are displayed in the timber section and appendix B.

Effects by alternative

The primary difference between alternatives is the acres of RWAs and the activities that are suitable to occur within the RWAs in regards to motorized and mechanized equipment. The vast majority of lands selected for RWAs are in IRAs. Therefore, regardless of alternative, natural disturbances are the primary drivers of vegetation change on these lands. Prescribed fire may occur in RWAs, but may be constrained by access as well as limitations on pre-burn fuel preparation techniques, and is therefore somewhat less likely to occur in these areas than if they are not in RWAs. Some harvest of small trees is permissible in IRAs, but would not be allowed in RWAs. Alternative D contains the most RWAs, followed by alternatives B/C and A. Alternative E contains no RWAs. Prescribed burning and harvest activities would therefore be most likely to occur in these areas under alternative E. However, they would be constrained by IRA regulations. Because of this, in the case of timber harvest especially, the difference in potential effects across alternatives in these areas is small.

Timber harvest is generally most likely to occur on lands suitable for timber production, but may also occur on other lands. The acres suitable for timber production vary slightly by alternative. Modeling to show differences in timber outputs by alternative were influenced by the acres of land suitable for timber production as well as other land allocations and the theme of the alternative. The timber and other forest products section displays the acres of lands suitable for timber production within potential lynx habitat by alternative. Alternative A contains the most acres of land suitable for timber production that overlaps with potential lynx habitat, followed by alternative E, B/C, and D. The overall difference across alternatives is relatively small; regardless of alternative, at least half of the land suitable for timber production lies in potential lynx habitat. The timber and other forest products section describes how lynx management would influence the types and amounts of harvest that may occur in those areas.

Modeling was done to project future vegetation conditions. The modeling showed very little variance in future vegetation conditions across alternatives because the primary driver of change is natural disturbances. Figure 12 displays the projected proportion of lynx habitat structural stage forestwide, as an average of all alternatives across five decades in the future, based on this modeling. The proportion of each structural stage varies by one percent, as described below by GA, when viewed by alternative. Figures in appendix B display this data by GA, and also display the habitat categories over time by alternative, compared to the NRV.

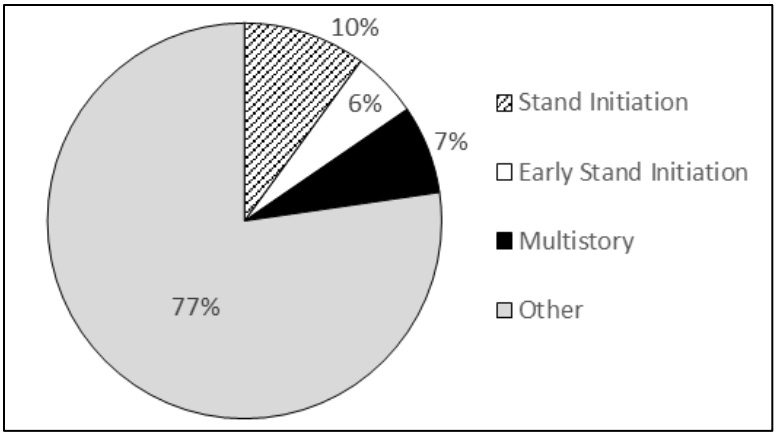

Figure 12. Forestwide proportion of potential lynx habitat by habitat category, average conditions of decades 1-5, average of alternatives

Figure 13 displays the changes, by decade, to the proportion of each habitat category, averaged across all alternatives. In general, mature, multistory habitat increases through decade 3, then decreases slightly. Early stand initiation habitat decreases through time. Stand initiation habitat increases through decade 4, then drops slightly. Habitat in the other category decreases through decade 4, with a slight increase in the fifth decade.

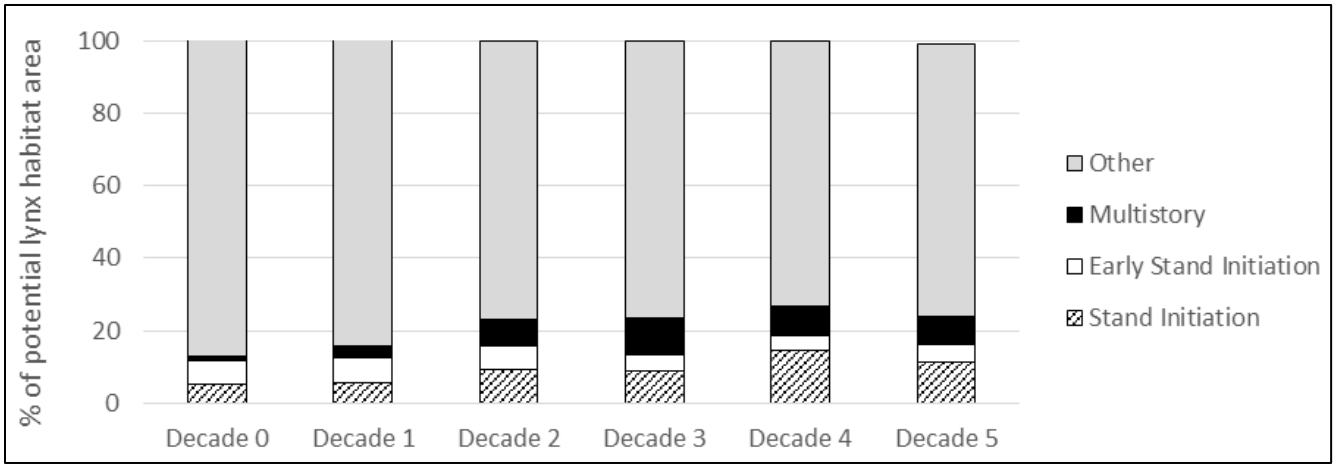

Figure 13. Lynx habitat by type, forestwide over time, average of all alternatives

Model results are used to indicate how vegetation may change over time. Models are one tool to help inform the analysis, and are useful for understanding relative differences between alternatives. These models are for comparative value, and are not predictive. For this analysis, SIMPPLLE modeling shows that the differences between alternatives are very small, and are within the model output variability. The modelling also shows that in all alternatives the amount of early stand initiation habitat decreases over time, while the amount of snowshoe hare habitat in the form of stand initiation structural stage and mature, multistory structural stage increases over time. Differences by alternative are described below.

Alternative A, no action

Alternative A includes few RWAs (three areas totaling just over 34,000 acres). Table 73 shows the proportion of each structural stage by decade from SIMPPLLE habitat modeling. Figures in Appendix B display this information by GA.

Table 73. Alternative A proportion of potential lynx habitat by structural stage by decade (%)

	Decade 0	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Stand Initiation	5	6	9	9	15	11
Early Stand Initiation	7	7	7	5	4	5
Multistory	1	3	7	10	8	8
Other	88	84	77	76	74	76

Alternatives B and C

Alternatives B and C include 9 RWAs totaling just over 213,000 acres. In addition to the RWAs, in the Upper Blackfoot GA identified as potential connectivity to the south (east and west ends of Lincoln Valley), were removed from the lands suitable for timber production in order to provide connection to south across the fragmented valley. Table 74 shows the proportion of each structural stage by decade from SIMPPLLE habitat modeling. Figures in appendix B display this information by GA.

Table 74. Alternatives B and C proportion of potential lynx habitat by structural stage by decade (%)

	Decade 0	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Stand Initiation	5	6	9	9	14	11
Early Stand Initiation	7	7	6	4	4	5
Multistory	1	3	7	10	8	8
Other	88	84	77	77	74	73

Alternative D

Alternative D has the most RWA, with almost 474,000 acres in 16 areas. These areas were chosen considering large scale connectivity and could facilitate movement of lynx across the landscape. Table 75 shows the proportion of each structural stage by decade from SIMPPLLE habitat modeling. Figures in appendix B figures display this information by GA.

Table 75. Alternative D proportion of potential lynx habitat by structural stage by decade (%)

	Decade 0	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Stand Initiation	5	6	9	9	14	11
Early Stand Initiation	7	7	6	4	4	6
Multistory	1	3	7	10	8	8
Other	88	84	77	77	74	76

Alternative E

Alternative E does not include any RWAs. Table 76 shows the proportion of each structural stage by decade from SIMPPLLE habitat modeling. Figures in appendix B display this information by GA.

Table 76. Alternative E proportion of potential lynx habitat by structural stage by decade (%)

	Decade 0	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Stand Initiation	5	6	10	10	15	12
Early Stand Initiation	7	7	7	5	4	5
Multistory	1	3	7	10	8	8

	Decade 0	Decade 1	Decade 2	Decade 3	Decade 4	Decade 5
Other	88	84	76	76	73	76

Cumulative effects

Table 77 summarizes the cumulative effects to Canada lynx from other resource management plans.

Table 77. Summary of cumulative effects to Canada lynx from other resource management plans

Resource plan	Description and Summary of effects
Adjacent National Forest Plans	The forest plans for NFS lands adjacent to the HLC NF include the Custer-Gallatin, Lolo, Flathead, and Beaverhead-Deerlodge NFs. All plans were amended to include the NRLMD in 2007. Management of Canada lynx and lynx Designated Critical Habitat is consistent across all NFs. The cumulative effect would be that the management of lynx and lynx critical habitat would be the same, and effects would be similar. This includes specific adjacent landscapes that cross Forest boundaries, such as the Upper Blackfoot, Divide, Elkhorns, Crazies, and the Rocky Mountain Range.
MTDNRC Forested State Trust Lands Habitat Conservation Plan (HCP) 2010.	The HCP applies to state trust lands in areas occupied by Canada lynx (the Upper Blackfoot GA) and includes a Lynx Conservation Strategy (MTDNRC and U.S. Fish and Wildlife Service 2010b, pp. 2-45–2-61) consisting of a suite of lynx habitat commitments that apply to all lands in the HCP project area supporting lynx habitat and additional commitments that apply to Lynx Management Areas. This strategy minimizes impacts of forest management activities on lynx. The goal of the lynx conservation strategy is to support federal lynx conservation efforts by managing for habitat elements important for lynx and their prey that contribute to the landscape scale occurrence of lynx, particularly in key locations for resident populations. This plan provides protection to important components of lynx habitat and cumulative benefits lynx and lynx habitat. These lands are not included in designated critical habitat.
Montana's State Wildlife Action Plan 2015	The SWAP identifies community types, Focal Areas, and species in Montana with significant issues that warrant conservation attention. The plan is not meant to be an FWP plan, but a plan to guide conservation throughout Montana. The SWAP does not identify lynx as a species of greatest conservation need. However, *Conifer-dominated Forest and Woodland (xeric-mesic)* is identified as a Terrestrial Community Type of Greatest Conservation Need within the Ecoregion that includes the Forest. This plan describes a variety of vegetation conditions related to habitat for specific wildlife species. This plan would likely result in the preservation of these habitats on state lands, specifically wildlife management areas. This plan would interact with the Montana Statewide Forest Resource Strategy. The vegetation conditions described would be complementary to the conditions being managed for with the HLC NF revised forest plan.
BLM Resource Management Plans (RMP)	BLM lands near the HLC NF are managed by the Butte, Missoula, and Lewistown field offices. The Butte plan was recently revised (2009) while the existing plans for the Missoula and Lewistown areas are under revision. These plans contain components related to lynx, primarily following guidance found in the Canada Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team, 2013), and would therefore likely be complementary to the plan components for the HLC NF.
National Park Service - Glacier National Park General Management Plan 1999	The general management plan for Glacier National Park calls for preserving natural vegetation, landscapes, and disturbance processes. Broadly, the lynx habitat and critical habitat characteristics in this area are therefore likely similar to the wilderness areas in the adjacent Rocky Mountain Range GA and would likely complement these conditions.
Montana Army National Guard – Integrated Natural Resources Management Plan for the Limestone Hills Training Area 2014	This plan is relevant to an area adjacent to NFS lands in the Elkhorns GA. The Limestone Hills area is primarily nonforested, and therefore does not contain much if any lynx habitat.

Resource plan	Description and Summary of effects
Montana State Parks and Recreation Strategic Plan 2015-2020	These plans guide the management of state parks, some of which lie nearby or adjacent to NFS lands. Due to their location and elevation, lynx habitat does not occur as a component of these parks, and would not contribute to the desired conditions as described for the HLC NF.
County wildfire protection plans	Some county wildfire protection plans map and/or define the WUI. The HLC NF notes that these areas may be a focus for hazardous fuels reduction, and the NRLMD has guidance specific to these areas. Managing for open forests and fire adapted species may be particularly emphasized in these areas. Overall, the effect of the county plans would be to influence where treatments occur to contribute to desired vegetation conditions.
City of Helena Montana Parks, Recreation and Open Space Plan (2010)	This plan is relevant to an area that lies adjacent to NFS lands in the Divide GA, in proximity to the City of Helena. The plan emphases forest management and wildfire mitigation. Due to the location and elevation, lynx habitat does not occur as a component of this area, and would not contribute to the desired conditions as described for the HLC NF.

Conclusions

Alternative A, no-action

The NRLMD provided management direction that conserves and promotes the recovery of Canada lynx while preserving the multiple use direction in existing forest plans (U.S. Department of Agriculture, Forest Service, 2007b). The direction applies to mapped lynx habitat occupied by Canada lynx, and is to be considered when designing management actions in unoccupied mapped lynx habitat. The NRLMD provided the regulatory mechanism to alleviate the main threat to lynx; "the lack of guidance for conservation of lynx and snowshoe hare habitat in NF Land and Resource Plans and BLM Land Use Plans" (U.S. Department of the Interior, Fish and Wildlife Service, 2000). The BA completed for the NRLMD concluded that while management direction would provide for lynx conservation, the plans amended by the NRLMD would still be likely to adversely affect lynx because individuals could be adversely affected as a result of the exemptions and exceptions to the vegetation standards for fuel treatment projects and pre-commercial thinning (U.S. Department of Agriculture, Forest Service, 2007b). The information here that we have added to that analysis supports that conclusion. A determination of effect will be made in a BA for consultation with USFWS on a preferred alternative, after that alternative has been selected.

Action alternatives

The action alternatives all include the NRLMD, which would continue to conserve and promote recovery of Canada lynx by reducing or eliminating adverse effects from land management activities on NFS lands. In addition to the NRLMD, plan components included in all action alternatives would:

- contribute to maintaining spruce/fir habitat on the forest;
- provide specific desired conditions and other guidance for management of designated areas such as RWAs, IRAs, and the conservation management area as relatively intact, un-fragmented landscapes where natural processes predominate;
- identify specific areas in the Upper Blackfoot and Divide GAs to manage for potential connectivity across landscapes; and
- increase the amount of available snowshoe hare habitat over time in the GAs.

The sum of that management direction would be to provide additional protections for lynx habitat and promote habitat conditions that provide for snowshoe hare. Alternatives B, C, and D provide more RWAs, which could limit potential treatments in lynx habitat more than in the alternatives A and E. A

determination of effect will be made in a biological assessment for consultation with USFWS on a preferred alternative, after that alternative has been selected.

3.15.9 Wolverine, affected environment

Status and distribution

The wolverine is currently proposed as threatened under the ESA (USFWS 2016). Wolverine are found in the northern portion of the western hemisphere, largely in northern Canada and Alaska but extending southward in the mountainous western portion of North America into Montana, Idaho, and the northern portion of Wyoming. Wolverine have been documented in all GAs in the plan area except the Highwoods, Snowies and Castles. There is a single trapping record from the Crazies from over 40 years ago.

Population trend

Wolverines were nearly extinct in Montana during the early 1900s, but have been increasing in numbers and range since. Wolverines likely exist as a metapopulation, with intermittent exchange of individuals among semi-isolated subpopulations that maintains genetic diversity and possibly demographic function. Because of their food and space requirements, wolverines appear to exist at naturally low densities.

Food habits and habitat use

Wolverines are food generalists, preying on small animals and birds, scavenging carrion, and consuming fruits, berries, and insects (Banci, 1994; Hornocker & Hash, 1981). Wolverines require a great deal of space, with home ranges in Montana (Glacier National Park) and northern Wyoming (Yellowstone National Park) estimated at 55 to 128 square miles for females, and 193 to 311 square miles for males. Wolverines use a wide variety of habitats, with their primary requirement apparently being areas with enough winter precipitation to reliably maintain deep, persistent snow into late spring, during the denning period (Copeland et al., 2010). Therefore in Montana, at the southern periphery of their range, wolverines are generally restricted to high elevations where deep snow persists, resulting in the metapopulation structure described above. Wolverines appear to choose areas of high structural diversity for dens, including components such as logs or boulders.

Two separate models were developed to map wolverine habitat in Region One. One is based on from studies of radio-collared wolverine in the Greater Yellowstone Ecosystem (Inman, Brock, et al., 2013; Inman et al., 2012). The second is based on research showing that wolverine appear to require snow cover that persists into May for successful reproduction (Copeland et al., 2010). The largest acreage of potential primary wolverine habitat is on the Rocky Mountain Range GA. Only the Rocky Mountain Range and Upper Blackfoot GAs appear to have snow that reliably (every year for 7 or more years in a row) persists through May. These two GAs are also connected to the Flathead NF and Glacier National Park, both of which also contain wolverine habitat. The other GAs on the HLC NF do not reliably have persistent snow, suggesting that wolverine may not be consistently present or be reproducing in those areas. The Highwoods and Castles GAs may not have enough potential habitat to support even a single wolverine, in addition to being isolated from larger GAs with more habitat. Neither the Highwoods nor the Castles GA has any records of wolverine presence. Based on habitat models the role of GAs other than the Rocky Mountain Range and Upper Blackfoot in contributing to the larger wolverine population is questionable.

Key drivers and stressors

Factors not under FS Control

Loss of or reduction in size of areas with persistent spring snow as a result of climate change is likely the most important threat to wolverine populations (U.S. Department of the Interior, Fish and Wildlife Service, 2013).

Harvest, usually in the form of trapping, can be a key factor affecting wolverine survival (Banci, 1994; Hornocker & Hash, 1981; J. R. Squires, Copeland, Schwartz, & Ruggiero, 2007), and consequently could affect population trend. Wolverine trapping in all four wolverine management units in Montana is currently closed (MTDFWP 2017c). Mortality of wolverines caught incidental to trapping for other species may occur.

Factors affected by FS management

Wolverine do not appear to be dependent on specific vegetation or habitat features that may be altered by land management activities and may not be heavily affected by recreation activities (U.S. Department of the Interior, Fish and Wildlife Service, 2013)). Heinemeyer et al. (Heinemeyer et al. 2017), however, found that although wolverine home ranges may include areas with high levels of winter recreation, some wolverines may be displaced from portions of their home range by recreational activities, and that displacement may reduce the total amount of habitat available to them. FS management actions do not threaten wolverines or their primary habitat, and activities on NFS lands do not appear to pose a threat to the long-term persistence of the species (U.S. Department of the Interior, Fish and Wildlife Service, 2013), although population-level impacts of recreation on wolverines are not yet fully understood (Heinemeyer et al. 2017).

Habitat loss due to factors other than climate change is less likely to occur, largely because much of wolverine habitat in the contiguous U.S, is in a management status, such as designated wilderness, IRA, or national park, that provides some protection from management, industrial, and certain recreational activities (U.S. Department of the Interior, Fish and Wildlife Service, 2013). Maintaining those large blocks of un-fragmented wolverine habitat could help mitigate, to some extent, habitat fragmentation caused by climate change. Specific vegetation conditions appear to be relatively unimportant to this species, so although there may be some avoidance of vegetation management activities while they are being implemented, vegetation management in general is unlikely to have measurable effect on wolverines.

Table 78 shows the acreage of mapped wolverine habitat on the HLC NF currently in conservation management area, IRA, or designated wilderness. Acreages in conservation management area, which only occurs on the Rocky Mountain Range GA, overlaps with acreage in IRAs. Habitat was mapped following both the Inman et al methodology (Inman, Brock, et al., 2013; Inman et al., 2012), which incorporates topographic features, and the Copeland methodology (Copeland et al., 2010), which focuses on areas of persistent spring snow. Percentages shown are the proportion of the total of each type of mapped habitat that is within the designated area type. For example, 7% of all mapped wolverine primary habitat on the HLC NF is within the Conservation Management Area, and 1% of all areas mapped as having persistent spring snow in seven out of seven years is within the Conservation Management Area.

Table 78. Acres in conservation management area, IRA, and designated wilderness by wolverine habitat category and percent of total habitat on HLC NF

Wolverine habitat[1]	Conservation management area	IRA	Designated wilderness
Primary	197,957 (20%)	503,504 (50%)	412,404 (41%)
Maternal	12,715 (4%)	123,442 (34%)	231,841 (65%)
Persistent Spring Snow 1 of 7 years	39,082 (10%)	217,978 (55%)	101,351 (26%)
Persistent Spring Snow 7 of 7 years	252 (1%)	11,164 (24%)	35,664 (76%)

1. Primary and maternal habitats were mapped using methods described by Inman (Inman, Bergen, & Beckman, 2013); spring snow habitat was mapped using methods described by Copeland (Copeland et al., 2010) and includes areas with persistent snow in at least 1 of 7 years, and in 7 of 7 years, to display a possible range.

The relatively large percent of areas with persistent spring snow in at least one of seven years that are also in designated areas compared to the percent of areas with persistent spring snow in all seven years, is largely a function of the relatively larger amount of area with snow persisting in at least one year. In other words, the total area with spring snow in only one year (over 395,000 acres, see project file) is much larger than the total area with spring snow in seven years (47,000 acres, see project file). That makes is more likely that areas with snow persisting for only one of seven years will overlap with a designated area. The areas of mapped wolverine habitat and persistent spring snow that are within designated areas varies by GA, with the majority on the Little Belts and Rocky Mountain Range GAs, as well as on the Upper Blackfoot GA.

Wolverines in Idaho were found to use use drainage bottoms, riparian areas, and forested edge habitats, and appear to use those more in winter than in summer (Heinemeyer et al. 2017). Maintaining landscapes that are relatively un-fragmented by human development between areas of high-elevation wolverine habitat may be important to maintain wolverine use of an area, and help to maintain both genetic and demographic connectivity among wolverine sub-populations.

3.15.10 Wolverine, environmental consequences

Effects common to all alternatives

Climate change and its predicted impacts on high-elevation, persistent spring snow are not likely to be affected by management actions on the HLC NF. Management of HLC NF lands will also not impact trapping-related mortality.

Under all alternatives the acreage and distribution of Congressionally-designated wilderness, conservation management area, and IRA would not change from the existing situation. These areas all provide large acreages that are undeveloped and occur in relatively contiguous large blocks, and where natural processes predominate. These areas also remain relatively undisturbed by human development and by many types of human activity. The acreage of these areas that overlap with mapped wolverine habitat would be as shown in Table 78 above. Outside of identified wolverine habitat, these areas may also contribute to potential connectivity among wolverine subpopulations within the plan area and with adjoining areas.

Under all alternatives, the plan components in the Grizzly Bear Amendment (appendix I of the Draft Plan) for management of grizzly bear habitat would result in limits on motorized access and on developed recreation sites in the Rocky Mountain Range and Upper Blackfoot GA. These limits could benefit wolverine by minimizing the potential for impacts due to motorized travel and human activities associated with overnight developed recreation sites.

Effects of alternative A, no action

Management of HLC NF lands under this alternative would not have an impact on high-elevation, persistent spring snow, nor would it affect potential trapping-related mortality.

The existing Helena NF and Lewis and Clark NF plans contain a number of plan components that provide general direction for maintenance of wildlife habitat values while carrying out other management actions. Among those that influence management of habitat used by wolverines are, in the Lewis and Clark NF plan:

- C-1(10): Cooperate with other entities to implement programs for land acquisition, exchanges, and easements;
- C-1 (6) and L-4: Manage motorized use through travel plans to reduce impacts to wildlife during periods of high stress, and generally minimize impacts of roads on wildlife;

- C-2: Several standards requiring consultation, analysis, research, coordination and contributions to recovery of listed species; would apply to wolverine if they become listed;
- C-5: Monitor populations of Management Indicator Species, including wolverine. Although Management Indicator Species will no longer be identified under the 2012 Planning Rule, identification of them in the Lewis and Clark NF plan would likely mean continued adherence to applicable standards and guidelines.;
- G-1 and G-2: Standards requiring stipulations to minimize potential disturbance and displacement of wildlife during oil and gas exploration and development operations.

Plan components in the existing Helena NF plan that relate to management of habitats used by wolverines include:

- Standards requiring consultation, analysis, research, coordination and contributions to recovery of listed species; would apply to wolverine if they become listed;
- Standards primarily relating to grizzly bear, but that require minimizing impacts of roads on wildlife; and
- Standards requiring analysis and mitigation of potential impacts to wildlife of oil and gas exploration and development operations.

Both plans include components for maintaining areas of secure habitat for elk and other big game; these areas could benefit wolverine by providing areas with minimal human disturbance in which to travel between areas of high-elevation preferred habitats.

The existing forest plans do not provide specific direction for wolverine habitat, and much of the direction relating to management activities occurring in wolverine or other wildlife habitat is somewhat general. The plans refer to the need to minimize impacts to wildlife when carrying out travel management planning, but are not specific regarding over-snow travel in high-elevation areas used by wolverines. Plan direction to maintain habitat security in some areas, and to minimize the potential impacts to wildlife from roads and other management may provide some benefit to wolverines. Nevertheless, FS management actions and activities occurring on NFS lands are unlikely to have impacts to wolverine populations (U.S. Department of the Interior, Fish and Wildlife Service, 2013), which will continue to be affected primarily by the effects of climate change on the amount and distribution of persistent spring snow.

Effects of the action alternatives

Management of HLC NF lands under these alternatives would not have an impact on high-elevation, persistent spring snow, nor would it affect potential trapping-related mortality.

Plan components for terrestrial vegetation (e.g., FW-VEGT-DC-01 and FW-VEGT-DC-02, 03) are intended to maintain the integrity of alpine ecosystems, and to provide vegetation conditions that would support at-risk species and provide connectivity. These plan components provide the coarse filter that would maintain the integrity of systems on which wolverine are dependent.

Maintaining large blocks of un-fragmented wolverine habitat could help mitigate, to some extent, habitat fragmentation caused by climate change. Primitive and semi-primitive nonmotorized recreation settings are areas in which motorized travel would not occur, and in which human development and the influence of humans is minimal. Similarly, RWAs also provide blocks of unfragmented habitat where natural processes predominate, and human influence is minimized. Table 79 shows the amount of mapped wolverine habitat that would occur in the combined primitive and semi-primitive non-motorized recreation settings, and in RWAs, by alternative. Alternative A is included in the table to provide comparison with the no-action alternative.

Table 79. Acres of RWAs, and combined primitive and semiprimitive nonmotorized ROS, by wolverine habitat category by alternative

Area designation or category	Wolverine habitat[1]	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E
Recommended Wilderness[2]	Primary	11,792 (1%)	85,229 (8%)	85,229 (8%)	160,866 (16%)	0
	Maternal	1,384 (<1%)	16,033 (4%)	16,033 (4%)	29,060 (8%)	0
	Persistent Snow 1 of 7 years	6,407 (2%)	24,486 (7%)	24,486 (7%)	61,266 (16%)	0
	Persistent Snow 7 of 7 years	0	3,007 (6%)	3,007 (6%)	3,007 (6%)	0
Combined Primitive and Semi-Primitive Non-Motorized Recreation Setting (Summer)	Primary	845,157 (84%)	846,107 (84%)	846,110 (84%)	854,130 (84%)	845,328 (84%)
	Maternal	339,764 (95%)	339,821 (95%)	339,821 (95%)	340,285 (95%)	339,761 (95%)
	Persistent Snow 1 of 7 years	288,564 (73%)	289,668 (74%)	289,685 (74%)	295,865 (75%)	288.085 (73%)
	Persistent Snow 7 of 7 years	46,479 (100%)	46,479 (100%)	46,479 (100%)	46,479 (100%)	46,479 (100%)
Combined Primitive and Semi-Primitive Non-Motorized Recreation Setting (Winter)	Primary	814,301 (80%)	819,780 (81%)	825,319 (82%)	827,489 (82%)	814,975 (81%)
	Maternal	330,985 (93%)	331,736 (93%)	331,796 (93%)	332,101 (93%)	331,059 (93%)
	Persistent Snow 1 of 7 years	297,742 (76%)	301,648 (77%)	306,204 (78%)	310,268 (79%)	297,378 (75%)
	Persistent Snow 7 of 7 years	44,945 (96%)	44,945 (96%)	44,945 (96%)	44,945 (96%)	45,015 (96%)

1. Primary and maternal habitats were mapped using methods described by Inman (Inman, Bergen, et al., 2013); spring snow habitat was mapped using methods described by Copeland (Copeland et al., 2010).
2. A zero means that data showed there were not 7 sequential years with persistent spring snow in any of the RWAs for that alternative. There may have been up to 6 sequential years; see project file for model details.

Alternative D, which features the largest number and acreage of RWAs, has the most area of mapped wolverine habitat of all types in RWAs, while alternative E has the least. Note that an even larger acreage and proportion of mapped wolverine habitat and areas of persistent snow are within IRAs, and that most RWAs areas overlap with IRAs. RWAs, however, would be managed specifically to maintain a natural environment where ecological processes function as the primary forces affecting the environment (FW-RECWILD-DC). The location of RWAs in alternative D was informed by assessing which areas might provide potential connectivity among island mountain ranges, where habitat on NFS land remains relatively intact and intervening lands either provide minimal disturbance or distances between island mountain ranges are shortest. Alternative D would therefore have slightly increased potential to maintain connections among separate GAs for some wildlife species, including wolverine, although that potential would continue to be greatly affected by land management and uses on intervening non-NFS lands.

The amount of primitive, and semiprimitive nonmotorized recreation settings in wolverine habitat would not be markedly different among alternatives, and the large majority of wolverine of all habitats is and would continue to be within either primitive or semi-primitive non-motorized settings under all alternatives, including the no action. That is a reflection of the relatively inaccessible nature of most key wolverine habitat. Plan components for these two recreation settings stress limited presence and evidence of human activity (FW-ROS-DC 02, 03, 04, and 05 and associated standards and guidelines. The largest area of habitat that is relatively free of human disturbance occurs on the Rocky Mountain Range GA

(refer to project file for acreages by GA), which also has the most mapped potential wolverine habitat and also is contiguous with wolverine habitat on the adjoining Flathead NF, and is adjacent to wolverine habitat in Glacier National Park.

Cumulative Effects

Table 80 summarizes the cumulative effects to wolverines from other resource management plans.

Table 80. Summary of cumulative effects to wolverines from other resource management plans

Resource plan	Description and Summary of effects
Adjacent National Forest Plans	The forest plans for NFS lands adjacent to the HLC NF include the Custer-Gallatin, Lolo, Flathead, and Beaverhead-Deerlodge NFs. The Flathead NF plan is currently being revised under the 2012 Planning Rule. All forest plans must adhere to requirements of the ESA, as amended, for species listed as threatened or endangered and those identified as proposed or candidate species for listing. Wolverines on the HLC NF are likely part of a connected population extending across NF boundaries. Plans on adjoining NFs include varying amount and pattern of winter motorized use that could have varying effects on wolverine.
BLM Resource Management Plans (RMP)	BLM lands near the HLC NF are managed by the Butte, Missoula, and Lewistown field offices. The Butte plan was recently revised (2009) while the existing plans for the Missoula and Lewistown areas are under revision. The Butte plan includes components that are similar and complementary to the HLC NF revised plan; components in the plans under revision are anticipated to be similar to those in the Butte plan. BLM lands near the HLC NF include likely relatively small amounts of wolverine habitat. All land use plans must adhere to requirements of the ESA, as amended, for species listed as threatened or endangered and those identified as proposed or candidate species for listing.
National Park Service - Glacier National Park General Management Plan 1999	Similar in scope to a forest plan. Philosophy is to manage the park for its wild character and integrity of natural heritage, while traditional visitor services and facilities remain. Guiding principles include providing for such things as biosphere reserve, proposed wilderness, interpretive, educational, and outreach programs, preservation of natural and cultural resources. Winter recreation in the park is limited to non-motorized travel, providing large expanses with little or no potential human disturbance.
Montana Statewide Forest Resource Strategy (2010)	MT conducted a statewide assessment of forest resources and identified issue-based focus areas with implementation strategies and deliverables for each. Focus areas include such varied things as achieving ecological integrity through recovery of species diversity, managing for wildfire and public safety, supporting forest products infrastructure, and addressing changing forest ownership patterns. Management for these focus areas on state lands would adhere to management plans for specific state-owned lands.
Montana State Parks and Recreation Strategic Plan 2015-2020	These plans guide the management of state parks, some of which lie nearby or adjacent to NFS lands. Goals include managing significant, relevant, and accessible parks and programs in a manner consistent with available resources, as well as emphasizing visitor experience, partnerships, and awareness of the state parks system. State parks near or adjacent to the HLC NF likely contain very little wolverine habitat.
Montana's State Wildlife Action Plan	This plan describes a variety of vegetation conditions related to habitat for specific wildlife species. This plan would likely result in the preservation of these habitats on state lands, specifically wildlife management areas. This plan would interact with the Montana Statewide Forest Resource Strategy (above). The vegetation conditions described would be complementary to the conditions being managed for with the HLC NF draft plan.
Montana State Wildlife Management Areas	Plans are specific to management areas and their established purpose. Most in the plan area were established to conserve big game winter range, with goals to maintain forage, cover, and security during winter use periods. Likely very little wolverine habitat on these lands, but they could contribute to large-scale connectivity.

Conclusions

It is unlikely that forest plan direction has the potential to impact recovery or persistence of wolverine in the plan area or in Montana (U.S. Department of the Interior, Fish and Wildlife Service, 2013). The most

serious threat to wolverine is reduction in the abundance, distribution, and persistence of late spring snow as a result of climate change, which would not be affected by FS management actions. Harvest of wolverines, although currently closed in Montana, has the potential to impact survival, which could affect population trend if at high enough levels. FS management does not affect harvest nor does it affect potential mortality related to trapping for other species.

All alternatives provide some area of relatively un-fragmented habitat in the form of designated wilderness and IRAs, as well as RWAs and primitive and semi-primitive non-motorized ROS settings, where natural processes predominate or where human influence is minimized. All of these areas, where they overlap with wolverine habitat, would prevent fragmentation of existing wolverine habitat. Elsewhere, these areas could contribute to maintaining connectivity among wolverine sub-populations in Montana. The largest area of mapped wolverine habitat on the HLC NF, on the Rocky Mountain Range GA, is within designated wilderness or the overlapping management designations of Conservation Management Area and IRA. This habitat would remain connected, to the extent it is not reduced or altered by climate change, to wolverine habitat on the adjoining Flathead NF and Glacier National Park. All alternatives would contribute to maintaining persistence of wolverines in the plan area.

3.15.11 Species of conservation concern

The Regional Forester has identified two SCC for the HLC NF: flammulated owl and Lewis's woodpecker. This list has changed from the one identified at the time the Proposed Action was released; information regarding the changes and rationale for those and for identifying these species as SCC can be found on the Region 1 SCC web page at: http://bit.ly/NorthernRegion-SCC.

The 2012 Planning Rule states that if plan components to maintain ecosystem integrity and diversity are insufficient to provide ecological conditions to "maintain a viable population of each SCC within the plan area", then additional species-specific plan components are to be included to provide such ecological conditions. The rule acknowledges that it may be beyond FS authority or the inherent capability of the plan area to maintain or restore ecological conditions that would maintain a viable population of a species in the plan area. In such case, the FS must document the basis for that determination, and include plan components that would provide ecological conditions to contribute to maintaining a viable population of the species within its range.

This section uses the BASI to demonstrate how the plan components (species-specific or otherwise) of each alternative would provide the ecological conditions to maintain those species in the plan area over the long term. Analysis of the effects of the alternatives is provided for each SCC. Analysis of the impacts of plan components for management of other resources, as well as cumulative effects, are discussed for both species together at the end of this section.

Flammulated owl, affected environment

Status and distribution

The breeding range of flammulated owls extends from southern British Columbia southward into Mexico (MTNHP field guide), corresponding strongly with the distribution of ponderosa pine and Jeffrey pine (M. D. Nelson, Johnson, Linkhart, & Miles, 2009). A 2006 evaluation (Samson, 2006) found no evidence of population decreases on NFS lands in Montana. However there are ongoing concerns about the availability and trend of stands of large, open ponderosa pine in the plan area. Flammulated owls have been detected both historically and recently in the Upper Blackfoot, Divide, Big Belts and Elkhorns GAs (Cilimburg, 2006), but not elsewhere on the HLC NF. The plan area crosses the eastern edge of the mapped distribution of flammulated owls in Montana (MNHP, 2014), with the Little Belts, Highwoods, Castles, Crazies, and Snowies GAs outside the known range of the species. The Rocky Mountain Range GA of the LCNF is included in coarse scale map of flammulated owl distribution in Montana (MNHP,

2014), but lacks ponderosa pine. There are no historic records of flammulated owls on the Rocky Mountain Range GA, and flammulated owls were not detected during surveys for several owl species (G.Frye, Rocky Mountain Front Institute of Natural History, Pers. Com.) between 2000 and 2005.

Habitat Use

Detailed information about flammulated owl habitat use can be found in the Assessment (U.S. Department of Agriculture, Forest Service, Northern Region, 2015), and in literature cited there and in this section. In this section we will summarize information directly relevant to analysis of the consequences of the HLC NF draft plan on flammulated owls.

Flammulated owls appear to prefer dry, open, mature and old-growth forests usually with ponderosa pine or Jeffrey pine (McCallum, 1994; M. D. Nelson et al., 2009) . In Montana, flammulated owls are associated with mature and old-growth xeric ponderosa pine and ponderosa pine/Douglas-fir stands (USDA 2011d). These birds require large snags with cavities, commonly excavated by pileated woodpecker, northern flicker, or sapsuckers (Climburg, 2006).

Flammulated owls have relatively small home ranges (Linkhart & McCallum, 2013) and often nest in groups, possibly due at least in part to the often clumped distribution of snags. The amount of current habitat on the HLC NF would likely provide for persistence of flammulated owls on the HLC NF. Maintaining habitat on the HNF portion of the HLC NF may be important to preventing contraction of the species' range in Montana.

Nelson et al. (M. D. Nelson et al., 2009) estimated that that there were about 18,533 mi^2 of potential breeding habitat in the United States. Samson (Samson, 2006) mapped flammulated owl habitat habitat throughout the Region and by NF; Bush and Lundberg (Bush & Lundberg, 2008) updated Samson's mapping and estimated that there are approximately 10,200 acres of potential flammulated owl nesting habitat on the HNF, and approximately 8,800 acres on the LCNF (total of roughly 19,000 acres on the combined HLC NF). Using the same queries with updated vegetation data, estimates were made using in 2015 for the plan area by GA as shown in Table 81. The SIMPPLLE model was used to estimate the NRV of a variety of vegetation characteristics and several wildlife habitats (refer to terrestrial vegetation section and project file) and to estimate the amount of currently existing habitat. The SIMPPLLE model uses somewhat different methods and parameters than those used by Samson (Samson, 2006) and Bush and Lundberg (Bush & Lundberg, 2008); the estimates of existing habitat and NRV are also displayed in Table 81. Refer to appendix B of the Assessment (U.S. Department of Agriculture, Forest Service, Northern Region, 2015) for a summary of the methodology and data used to estimate habitat for that assessment, and to the project file for information about the methods and data used in the SIMPPLLE model.

Table 81. Estimated flammulated owl nesting habitat on the HLC NF, by GA with 90% confidence interval

GA	2015 Estimated Habitat Acres: Mean (Range)[1]	2017 SIMPPLLE Estimated Current Habitat Acres	SIMPPLLE Estimated NRV: Min-Max
Big Belts	9,525 (4,098 – 15,757)	1,670	13,045 – 124,497
Divide	4,608 (1,158 – 8,666)	6,170	2,446 – 22,757
Elkhorns	1,828 (0 – 5,330)	2,500	833 – 25,974
Upper Blackfoot	9,284 (3,963 – 15,263)	3,210	2,123 – 51,295

GA	2015 Estimated Habitat Acres: Mean (Range)[1]	2017 SIMPPLLE Estimated Current Habitat Acres	SIMPPLLE Estimated NRV: Min-Max
Total	25,245 (9219 – 45,016)	28,181	18,447 – 224,523

1. 2015 estimate made using the parameters and methodology of Samson (Samson, 2006)

The 2015 estimates differ in some GAs from the SIMPPLLE estimates for current habitat based on differences in model parameters and in methodologies. For most GAs the NRV is fairly broad, reflecting variability in model outcomes that may represent large-scale disturbances, such as fire, climate, and insect infestation, over time. For the GAs within known flammulated owl distribution, the amount of estimated current habitat by either method is at the lower end, or in the case of the Big Belts GA, below the low end of the estimated NRV. This parallels the current estimates for both ponderosa pine and large and very large diameter trees (refer to appendix B and the terrestrial vegetation section), both of which are components of flammulated owl habitat, forestwide and in the Big Belts GA. With the exception of the Little Belts GA it appears that the GAs with the least potential habitat currently and by estimated NRV correspond to areas where flammulated owls have not been detected. Elsewhere on the HLC NF (primarily in the Little Belts GA) there are over 15,000 acres of areas with ponderosa pine that do not appear to be current or historic range, and that may continue to be unoccupied in the future.

Key drivers and stressors

Although habitat appears to be well-distributed and relatively abundant in Region One, ponderosa pine forests have decreased in abundance and distribution, and their structure has changed over the last century. Changes in flammulated owl habitat may be due to factors affected by FS management, as well as those not under FS management control.

The ponderosa pine cover type is less prevalent on the HLC NFs than the dry Douglas-fir/mixed mesic conifer and lodgepole pine cover types, and is probably less abundant than it was historically (U.S. Department of Agriculture, Forest Service, Northern Region, 2015). Nelson et al. (M. D. Nelson et al., 2009) noted that logging and wildfire exclusion, both of which can be affected by FS management, have resulted in a loss of ponderosa pine forest habitat. Fire exclusion allows growth of young Douglas-fir and may reduce the amount of open understory needed for flammulated owl foraging (Samson, 2006). A lack of low-intensity disturbance may have caused a decrease in the larger size classes of trees in some cover (U.S. Department of Agriculture, Forest Service, Northern Region, 2015) in the plan area. Samson (Samson, 2006) stated that "[t]imber management is an insignificant influence on the landscape in comparison to suppression of fire", in terms of its influence on flammulated owl habitat.

Ponderosa pine has been impacted by recent heavy insect infestation on the HNF. While insect infestations may be influenced indirectly by factors related to forest management, they are a stressor that is not under FS management control. Similarly, human settlement and development on non-NFS lands may reduce mature ponderosa pine habitat through direct removal of habitat.

Flammulated owl, environmental consequences

This analysis focuses on potential impacts to the specific combination of vegetation type (tree species) and structural stage that appears to be required for nesting by flammulated owls.

Effects common to all alternatives

A general discussion of the ecological conditions that support flammulated owls (i.e. the coarse filter analysis of the species' needs) is incorporated into the terrestrial wildlife diversity sections (Species Associated with Dry Conifer Habitats and Species Associated with Snags). Forestwide over the next five decades, ponderosa pine is predicted to increase under all alternatives (but refer to action alternatives

section below, including discussion of trend by GA). The large tree size class as well as concentrations of large trees would also likely increase under all alternatives. Very large tree abundance would likely remain static.

Estimates made using the SIMPPLLE model (refer to appendix B) predict that at a forestwide scale, the average acreage of flammulated owl habitat forestwide would increase over the five decades modelled, moving into the lower end of the estimated NRV within about three decades.

Effects of alternative A, no action

The effects of alternative A on the ecological conditions that support flammulated owls are discussed in the terrestrial vegetation section regarding ponderosa pine and large and very large trees, and are summarized from there into the terrestrial wildlife diversity section, in the sections on dry conifer habitats, and late successional forests.

The existing forest plans do not include desired conditions or other plan components specific to ponderosa pine forests, large and very large trees, or management of flammulated owl habitat. Without specific desired conditions for this forest type and tree size there is no guidance for management of habitat conditions required by flammulated owls. Existing plan standards for retaining snags, particularly large snags, would provide some habitat for flammulated owls where large and very large snags occur in ponderosa pine habitats. This species is currently listed as a RFSS, so it would continue to be considered in forest management planning and implementation at a site or project specific level.

As discussed above under ‘effects of all alternatives’, modelled estimates of flammulated owl habitat at a forestwide scale show some increase under this alternative, and would be predicted to move into the estimated NRV during the third decade. Results by GA are discussed in the section below along with the action alternatives to facilitate comparison.

Effects of the action alternatives

All action alternatives include a number of plan components that set desired conditions for vegetation management that would maintain or improve potential flammulated owl habitat (Table 82) or the ecological conditions (coarse filter) required to support flammulated owls. Plan components for GAs are included only for those where flammulated owls have been observed or that are within the known distribution of flammulated owls. Additional plan components that may directly or indirectly maintain or improve potential habitat for flammulated owls may also be included in other GAs. Descriptions in Table 82 paraphrase the actual components, to briefly illustrate the manner by which they may influence habitat. Please refer to the draft plan for the actual text of plan components.

Table 82. Draft plan components that would contribute to providing habitat for flammulated owls

Plan Component	Area Where Plan Component Applies	Brief Description of Plan Component
FW-VEGF-DC-01	Forestwide	Distribution of cover types, based on NRV includes increasing ponderosa pine and maintaining or increasing non-forested inclusions. See HLC NF Draft Plan for details by broad PVT; and see individual GAs.
FW-VEGF-DC-02	Forestwide	Distribution of tree species presence, based on NRV: includes increasing ponderosa pine. See HLC NF Draft Plan for details by broad PVT, and see individual GAs.
FW-VEGF-DC-03	Forestwide	Distribution of size classes, based on NRV: includes increasing abundance and distribution of large and very large size classes. See HLC NF Draft Plan for details by broad PVT, and see individual GAs.

Plan Component	Area Where Plan Component Applies	Brief Description of Plan Component
FW-VEGF-DC-04	Forestwide	Distribution of density classes, based on NRV: includes increasing low/medium density class and decreasing high density class. See Table 7 in HLC NF Draft Plan for details by broad PVT, and see individual GAs.
FW-VEGF-DC-09	Forestwide	Desired conditions of snags by size class, to maintain or increase large and very large snags in Warm Dry type; see HLC NF Draft Plan for details.
FW-VEGF-STD-01	Forestwide	Standards to retain a minimum amount of large and very large trees based on DC. See HLC NF Draft Plan for details.
FW-VEGF-GDL-02	Forestwide	Guideline to retain a minimum amount of snags, specified by size and R1 Broad PVT. See HLC NF Draft Plan for details.
BB-VEGF-DC-01	Big Belts	Distribution of tree species presence, based on NRV: includes increasing ponderosa pine.
DI-VEGF-DC-02	Divide	Divide -Distribution of tree species presence, based on NRV - increase limber pine, maintain juniper, increase ponderosa pine, maintain Douglas-fir, maintain aspen
EH-VEGF-DC-02	Elkhorns	Elkhorns -Distribution of tree species presence, based on NRV - increase limber pine, maintain juniper, increase ponderosa pine, maintain Douglas-fir, maintain aspen.

In addition to the coarse-filter plan components listed above that would provide ecological conditions needed by flammulated owls, the revised plan includes a component specific to flammulated owls that would be applied in the Upper Blackfoot, Divide, Big Belts, and Elkhorns GAs. These GAs are within the known distribution of flammulated owls, and have documented observations. The species-specific plan component for flammulated owls is as follows:

> Ponderosa pine-dominated forests have concentrations of large (greater than 15” dbh) ponderosa pine and Douglas-fir trees and snags with relatively open canopy available for nesting by flammulated owls. These areas occur within a larger mosaic of closed-canopy forest and shrub-dominated openings that serve as flammulated owl roosting and foraging areas. (BB-WL-DC-02, DI-WL-DC-02, EH-WL-DC-03, UB-WL-DC-02)

Although elements of this plan component are also addressed in the plan components for terrestrial vegetation, the purpose of the desired condition is to ensure specific effort to provide for the mix of vegetation components (ponderosa pine, large-diameter trees and snags, open understory, in proximity to other habitats) that characterize flammulated owl habitat. This desired condition would ensure that lands managed by the HLC NF would provide conditions necessary for persistence of flammulated owls in the plan area over the long term.

Estimates of flammulated owl habitat under all alternatives by GA were made using the SIMPPLLE model (refer to appendix B) for those GAs within the known distribution of flammulated owls in Montana. The predicted acreage of flammulated owl habitat would increase in the Big Belts over the modelled five decades, moving into the lower end of the estimated NRV by the third decade. The increase would be slightly greater under alternative E. The predicted acreage of flammulated owl habitat would decrease slightly in the Divide GA over the modelled five decades, but would remain at the lower end of the estimated NRV. For the Elkhorns and Upper Blackfoot GAs, the model estimates that flammulated owl habitat would remain approximately the same or decrease very slightly over the five decades modelled, and remain at the lower end of the estimated NRV. The predicted trends for flammulated owl habitat in the Divide, Elkhorns, and Upper Blackfoot GAs appear to be the same for all alternatives, including the no-action alternative.

The modelling process is complicated and involves a large number of assumptions (refer to appendix B), which make some outputs difficult to specifically interpret. Although ponderosa pine is predicted to increase and large/very large trees are predicted to increase or remain near current abundance under all alternatives, flammulated owl habitat is predicted to remain stable or decrease slightly in three GAs. The reason for this modelled outcome is not clear, but may be due to the structural components of that habitat as modelled. Tree density is predicted to decrease slightly in the warm dry potential vegetation group (refer to appendix B and the terrestrial vegetation section). Some of that decrease in density could occur in the ponderosa pine type in those GAs, bringing it below the range identified in the scientific literature and incorporated into the model as used by flammulated owls. The species-specific plan component for flammulated owls (BB-WL-DC-02, DI-WL-DC-02, EH-WL-DC-03, UB-WL-DC-02) could help offset the predicted habitat trend by guiding managers to promote development of the specific mix of habitat components required by flammulated owls.

Cumulative effects

Cumulative effects for flammulated owls would be the same as those addressed for other wildlife species in the terrestrial wildlife diversity section. Please refer to that section.

Conclusions

The HLC NF appears to have enough habitat currently to maintain persistence of the species in the plan area, based on the density and home range size reported for this species in the literature. The draft plan includes components designed to maintain or increase the presence and distribution of habitat components (stands of large, old ponderosa pine trees and large snags) used by flammulated owls.

Because of its location crossing the edge of the known distribution of this species, the HLC NF makes a key contribution to flammulated owl habitat by potentially preventing or reducing range contraction of the species. All alternatives would contribute to maintaining flammulated owls in the plan area. By including desired conditions for the habitat components and ecological conditions required by flammulated owls, and by including species-specific desired conditions for flammulated owls, the action alternatives) would likely provide greater assurance of flammulated owls persisting in the plan area over the long term than would be provided under the no-action alternative. Alternative E may provide slightly more flammulated owl habitat in one GA (the Big Belts) than provided by other alternatives. However, given the relatively minimal differences among alternatives in terms of the trend and amount of predicted habitat, it seems likely that flammulated owl habitat may be affected at the forestwide and GA scales more by natural processes (fire and insects) than by management actions.

Lewis’s woodpecker, affected environment

Status and distribution

Lewis's woodpeckers have been detected in recent years only in the Big Belts GA and on private land adjacent to the Elkhorns and Divide GAs. A few historic records exist from the Divide, Little Belts, Castles, and Highwoods GAs. The plan area occurs at the eastern edge of the mapped distribution of Lewis’s woodpecker (MNHP-MTFWP) with the Snowies GAs at the northeastern edge of the known range of the species in Montana. Concern over declines in mature to old ponderosa pine forest as well as large, old riparian cottonwood, combined with the impact of long-term fire exclusion on availability of large, soft snags has led to some concern about the long-term persistence of this species in Montana.

Habitat use

Detailed information about Lewis's woodpecker habitat use can be found in the Assessment (U.S. Department of Agriculture, Forest Service, Northern Region, 2015). Briefly, Lewis's woodpeckers are not good excavators and rely on other woodpeckers to create cavities they use for nesting or using snags in advanced stages of decay (Abele, Saab, & Garton, 2004). They glean insects from shrubs or on the

ground, therefore requiring open-canopy forest that allows for development of an understory that will maintain certain insect populations (Abele et al., 2004). Lewis's woodpeckers also use stands of large, old cottonwood in riparian areas (Abele et al., 2004; MNHP-MTFWP). Distribution of this species is strongly associated with fire-maintained old-growth ponderosa pine, and they appear to favor areas that have experienced fire in the past 2-20 years (Abele et al., 2004; MNHP-MTFWP; Saab & Dudley, 1998). Their requirement for stands of large, old, fire-maintained open ponderosa pine stands overlaps with requirements for flammulated owls.

Habitat for Lewis's woodpecker on the HLC NF has been estimated using modelling techniques similar to those used for flammulated owl. The SIMPPLLE model (see appendix B, and the project file for detailed information about habitat models and techniques) estimated slightly over 21,000 acres of Lewis's woodpecker habitat forestwide. The majority of modelled habitat is in the Divide, Little Belts, and Upper Blackfoot GAs, with over 5,000 acres estimated in each. The model estimated slightly more than 1,000 acres each in the Big Belts, Castles, and Elkhorns GAs, less than 400 acres in the Snowies, and fewer than 100 acres each in the Crazies, Highwoods, and Rocky Mountain Range GAs. All GAs appear to be at the lower end or below the estimated NRV. The forestwide NRV is estimated between 377,000 acres and 624,000 acres. Note that the model may not estimate the cottonwood component of habitat very accurately, because this tends to be limited along lower elevation riparian areas.

Key drivers and stressors

Although habitat appears to be well-distributed and relatively abundant in Region One, ponderosa pine forests have decreased in abundance and distribution, and their structure has changed over the last century. Changes in Lewis's woodpecker habitat are due to factors affected by FS management, as well as those not under FS management control.

The ponderosa pine cover type is less prevalent on the HLC NFs than the dry Douglas-fir/mixed mesic conifer and lodgepole pine cover types, and is probably less abundant than it was historically (U.S. Department of Agriculture, Forest Service, Northern Region, 2015). In their work on flammulated owls, which also rely on stands of large old ponderosa pine, Nelson et al. noted that logging and wildfire exclusion, both of which can be affected by FS management, have resulted in a loss of ponderosa pine forest habitat. Fire exclusion allows growth of young Douglas-firs and may reduce the amount of open or shrub-dominated understory used by Lewis's woodpeckers for foraging. A lack of low-intensity disturbance may have caused a decrease in the larger size classes of trees in some cover (U.S. Department of Agriculture, Forest Service, Northern Region, 2015) in the plan area. With respect to the prevalence of large-diameter, open-understory ponderosa pine, Samson (Samson, 2006) stated that "[t]imber management is an insignificant influence on the landscape in comparison to suppression of fire".

Ponderosa pine has been impacted by recent heavy insect infestation on the HNF. While insect infestations may be influenced indirectly by factors related to forest management, they are a stressor that is not under FS management control. Similarly, human settlement and development on non-NFS lands may reduce both mature ponderosa pine habitat and large old cottonwood stands through direct removal of habitat.

Stands of large old cottonwood are less prevalent on NFS lands, occurring in lower elevation riparian areas. These areas tend not to be included in vegetation management activities, although in some localized areas individual cottonwoods may be removed as hazard trees where they occur in close proximity to campsites or recreation residences. Prevalence of cottonwood stands may be most influenced by drought and changes in hydrology, particularly off NFS lands where stream flows may be regulated by dams and irrigation practices.

Lewis's woodpecker, environmental consequences

Effects common to all alternatives

The terrestrial vegetation and terrestrial wildlife diversity sections summarize the ecological conditions required by Lewis's woodpeckers (i.e. the coarse filter analysis of the species' needs). Ponderosa pine would increase over the course of five decades under all alternatives, as would cottonwood. The large tree size class as well as concentrations of large trees would also likely increase over that timeframe under all alternatives. Very large tree abundance would likely remain static. The increase in large ponderosa pine and in cottonwood would provide additional or improved habitat for Lewis's woodpeckers.

The SIMPPLLE model estimates that at a forestwide scale, Lewis's woodpecker habitat would increase over the five decades modelled, with no differences among alternatives. The total forestwide acreage of habitat would move into the lower end of the estimated NRV during the fourth decade modelled. Predicted habitat in most GAs appears to increase to within the lower end of the estimated NRV as well (see below).

Effects of alternative A, no action

The effects of alternative A on the ecological conditions that support Lewis's woodpeckers are discussed in the terrestrial vegetation section regarding ponderosa pine, hardwoods, and large and very large trees, and are summarized from there into the terrestrial wildlife diversity section, in the sections on dry conifer, hardwood, and riparian habitats, and late successional forests.

The existing forest plans do not include desired conditions or other plan components specific to ponderosa pine forests, large and very large trees, or management of Lewis's woodpecker habitat. Without specific desired conditions for this forest type and tree size there is no guidance for management of habitat conditions required by this species. Existing plan standards for retaining snags, particularly large snags, would provide some habitat for Lewis's woodpeckers where large and very large snags occur in ponderosa pine or cottonwood habitats. The SIMPPLLE model (see terrestrial vegetation section) estimates that the aspen/hardwood cover type, which includes cottonwood, would increase slightly over the next 50 years. The section also cautions, however, that the presence of cottonwood is not well-represented by plot data or modeling.

As discussed above under 'effects of all alternatives', modelled estimates of Lewis's woodpecker habitat at a forestwide scale show some increase under this alternative. Results by GA are discussed in the next section, for ease of comparison.

Effects of the action alternatives

All action alternatives include a number of plan components that set desired conditions for vegetation management that would maintain or improve potential Lewis's woodpecker habitat Table 83, or the ecological conditions (coarse filter) required to support Lewis's woodpeckers. Descriptions in Table 83 paraphrase the actual components, to briefly illustrate the manner by which they may influence habitat. Please refer to the draft plan for the actual text of plan components.

Table 83. Draft plan components that would contribute to providing habitat for Lewis's woodpeckers

Plan Component	Area where plan component applies	Brief description of plan component
FW-VEGF-DC-01	Forestwide	Distribution of cover types, based on NRV includes increasing ponderosa pine and maintaining or increasing non-forested inclusions. See HLC NF Draft Plan for details by broad PVT, and see individual GAs.

Plan Component	Area where plan component applies	Brief description of plan component
FW-VEGF-DC-02	Forestwide	Distribution of tree species presence, based on NRV: includes increasing ponderosa pine. See HLC NF Draft Plan for details by broad PVT, and see individual GAs.
FW-VEGF-DC-03	Forestwide	Distribution of size classes, based on NRV: includes increasing abundance and distribution of large and very large size classes. See HLC NF Draft Plan for details by broad PVT, and see individual GAs.
FW-VEGF-DC-04	Forestwide	Distribution of density classes, based on NRV: includes increasing low/medium density class and decreasing high density class. See HLC NF Draft Plan for details by broad PVT, and see individual GAs.
FW-VEGF-DC-09	Forestwide	Desired conditions of snags by size class, to maintain or increase large and very large snags in Warm Dry type; see HLC NF Draft Plan.
FW-VEGF-STD-01	Forestwide	Vegetation management projects shall retain a minimum amount of large and very large trees based on DC. See HLC NF Draft Plan.
FW-VEGF-GDL-02	Forestwide	Vegetation management projects should retain a minimum amount of snags, specified by size and R1 Broad PVT. See HLC NF Draft Plan.
FW-FIRE-DC-01	Forestwide	Wildfire is allowed, as nearly as possible, to function in its natural ecological role.
BB-VEGF-DC-01; CA-VEGF-DC-01; CR-VEGF-DC-01; DI-VEGF-DC-02; EH-VEGF-DC-02; HI-VEGF-DC-02; LB-VEGF-DC-01; RM-VEGF-DC-02; SN-VEGF-DC-02; UB-VEGF-DC-02	All GAs, specific, quantified DCs identified for each GA	Distribution of tree species presence, based on NRV: includes increasing ponderosa pine (maintain or increase in Snowies GA; also recognize that on Rocky Mountain Range GA there is little or none).
BB-WL-DC-02; DI-WL-DC-02; EH-WL-DC-03; UB-WL-DC-02	Big Belts, Divide, Elkhorns, Upper Blackfoot	Desired large, open, ponderosa pine and Douglas fir trees and snags within mosaic of other vegetation to provide nesting habitat for flammulated owls.

There are no species-specific plan components for Lewis's woodpecker. The plan components specific to flammulated owls (BB-WL-DC-02, DI-WL-DC-02, EH-WL-DC-03, UB-WL-DC-02) would help to ensure habitat is managed in some areas for Lewis's woodpeckers, because the "landscape level-needs of the flammulated owl would probably accommodate any habitat-area needs of Lewis's woodpeckers" (Casey, 2000; MNHP-MTFWP). Site-specific habitat components, including interspersed shrubby understory, would be addressed appropriately at the project planning level.

The combined effects of the desired conditions for increasing abundance of large, old ponderosa pine and cottonwood stands, along with plan components that would guide managers to allow fire to play its natural role to the extent possible in some areas, and the site-specific plan components for flammulated owl, would ensure that lands managed by the HLC NF would contribute to persistence of Lewis's woodpeckers in the plan area over the long term.

Although Lewis's woodpeckers have been documented in recent years only in the Big Belts GA and on private land immediately adjacent to the Elkhorns and Divide GAs, the distribution of this species as mapped by the Montana Natural Heritage Program (MNHP-MTFWP) includes the entire HLC NF, with the possible exception of the Snowies GA. Estimates of Lewis's woodpecker habitat under all alternatives by GA were made using the SIMPPLLE model. Habitat would increase to above the estimated NRV in the Castles, Crazies, and Divide GAs, although note that the estimated NRV range in these GAs is

relatively narrow. Habitat would increase to within the estimated NRV in the other GAs. The rate of increase is predicted to vary by GA, with the most rapid increase predicted in the Castles, Crazies, and Divide GAs and slower rates of increase predicted in the remaining GAs. Model results are the same across all alternatives, with possibly a slightly higher acreage of habitat predicted under alternative E in the Big Belts GA.

Cumulative Effects

Cumulative effects for the Lewis's woodpecker would be the same as those addressed for other wildlife species in the terrestrial wildlife diversity section. Please refer to that section.

Conclusions

The draft plan includes components designed to maintain or increase the presence and distribution of habitat components (stands of large, old ponderosa pine trees and large snags) used by Lewis's woodpeckers. Because of its location along the eastern/northeastern edge of the known distribution of this species, the HLC NF makes a key contribution to Lewis's woodpecker habitat by potentially preventing or reducing range contraction of the species. All alternatives would likely contribute to maintaining Lewis's woodpeckers in the plan area. By including desired conditions for the habitat components and ecological conditions required by Lewis's woodpeckers, and by including species-specific desired conditions for Lewis's woodpeckers, the action alternatives (alternatives B, C, D and E) would likely provide greater assurance of Lewis's woodpeckers persisting in the plan area over the long term than would be provided under the no-action alternative (alternative A). Given the apparent lack of measurable differences among alternatives in terms of the trend and amount of predicted habitat, it seems likely that Lewis's woodpecker habitat may be affected at the forestwide and GA scales more by natural processes (fire and insects) than by management actions.

3.16 Elk

3.16.1 Introduction

This section addresses the status of elk in the planning area and the ability of the Draft Plan to provide habitat for elk on NFS lands. The 2012 Planning Rule (U.S. Department of Agriculture, Forest Service, 2012) requires that NFs maintain or work toward restoring the ecological integrity of the plan area. Doing so includes maintaining the diversity of plant and animal communities within the plan area. For most wildlife species, a "coarse filter" approach of maintaining key vegetation communities and characteristics also provides for habitat required to maintain a species or animal community. This is the case with elk, which are a habitat generalist. Viability of elk and the persistence of elk populations in Montana and in the plan area are not of concern in Montana or on the HLC NF (U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013). Information regarding the coarse filter ecological conditions in the plan area that would continue to support elk populations is described in the terrestrial wildlife diversity section.

The planning rule also requires that NFs provide for ecosystem services and multiple uses, which include habitat for fish and wildlife communities, as well as opportunities for recreation and other uses. In addition to being an important component of native wildlife diversity, elk are socially and economically important in Montana and in the planning area for a variety of reasons. Elk and the management of elk populations and habitat generate a great deal of public interest, and management of elk and elk habitat has generated comparable attention from land and wildlife managers. The MTDFWP manages elk populations, largely through establishing hunting seasons and limits. The FS manages some of the habitat used by elk. Forest management activities therefore have the potential to influence elk numbers or distribution, or elk hunting and viewing opportunities.

The planning rule acknowledges that some species, generally those considered 'at-risk' species, may require additional, species-specific plan components to ensure that the ecological conditions that provide for their persistence in the plan area are maintained or restored. Elk are not an at-risk species, but there is a great deal of public and agency interest in the distribution of elk and their availability on NFS lands, especially related to hunting opportunities. Public and agency concern has focused for many years on elk vulnerability to hunting, and more recently on elk use of adjoining private lands. Therefore we will briefly discuss these management issues and evaluate the effects of the draft plan and alternatives on elk distribution and availability for recreation opportunities, including hunting. For detailed information regarding elk status and management issues on HLC NF lands, refer to the Elk Background Report in the project file.

3.16.2 Regulatory framework

Please refer also to the introductory regulatory framework section of this chapter (3.3).

The Helena NF Plan (USDA 1986) provides standards that set the framework for current management of elk. Forest-wide standards providing direction for elk management are identified on pages II/17 – II/21 of the Plan. The Lewis and Clark NF Plan (USDA 1986) provides standards that set the framework for current management of elk. Forest-wide standards are identified on pages 2-30 to 2-31.

3.16.3 Assumptions

The primary assumption underlying the analysis in this section is based on the 2012 Planning rule and the directives for implementing the rule: that plan components developed for ecosystem integrity and ecosystem diversity will provide for ecological conditions necessary to maintain the persistence or contribute to the recovery of native species within the plan area (FHS 1909.12, 23.13). Therefore we assume that effects to vegetation systems and characteristics as described in the terrestrial vegetation section provide the basis for understanding most of the potential effects to wildlife species, including elk, associated with those systems. We also assume that the coarse filter approach as described in the Introduction above will retain representative habitats and seral stages important to elk habitat.

The analyses discussed in this section rely on an analytical model (SIMPPLLE), which is described in the terrestrial vegetation section and in appendix B. The SIMPPLLE model uses "numerous assumptions to simplify ecosystem processes as well as treatment implementation" (terrestrial vegetation section, Assumptions section). We have also relied on a set of parameters established by the FS and MTDFWP to estimate existing elk habitat (U.S. Department of Agriculture, Forest Service, 2013a).

In this analysis, we assume that elk habitat is best modeled using what scientific literature and field examination identify as "typical" habitat for elk. Although our habitat models are simplifications of complex biological systems and therefore cannot be perfectly predictive, we expect that use of these general models will be applicable across all geographic areas and that they will be useful in determining elk/habitat interactions ascribed to the draft plan. Refer to appendix B for a full description of the model and processes used to estimate and predict elk habitat for this analysis.

We assume that there is at least some relationship between management of elk habitat, elk population trend and distribution, and elk hunting opportunity as follows:

- Hunter days provide a proxy or index for hunting opportunity;
- Hunter-days given on statewide scale are reasonable proxy for what happens on the HLC NF; and
- Elk numbers by hunting district reflect habitat conditions on NF lands, even though elk spend only part of time there.

Last, we assume that the discussion and analyses related to the Helena NF plan address the Elkhorn portion of the Beaverhead-Deerlodge NF that are included in this revision effort. Habitat data for those herd units that occur on the B-D portion of the Elkhorns are included.

3.16.4 Best available scientific information used

A thorough review of the scientific information was completed, and the BASI was used to inform the planning process and develop plan components. Key information on the population, life history, status, and management issues of elk on and adjacent to the HLC NF was obtained from sources listed in the references section of this document, and in the Elk Background Report in the project file. Published, peer-reviewed articles and data in which reliable statistical or other scientific methods were used, where those were available. For best relevance, studies conducted in north-central or north-western Montana, western North America, or other areas with habitat conditions similar to those in the plan area where used, where those were available. When not available, articles that considered conditions and/or issues similar to those in the plan area were used. The planning rule acknowledges that the best available scientific information may include expert opinions, inventories, or observation data prepared and managed by the FS or other agencies, universities, reputable scientific organizations, and data from public and governmental participation. Those sources of information were relied upon when published, peer-reviewed information was not available or when needed to provide additional information specific to the plan area. Where needed in the assessment and in this section, specific discussion may be included regarding contradictory science, why some information is used to the exclusion of others, and regarding areas for which scientific information is lacking.

The information in this analysis relies heavily on information in the Assessment of the Helena and Lewis and Clark National Forests (U.S. Department of Agriculture, Forest Service, Northern Region, 2015) and in the Elk Background Report (project file).

3.16.5 Elk, affected environment

Indicators and scale of analysis

The issue being considered in this section is the extent to which the draft plan provides habitat on NFS lands to support elk for hunting, wildlife viewing, and for their contributions to ecological diversity and to animal communities per the 2012 Planning Rule (U.S. Department of Agriculture, Forest Service, 2012). This issue also serves as a proxy for assessing the availability of habitat for some other big game species with broadly similar requirements, such as white-tailed deer and mule deer.

The most direct measure of the effectiveness of elk habitat on NFS lands would be an evaluation of trends in elk numbers on NFS lands relative to specific measures of the quality and availability of seasonal habitats there. However, these data do not exist at a scale where those comparisons can be made, nor across the planning area as a whole. Information on elk numbers and population trend are available at statewide and hunting district scales; data from hunting districts that overlap with the HLC NF can be used as an indicator of the current general health of the elk population and availability of elk. Hunter-days by hunting district for those districts that include NFS lands can be used as an indicator of the opportunity to hunt elk. Neither population trend nor hunter-days can be predicted for the alternatives, however, because both depend on complex interactions among habitat, climate and weather, hunting, predation, elk behavior, human behavior, management of adjacent lands, and other factors. This section will therefore provide information regarding elk numbers and trend and hunter-days as an indication of the current status of the elk population and current availability of elk for hunting, but cannot estimate either of those for comparison among alternatives.

Elk security generally includes consideration of the amount or density of open roads. The pattern and density of open roads is determined by travel management plans. This would not be changed by the draft

forest plan. Hiding cover and winter cover, however, are components of habitat security that may be affected by components of the draft plan, and could vary by alternative. These measures are discussed in this section as an indicator of habitat components that may contribute to the distribution and availability of elk on lands managed by the HLC NF. Other habitat characteristics, such as forage quality and availability, as well as management of adjoining lands and other factors also play key roles in influencing elk distribution and population trend. A more complete discussion of factors influencing elk population trend and distribution on NFS lands can be found in the Elk Background Report in the project file.

Elk population size and trend

Elk population numbers are dynamic, but throughout Montana elk have generally increased in numbers and spatial extent since the early to mid-1900s (Montana Fish and Wildlife and Parks, 2004), and have continued to do so since the current forest plans were written. Statewide, elk numbers have increased from 8,000 in 1922 to 55,000 in 1978 to about 160,000 in 2004 (Montana Fish, 2005) , to over 170,000 estimated in 2017 (http://fwp.mt.gov/fishAndWildlife/management/elk/).

Elk are counted by elk hunting districts or by elk management units, for which population and habitat objectives have been set (Montana Fish and Wildlife and Parks, 2004). The Helena NF is within 17 elk/deer hunting districts, and the Lewis and Clark NF is within 22 elk/deer hunting districts, all of which extend to varying degrees beyond the NF boundaries. Although elk counts include non-NFS lands, they represent the best available estimates of elk numbers and, cumulatively over time, of the trend in numbers of elk using NFS lands. Aerial surveys are not intended to be complete counts, but are designed to provide relative between-year comparison of total elk seen as well as of specific demographic segments.

Table 84 displays the estimated elk population and trend for 2017, by GA. The table also includes numbers by hunting district and elk management units, which are delineated in the Montana Statewide Elk Management Plan (MTFWP, 2004) and are the basis for population management and analysis used by MTDFWP.

Table 84. 2017 Estimated elk population and trend by (MTDFWP 2017b)

GAs included	Elk management unit	Hunting district(s)	Elk plan objective (observed elk)	2017 or most recent number elk observed	Status: over, at or below objective	Estimated elk numbers assuming 80% of elk are observed[1]
Rocky Mountain Range	Bob Marshall	415	200	266	Over	333
		422[2]	500	1,508	Over	1,885
		424, 425, 442	2,500	2,288	At	2,860
		441	500	580	At	725
Elkhorns	Elkhorn	380	2,000	2,100	At	2,625
Big Belts	West Big Belt	392	400	198	Below	248
	Bridger	390	900	2,252	Over	2,815
		391	975	1,844	Over	2,305
	East Big Belt	446	950	1,893	Over	2,366
	Devils Kitchen	445, 455	2,500	4,363	Over	5,454
Crazies	Crazy Mountains	315	1,000	1,186	At	1,483
		580	975	4,846	Over	6,058
Castles	Castle Mountains	449, 452	600	1,073	Over	1,341

GAs included	Elk management unit	Hunting district(s)	Elk plan objective (observed elk)	2017 or most recent number elk observed	Status: over, at or below objective	Estimated elk numbers assuming 80% of elk are observed[1]
Little Belts	Little Belt	413	500	610	Over	763
		416	475	913	Over	1,141
		418	150	241	Over	301
		420, 448	1,200	1,113	At	1,391
		432	325	443	Over	554
		454	250	364	Over	455
		540	600	2,046	Over	2,558
Highwoods	Highwood	447	700	1,828	Over	2,285
Snowies	Snowy	411 (north)	400	2,140	Over	2,675
		511 (411 west)	400	549	Over	686
		530	See 411 (north)	3,273	Over	4,091
Upper Blackfoot	Bob Marshall	281	500-700	872	Over	1,090
	Granite Butte	293[3]	750	587	Below	734
		339, 343	1,400	1,617	At	2,021
	Garnet	298	600	845	Over	1,056
	Birdtail Hills	421, 423	500	783	Over	979
Divide	Deer Lodge	215	1400	2,850	Over	3,563
		318	500	381	Below	475
		335	600	695	At	869
	Granite Butte	343[4]	1,400	1,617	At	2,021

1. Visibility of elk during surveys can be affected by weather conditions, snow cover, canopy cover, animal activity, and survey vehicle (helicopter or fixed-wing). The 80% visibility index provided in this table is for illustrative purposes only and is not a true population estimate.
2. HD 422 includes part of Upper Blackfoot GA but is listed only once, under the Rocky Mountain Range GA, which includes the majority of HD 422.
3. HD 293 includes part of the Divide GA but is listed only once, under the Upper Blackfoot GA, which includes the majority of HD 293. Also, data for HD 293 include HD 284.
4. Data for HD 343 and 339 are combined in the Statewide Elk Trend Estimates data.

The information in Table 84 also includes whether elk numbers are over, at, or below the population objectives established by MTDFWP. Population objectives are established by considering the history of long-term trend counts in an area, input from the public, land managers, and community working groups, landowner tolerance, desired type of harvest, accessibility of elk to harvest, and other factors. Of 34 units that overlap HLC NFS lands and in which elk are counted and numeric objectives have been established, 22 (67%) are above objective, 8 (24%) are at objective, and 3 (6%) are below objective. Figure 14 shows the status of elk populations relative to established objectives for the entire state of Montana, by hunting district, for 2017.

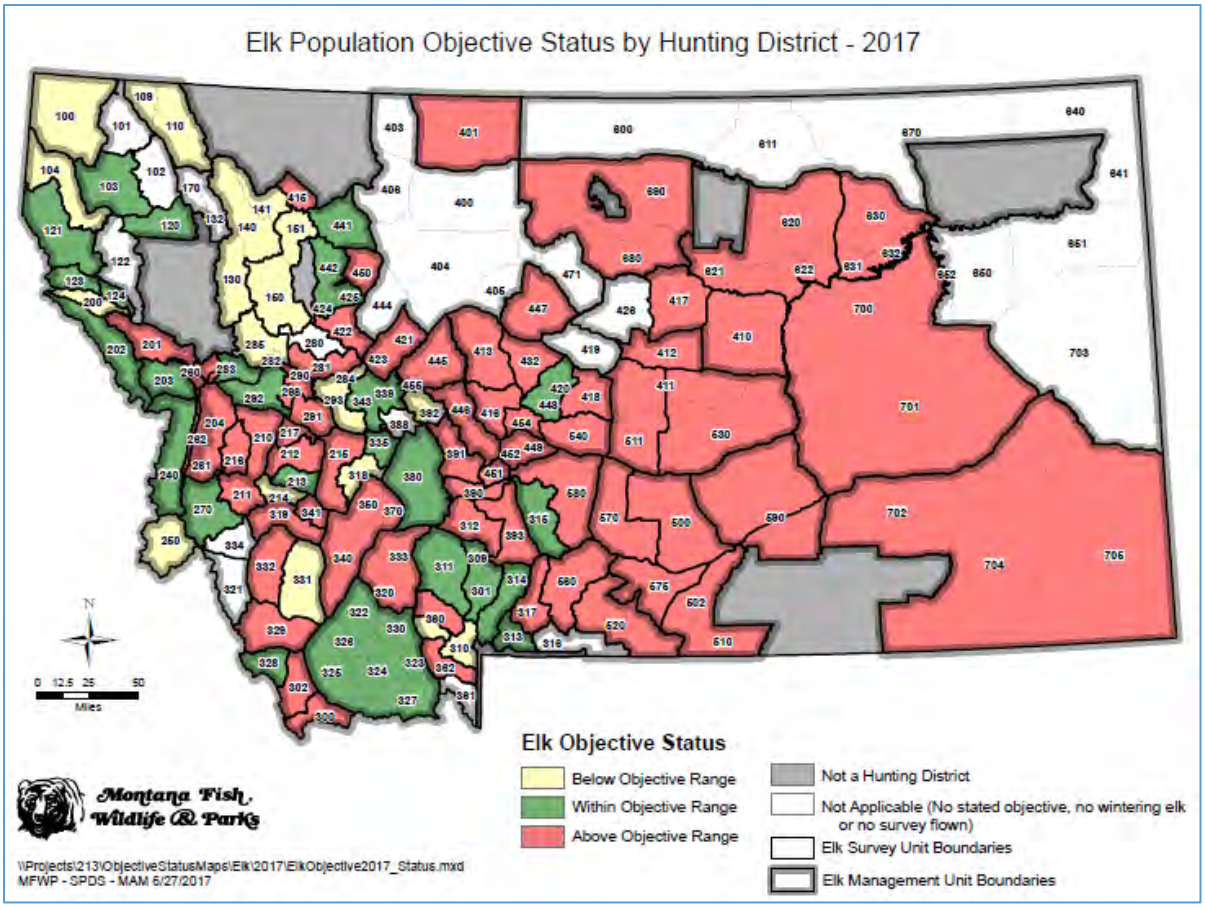

Figure 14. Elk population objective status by hunting district in 2017 (MTDFWP 2017a)

Elk populations in most of Montana, are at or over objectives, with a few areas primarily in western and northwestern Montana below objective. It should be noted that elk populations that are significantly above established objectives pose management issues that are different but no less important than populations that are below (MTFWP, 2004). Consequently, shoulder seasons (a firearms hunting season that occurs outside the 5-week general firearms and archery hunting seasons) are planned for 43 hunting districts in Montana in order to reduce elk populations in areas that are over objective (MFWP 2017a).

Relationship to existing forest plans

The existing (1986) Helena NF and Lewis and Clark NF plans identified elk population potential as a major issue during plan development, and discussed elk populations relative to hunting opportunity. The elk population potential identified for both plans was based on population goals identified in the Northern Regional Plan (U.S. Department of Agriculture, Forest Service, 1981), which were in turn based on the 1978 Montana Statewide Comprehensive Outdoor Recreation Plan (Montana Fish, 1978). The latter included goals of protecting and perpetuating "elk and their habitat and to increase the supply of available, harvestable elk to meet demands for hunting and non-hunting recreation" (Montana Fish, 1978). All of these plans were developed at a time when elk numbers were markedly lower than they are currently (less than one third of current numbers statewide), logging was increasing on NFS lands particularly in western Montana, and concerns were being raised by the public and biologists about the potential impacts to elk of logging and of roads created for logging and used by hunters.

The elk population capacity of lands under management of the Helena NF at the time the existing plan was written was estimated at 6,300 elk in summer and 3,300 in winter, with a maximum capacity

estimated at 8,500 for both seasons (USDA 1986). The elk population capacity of lands under management of the Lewis and Clark NF at the time the existing plan was written was estimated at 8,800 elk, with a maximum capacity estimated at 12,500. Analysis for both plans predicted the same (Lewis and Clark NF) or slightly fewer (Helena NF) elk would use NFS lands in summer by the end of five decades after implementation. The Helena NF plan predicted that the number of elk wintering on NFS lands would increase over time.

Summarizing from Table 84 above, MTDFWP counts show over 26,000 elk within the hunting districts that largely overlap the Helena NF, and over 31,000 elk within the hunting districts that overlap the Lewis and Clark NF. Not all of those elk use NFS lands, but those estimates indicate that elk numbers have far exceeded the targets and maximum capacities identified in the analyses for the existing forest plans.

Hunter days have been used as an indicator of hunting opportunity associated with elk and other big game presence on public lands. When opportunity to encounter or harvest an animal is or is perceived to be low, hunter-days are expected to be lower than when those opportunities are greater or perceived to be greater. It is important to note, however, that hunter effort is also influenced by weather, access both on and off NFS lands, economic trends, social factors, and other things that may vary greatly among years. Table 85 shows the estimated number of hunter days by GA since 2004; hunter days shown in the table are calculated by hunting districts, which usually include non-NFS lands.

Table 85. Estimated elk hunter days by GA 2004-2016 (MTDFWP 2017b)

GA (hunting districts included)	Average hunter days 2004-2016	Range of hunter days 2004-2016	Trend
Big Belts (390, 391, 392, 445, 446)	36,415	27,909 – 56,300	Stable to increasing
Divide (215, 318, 335, 343)	41,848	33,023 – 59,568	Stable to increasing
Elkhorns (380)	22,558	17,384 – 31,786	Increasing
Upper Blackfoot (281, 284, 293, 298, 339, 343, 421, 423)	43,022	36,275 – 54,643	Stable
Former HNF portion Subtotal	*143,843*	*na*	*na*
Castles (449,452)	6,248	4,341 – 11,237	Increasing
Crazies (315, 580)	13,177	10,203 – 18,640	Increasing
Highwoods (447)	4,214	3,023 – 7,441	Stable to Increasing
Little Belts (413, 416, 418, 420, 432, 448, 454, 540)	38,732	30,092 – 52,042	Stable to Increasing
Rocky Mountain Range (424, 425, 441, 442)	11,765	8,755 – 15,893	Stable to Increasing
Snowies (411, 511, 530)	10,447	6,092 – 16,559	Increasing
Former LCNF portion Subtotal	*84,613*	*na*	*na*

The 1986 Helena NF plan projected 43,100 hunter-days per year by the fifth decade (beginning in 2026) of implementation (FEIS, II/46). Elk hunter-days on hunting districts that include the Helena NF have increased to approximately 177,531 days as of 2016 (see project record and http://fwp.mt.gov/hunting/planahunt/harvestReports.html), and have averaged over 143,000 hunter days annually between 2004 and 2016. The 1986 Lewis and Clark NF plan projected 63,700 hunter-days per year by the fifth decade (beginning in 2026) of implementation. Elk hunter-days on hunting districts that include the Lewis and Clark NF have increased to approximately 117,480 days as of 2016 (ibid), and have averaged over 84,000 hunter days annually between 2004 and 2016. Not all of these hunter-days are associated with elk, and not all occur on HLC NF lands, but as an indicator of the recreational opportunity

associated with elk hunting they show that this opportunity has increased beyond what was anticipated in the analyses for the existing plans.

Elk habitat status

Discussion of the potential impacts to elk from land management practices, hunting, wildlife viewing, and the presence of people in elk habitat have generally focused on seasonal habitat needs.

Elk summer habitat

Elk summer habitat includes a mix of cover and foraging areas, often including riparian areas (Ward Thomas, Black, Scherzinger, & Pedersen, 1979). Elk may use a variety of vegetation types, including conifer and hardwood forests, grasslands, alpine zones, and stream and valley bottoms. Some research suggests that the quality of summer forage may be the most important variable in determining annual variation in herd growth (J. G. Cook, 2002; J. G. Cook et al., 1996; K. M. Proffitt, Hebblewhite, Peters, Hupp, & Shamhart, 2016; Ranglack et al., 2014; Stewart, Bowyer, Dick, Johnson, & Kie, 2005).

Generally, the resources that elk need to thrive on summer range are well distributed across mid to high elevation habitats on NF lands across western and central Montana. Elk summer habitat on the HLC NF has not been specifically mapped or quantified because of the generalist nature of elk summer habitat use. Elk, as most wildlife species, may not find all habitat and resources equally available due to a variety of factors, including the distribution of open roads and trails that may contribute to disturbance or displacement from nearby habitats, competition from domestic livestock, and vegetation patterns created by disturbances such as timber harvest and fire. Hiding cover, defined as “vegetation capable of hiding 90 percent of a standing adult elk from the view of a human at a distance equal to or less than 200 feet” (J. L. Lyon & Christensen, 1992) has been used as a measure of summer habitat quality (Thomas, 1979), assuming that adequate hiding cover may increase the ability of elk to use summer habitat by providing areas where they can rest, forage, and regulate body temperature without disturbance or displacement caused by humans or predators. Various sources have recommended managing for a variety of mixtures of hiding cover, thermal cover, and foraging areas, depending on characteristics of the area under consideration (Thomas, 1979). However, habitat relationships on summer range are far more complex than can be defined by cover/forage ratios (Leege, 1984), making management recommendations for specific cover/forage ratios difficult and of questionable value.

Elk fall habitat

Habitat used by elk in fall is variable and dependent on annual and seasonal changes in forage availability, weather and climate, hunting pressure, predation, and other factors. It is not useful to attempt mapping specific fall habitat for elk on the HLC NF. Instead, elk habitat management during the fall has generally attempted to achieve a balance between elk availability to hunters and the need to allow some elk to escape hunting-related mortality or displacement by providing for some level of security throughout NFS lands. Elk security has been defined as “the protection inherent in any situation that allows elk to remain in a defined area despite an increase in stress or disturbance associated with the hunting season or other human activities” (J. L. Lyon & Christensen, 1992). Security may be affected by vegetation, topography, road density, distance from roads, size of vegetation blocks, hunter density, season timing, and land ownership (ibid), as well as road use type and levels, weather, and other factors.

Management concerns in the past have been focused on elk vulnerability to hunting as a result of logging activity and human access created by logging roads on NFS lands. Concerns about those impacts emerged largely from western Montana and some other western states in which elk populations were lower than desired or were perceived to be declining (L. J. Lyon et al., 1985). During that same period, the pace and scale of logging activity had increased on NFS lands, and there was concern that logging and the access created by roads associated with logging were increasing elk vulnerability to harvest to potentially

unacceptable levels. Concerns focused on elk distribution and movements on a drainage or watershed scale.

Research from several areas in Montana regarding the potential for logging roads and activity on them to disturb or displace elk and increase their vulnerability to harvest also provided recommendations for management of elk habitat on NFS lands where logging was occurring (L. J. Lyon et al., 1985). Several studies since then have documented the effect of roads on elk security, population structure, and hunter success (Edge & Marcum, 1991; Gratson & Whitman, 2000; Gucinski, Furniss, Ziemer, & Brookes, 2001; Leptich & Zager, 1991; Unsworth & Kuck, 1991). Those found that open roads can influence elk distribution during the hunting season, and that targeted road closures can lower the elk harvest rate in a given area. Other research (Preisler, Ager, & Wisdom, 2006; Kelly M. Proffitt, Gude, Hamlin, & Messer, 2013; M. J. Wisdom et al., 2005) has indicated that factors such as topography, cover, forage quality and quantity, and hunting pressure on adjoining lands, may affect the degree to which roads influence elk movements.

The role of hiding cover, which is a component of elk security, appears to vary. Some studies have emphasized cover as a key habitat component for elk in the fall and have attempted to quantify its contribution to security as a counterweight to open road density (L. J. Lyon, 1979); Perry and Overly 1976). A majority of management approaches, however, have concluded that the influence of cover can be outweighed by hunting pressure resulting from open roads or by the availability of un-hunted or very lightly hunted areas nearby (Christensen, Lyon, & Unsworth, 1993; Henderson, Sterling, & Lemke, 1993; J. L. Lyon & Canfield, 1991; J. L. Lyon & Christensen, 1992; Kelly M. Proffitt et al., 2013; Skovlin, Zager, & Johnson, 2002; Thomas, 1979) Montana Fish, Wildlife and Parks 2015.

The abundance, distribution, and importance of hiding cover is less well understood in the more open elk ranges across much of central and eastern Montana as compared to the dense forest environments of western Montana and northern Idaho (Hillis et al., 1991) where much of the research on elk security and hiding cover has taken place. Most research and recommendations regarding elk security, hiding cover, and managing elk vulnerability during the hunting season cautions against applying results and recommendations from one area too broadly, and most recommend a site or area specific analysis of the many factors influencing elk vulnerability in a given area (Hillis et al., 1991; L. J. Lyon et al., 1985; U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013).

Increasingly, movement of elk early in the fall from accessible NFS lands to remote areas or to adjoining private lands that receive little or no early hunting pressure has been a concern with respect to hunter success rate throughout the remainder of the season. Some studies in Montana have concluded that many elk move to private land that is lightly hunted or not hunted, rather than remain in security areas (defined as areas that hold elk during periods of stress (J. L. Lyon & Christensen, 1992)) or other areas on public land (Burcham, Edge, & Marcum, 1999; Kelly M. Proffitt et al., 2013) Ranglack et al. (2017) also found that elk may increase use of private land during the hunting season due to limited hunting pressure. Elk appear to be moving in increasing numbers to these private land refuges, and are doing so regardless of the level of security provided on NFS lands (Montana Fish, Wildlife and Parks 2015). Population increases and elk numbers over objective, as discussed earlier in this section, appear to be caused in part by the inability of elk harvest on public lands to reduce elk numbers sufficiently to reduce population growth (Kujala, Q., and Gude, J. MTDFWP, Pers. Comm. 2017).

Elk winter habitat (winter range)

Traditionally, the availability of suitable winter range has been seen as the key limiting factor for most elk populations (Polfus, 2011) (J. L. Lyon & Christensen, 2002). Winter ranges are usually smaller than summer ranges, supply less forage, provide less forest cover, often lie closer to sources of human disturbance, are often grazed by domestic livestock, and are occupied by elk when temperatures are low and snow may limit access to forage. Winter ranges have been identified and mapped by both the FS and

by MTDFWP, but areas used by elk in winter vary over time and based on factors such as forage availability, snow depth and characteristics, disturbance by humans, and characteristics of adjacent private lands. Managing for wintering areas with minimal human activity and adequate forage can help reduce energy costs associated with over-winter survival (Skovlin et al., 2002). On the other hand, recent studies suggest that while natural mortality is generally higher on winter ranges, the probability of elk surviving a given winter is directly linked to the quality of nutrition on spring, summer, and fall habitat (J. G. Cook, 2002; Ranglack et al., 2014).

For several decades, thermal cover and forage have been the two habitat elements of greatest management concern on big game winter ranges. In winter, thermal cover stands curtail snow accumulation, block wind, and can moderate microsite temperature. However, although thermal cover was widely accepted as a key component of elk winter range in the 1970s and 1980s (Thomas, 1979) (Beall 1976) more recent research (J. G. Cook, Irwin, Bryant, Riggs, & Thomas, 2005; Skovlin et al., 2002) has concluded that thermal cover may not be a critical factor to elk on most winter ranges in Montana. Thompson and others (2005) indicate that forest cover on Montana elk winter ranges may be important to provide areas for reduced energy expenditure and access to forage during times when deep or crusted snow have made higher quality forage unavailable. Forest cover as described by Thompson and others (2005) is not specifically defined, but rather is described more generally as a cover/forage mosaic.

Relationship to existing forest plans and seasonal habitat status in the plan area

Elk summer habitat

The existing Helena NF and Lewis and Clark NF Plans both use hiding cover as the primary determinant of summer habitat capability. The existing Helena NF Plan includes a standard requiring that hiding cover is to be maintained at or above 35 percent (measured by ground surveys) or 50 percent (measured as 40 percent crown closure) of the elk summer range within each herd unit (USDA 1986) with a 40 acre minimum patch size. The existing Lewis and Clark Plan requires that effective hiding cover be maintained within a drainage or herd unit for projects involving significant vegetation removal (ibid).

Table 86 summarizes the status of hiding cover by GA, which reflects the scale at which the ability of the draft plan to provide hiding cover will be measured. Methods for calculating hiding cover are described in the project file. Two estimates of hiding cover are shown. The first is calculation using the same methods as for project-level analysis. The second is using the SIMPPLLE model, to allow comparisons with predictions made for hiding cover under the draft plan (see environmental consequences section). Although both estimates are based on methods outlined in the USFS and MTDFWP Collaborative Recommendations for Big Game Habitat Management on the Custer, Gallatin, Helena, and Lewis and Clark National Forests (U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013), the map calculation uses basic queries of vegetation data whereas the SIMPPLLE model estimates are based on a more complex interaction of parameters (see project file and terrestrial vegetation section for information about SIMPPLLE). Estimates of hiding cover differ based on the method of calculation, and are provided solely for the purpose of comparison rather than as established amounts of hiding cover, and should not be used for purposes other than the general comparisons made in this section.

Table 86. Elk hiding cover by geographic area

GA	Total acres - all ownerships	Total acres hiding cover - all ownerships (% of GA) map calculation	Total acres hiding cover - all ownerships (% of GA) SIMMPPLE model calculation
Big Belts	452,292	130,595 (29%)	49,790 (11%)
Castles	79,862	32,716 (41%)	18,670 (23%)
Crazies	70,036	17,658 (25%)	7,210 (10%)
Divide	232,890	76,015 (33%)	42,350 (18%)

GA	Total acres - all ownerships	Total acres hiding cover - all ownerships (% of GA) map calculation	Total acres hiding cover - all ownerships (% of GA) SIMMPPLE model calculation
Elkhorns	175,259	65,876 (38%)	21,510 (12%)
HIghwoods	44,495	3,251 (7%)	3,930 (8%)
Little Belts	900,961	554,599 (62%)	89,470 (10%)
Rocky Mountain Range	782,986	263,367 (34%)	59,680 (8%)
Snowies	121,897	68,862 (56%)	8,390 (7%)
Upper Blackfoot	348,185	127,697 (37%)	83,410 (24%)

Hiding cover is more appropriately estimated and evaluated on an elk herd or analysis unit scale (U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013) or by drainage. Hiding cover standards in both forest plans are also based on a herd unit or drainage scale.

The role of hiding cover within each GA as a determinant of retaining elk on public land is not clear and likely depends on local or site-specific conditions.

Elk fall range

Elk hiding cover is generally calculated for the spring/summer/fall period, although concerns regarding hiding cover are generally expressed in terms of elk vulnerability during the fall hunting season. Compliance with existing forest plan standards is one way to characterize the current status of this habitat component. Estimates of hiding cover made according to protocols identified in the existing Lewis & Clark plan indicates that 54 of 75 (72%) of 6th code hydrologic units and 109 of 144 (76%) of 7th code Hydrologic Units on the Lewis & Clark portion of the HLC NF meet existing summer/fall hiding cover numeric standards. Note that these calculations were made for the entire Lewis and Clark NF portion, although the hiding cover standard in the existing Lewis and Clark NF Plan states that it applies only to "projects involving significant vegetative removal". Nevertheless, these numbers provide an idea of the existing condition of hiding cover across the Lewis and Clark NF portion of the HLC NF.

The current Helena NF Plan includes a standard for measuring elk security/vulnerability during the hunting season [big game standard 4a (USDA 1986)] using an index that combines open road density and hiding cover. The Lewis and Clark Plan does not include a hiding cover/open road density requirement.

Table 87 summarizes the status of elk security by GA. Travel management is not included as part of the draft plan, the amount and configuration of open roads, and therefore of open road density, will not change except in alternatives B and D (refer to the environmental consequences section). Estimates of existing security are provided here as a means to describe this component of fall elk habitat on the HLC NF. As with hiding cover, the size and specific characteristics of areas that are effective in providing security for elk likely varies by elk herd unit; Hillis et al. emphasize that "strict adherence to the guidelines should be avoided" (Hillis et al., 1991). To provide a basic idea of the availability of security on the HLC NF, however, security as reported in Table 87 for all GAs is based on areas at least 250 acres in size and at least on half mile from roads open to the public between 9/1 and 12/1 (Hillis et al., 1991; U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013).

Table 87. Elk security by geographic areas

GA	Total acres (All ownerships)	Secure acres	Percent security
Big Belts	452,292	116,977	26%

GA	Total acres (All ownerships)	Secure acres	Percent security
Castles	79,862	15,796	20%
Crazies	70,036	26,240	37%
Divide[1]	232,890	69,224	30%
Elkhorns	175,259	73,629	42%
HIghwoods	44,495	25,713	58%
Little Belts	900,961	281,663	31%
Rocky Mountain Range	782,986	608,475	78%
Snowies	121,897	82,607	68%
Upper Blackfoot[1]	348,185	187,255	54%

1. Note that both the Divide and Upper Blackfoot GAs have updated security methodologies developed in conjunction with MFWP during the respective travel planning revision efforts. For the purposes of analysis, the basic Hillis methodology is used here.

Security percentages range from 20% in the Castles to 78% in the Rocky Mountain Range GA. The high percentage of security in the Rocky Mountain Range is to be expected given the preponderance of wilderness as well as the lack of roads within that GA.

The Helena NF standard for elk security is based on a ratio of hiding cover and road density calculated and applied at an elk herd unit scale. Of 40 elk herd units (37 on the Helena NF and 3 on the Beaverhead-Deerlodge portion of the Elkhorns GA that is included in the plan area), 15 (38%) currently meet the standard for elk security during the fall hunting season. As discussed above, the level of security on public lands is not a reliable indicator of overall elk availability or distribution on public lands during the hunting season where private land 'refuges' are available (Burcham et al., 1999; Kelly M. Proffitt et al., 2013; Ranglack et al., 2014), Ranglack et al. 2017).

Elk winter range

The Helena NF Plan requires that thermal cover on winter range be maintained at 25 percent in blocks of at least 15 acres. Thermal cover is described as stands of trees greater than or equal to 40 feet high with at least 70 percent canopy closure. The Lewis and Clark Plan does not include a thermal cover requirement. Recent science strongly suggests that traditionally defined and measured thermal cover may be less important to elk over-winter survival than previously thought. For that reason, cover on winter range was modelled using the SIMPLLE model to get a broader estimate of forest cover that may provide some benefit to elk, as described by more recent research and review (J. G. Cook et al., 2005).

Table 88 summarizes the status of thermal and winter cover by winter range and GA. Although winter range extends outside of the NF boundary, only that portion within the boundary is considered in the analysis. Private land on winter range within the forest boundary is included in the calculations. Thermal cover was calculated using the same methods as for project-level analysis. The SIMPPLLE model estimates for winter cover were made using parameters identified in the MTDFWP/FS collaborative recommendations for elk habitat on the east-side forests (Montana Fish, 2013); refer to the project file and to the terrestrial vegetation section for more information about SIMPPLLE. The SIMPPLLE model estimates also allow comparisons with predictions made for winter cover under the draft plan (see environmental consequences section, appendix B, and the elk background report in the project file).

Table 88. Elk thermal cover on winter range by geographic area

GA	Total acres (all ownerships)	Total acres winter range (all ownerships)	Total acres thermal cover winter range (all ownerships)	Percent thermal Cover on winter range (all ownerships)	Total acres winter cover estimated by SIMPPLLE model
Big Belts	452,292	223,000	85,466	19%	52,580
Castles	79,862	25,892	10,889	14%	8,410
Crazies	70,036	40,378	22,927	33%	7,050
Divide	232,890	130,005	96,503	41%	35,950
Elkhorns	175,259	90,136	50,629	29%	23,660
HIghwoods	44,495	40,619	25,778	58%	15,220
Little Belts	900,961	152,694	87,937	10%	57,350
Rocky Mountain Range	782,986	167,150	71,568	9%	52,390
Snowies	121,897	11,775	8,938	7%	5,000
Upper Blackfoot	348,185	131,825	99,910	29%	59,820

The Helena NF standard for thermal cover is calculated and applied at the scale of the elk herd unit. Estimates of thermal cover made for the purposes of evaluating compliance with existing forest plans provide some idea of the existing condition of this habitat component on the former Helena NF portion of the plan area. Of the 24 total elk herd units (21 on the Helena NF and 3 on the Beaverhead-Deerlodge portion of the Elkhorns GA that is included in the plan area) that include identified winter range, none currently meet the standard for thermal cover (refer to the Elk Background Report in the project file for estimates of thermal cover by herd unit).

Stressors under FS control

Vegetation management can influence elk distribution and potentially elk numbers in a given area by affecting both forage and cover. Livestock grazing can affect forage, and some research has suggested that elk may be displaced from some habitats by the presence of domestic livestock (Wisdom et al. 2005). Motorized travel on roads and trails can displace elk from some habitats, and can increase vulnerability of elk to hunting mortality by allowing greater access by hunters into elk habitat.

Stressors not under FS control

Insects, disease and fire can all affect vegetation characteristics in elk habitat and lead to changes in cover and forage. Those forces often increase the amount and palatability of forage by opening forest canopy, but can reduce available cover. Conversely, extensive blowdown associated with fire, insects, and disease can provide ‘cover’ by making areas inaccessible to hunters. Both weather and climate affect the availability and quality of forage. Management of non-NFS lands, particularly those adjoining NFS boundaries, can affect elk distribution by providing refuges from hunting and by providing high-quality forage in the form of hay and irrigated cropland. Those factors can in turn affect elk population trend by increasing growth rates and/or reducing vulnerability to hunters and other predators.

3.16.6 Elk, environmental consequences

Effects common to all alternatives

The terrestrial vegetation section shows that vegetation conditions for those types used by elk would likely move toward more open forest densities under all alternatives. Because elk are a habitat generalist, and because distribution of elk is driven by the varying and complex interactions among forage availability, weather and climate, and hunting and other predation pressure, the number and distribution of elk on NFS lands is unlikely to differ among alternatives. All alternatives would provide forage and cover for elk to a similar degree, as discussed in the terrestrial wildlife diversity section on species associated with grass/shrub, dry conifer, and mixed conifer vegetation types. Under all alternatives, mortality of elk is likely to continue to be influenced primarily by hunting, and in some areas by predation, neither of which would differ by alternative.

A great deal of management and public attention has been focused on the concept of elk security and its potential effect on elk distribution and on hunting opportunity (Burcham et al., 1999; Christensen et al., 1993; Hillis et al., 1991; L. J. Lyon et al., 1985; Ranglack et al., 2014; U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013). As described in the affected environment section above, hiding cover can be one component of security, which also may depend on topography, road density, distance from roads, timing and use level of roads, hunter density, season, forage availability and other factors. The HLC NF manages vegetation, which can affect hiding cover (see below), and access via roads. The pattern (density), timing, and season of use of roads on the HLC NF are determined by travel management, which is a site or area-specific decision that occurs separately from forest planning. The draft plan and alternatives to the draft plan, including the no action alternative, do not differ in terms of the amount, density, or timing and season of use of open roads.

Spring/summer/fall hiding cover

As discussed above in the affected environment section, hiding cover has been considered an important component of elk habitat because it allows elk to use areas for bedding, foraging, thermal relief, and other functions (J. L. Lyon & Christensen, 1992) with reduced potential for disturbance or displacement . Because hiding cover has been the focus of management and discussion about management in the past, and because it is considered to be an important habitat element used by elk, the SIMPPLLE model was used to estimate potential hiding cover under all alternatives. Cover in winter was modelled separately from that for spring/summer/fall, following guidance described in the collaborative FS and MTDFWP recommendations for elk management (U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013). Estimates of hiding cover are based on vegetation characteristics, with predicted natural disturbance incorporated into the model, as well as predicted vegetation management under each alternative (details of the model parameters and process are available in appendix B and in the project file). Estimates do not consider the potential effects of plan components for elk security in alternatives B and D, because those would occur at an area or project specific scale (see discussion below on effects of those alternatives) and the specific means for achieving security would vary by situation. Results are displayed in the figures below. Although some results vary by alternative, most are similar across all alternatives. Therefore all alternatives are shown below in order to facilitate comparison.

Figure 15 shows the predicted average spring/summer/fall hiding cover by alternative and GA, including the estimated NRV for hiding cover in each GA. This figure displays the average hiding cover estimated currently, and predicted over all five decades modelled.

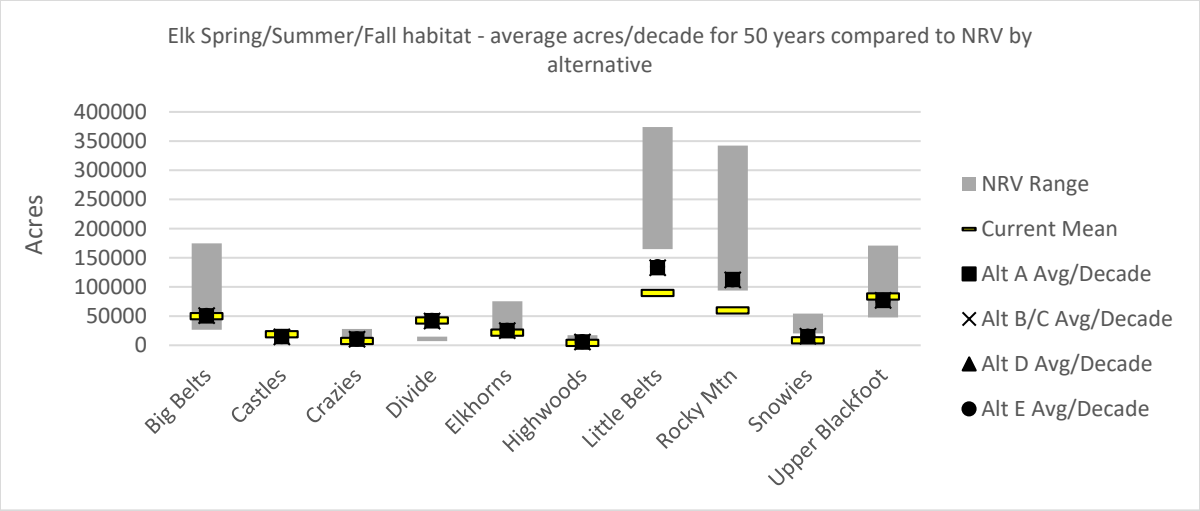

Figure 15. Predicted elk spring/summer/fall cover by GA over 5 decades by alternative

It appears that on average, modelled hiding cover in most GAs is currently within or above the estimated NRV and is predicted to remain so under all alternatives. Only the Little Belts, Rocky Mountain Range, and Snowies GAs appear to have less modelled spring/summer/fall hiding cover currently than the estimated NRV.

The estimates in Figure 15 are averages over the five decades modelled, and don't provide information about trend, which is useful for evaluating progress toward a desired condition or toward the estimated NRV. Figure 16 shows the predicted forestwide trend of spring/summer/fall hiding cover for all alternatives.

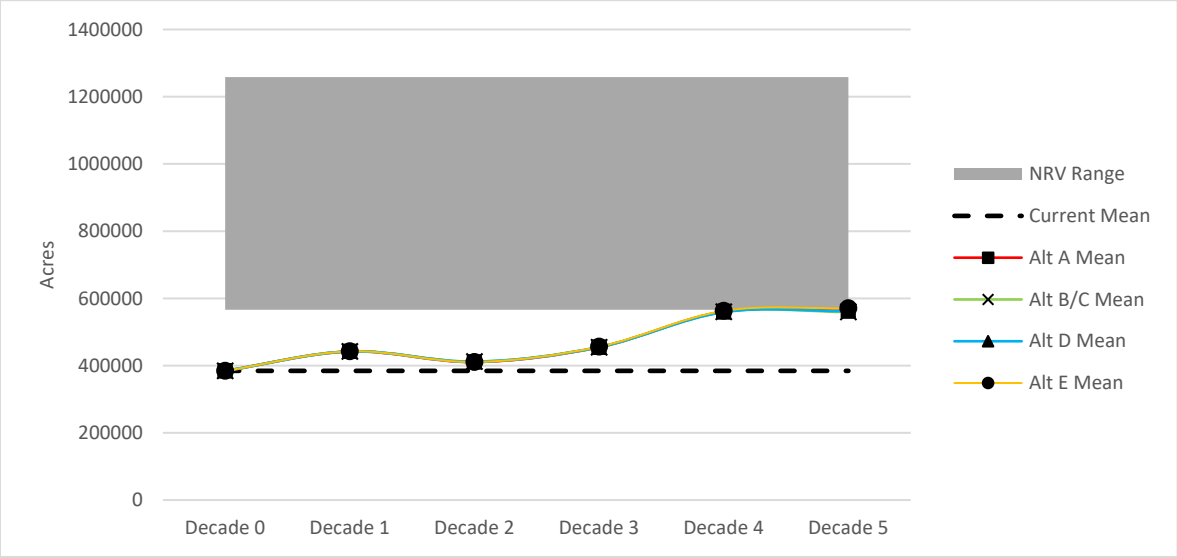

Figure 16. Predicted trend in elk spring/summer/fall cover over 5 decades by alternative

Because all alternatives showed a similar trend and pattern over time, the lines and symbols for each alternative are stacked directly on top of one another and are indistinguishable in the graphic. The estimated spring/summer/fall elk hiding cover increases to the lower end of NRV by the fourth decade modelled, at the forestwide scale, after a small decline in the second decade.

As discussed in the affected environment section, cover is most appropriately evaluated and managed at the scale of the elk herd unit (U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013). Habitat was modelled at the level of the elk herd unit (Big Belts, Castles, Divide, Elkhorns and Upper Blackfoort GAs) or elk analysis unit (Castles, Crazies, Highwoods, Little Belts, Rocky Mountain Range, and Snowies GAs). The results involve a large amount of data that is difficult to display, so it is summarized here. Full results are available in the project file.

Table 89 displays the status of elk herd or analysis units by GA, indicating whether they are within the NRV currently, whether they are predicted to be within the NRV under any alternatives, and whether they are predicted to experience increase or decrease in hiding cover as compared to the current estimated amount.

Table 89. Estimated elk spring/summer/fall hiding cover trend by GA

GA	Total number of elk herd/analysis units in GA	Status of hiding cover currently relative to NRV	Predicted status of hiding cover in alternatives, relative to NRV	Predicted status of hiding cover in alternatives, relative to estimated current amount
Big Belts	18	All herd units within NRV	All units within NRV	9 units slightly increase 6 units slightly decrease 3 units remain approximately the same
Castles	3	2 units in or above NRV 1 unit below NRV	All units in or below NRV	2 units decrease slightly 1 unit remains approximately the same
Crazies	2	Both units below NRV	Both units at or below NRV	Both units increase
Divide	7	5 units in NRV 2 units below NRV	5 units in NRV 2 units below NRV	3 units increase 2 units decrease slightly 2 units remain approximately the same
Elkhorns	9	All units within NRV	All units within NRV	5 units increase 3 units decrease 1 unit remains approximately the same
Highwoods	3	1 unit below NRV 2 units within NRV	All units within NRV	2 units increase 1 unit remains approximately the same
Little Belts	22	11 units at lower end or below NRV 11 units within NRV	3 units at low end or below NRV 19 units within NRV	17 units increase 2 units decrease 3 units remain approximately the same
Rocky Mountain Range	13	All units within NRV	All units within NRV	12 units increase 1 unit remains approximately the same
Snowies	6	5 units at lower end or below NRV 1 unit within NRV	2 units at low end or below NRV 4 units within NRV	All units increase
Upper Blackfoot	9	All units within NRV	All units within NRV	4 units increase 5 units decrease slightly

The NRV for hiding cover provides an approximate idea of the range of conditions under which elk evolved and that allowed them to be present in historic distribution and numbers across what is now the HLC NF. The role of hiding cover, however, continues to depend on site-specific conditions including the amount and nature of human activity and hunting pressure in an area relative to other areas accessible to those elk. The information in Table 89 serves mainly to demonstrate the degree to which the plan area currently approximates the NRV, and the degree to which hiding cover on the HLC would increase or decrease relative to current conditions and to the NRV under each alternative. Those estimates do not vary measurably among the different alternatives. Furthermore, the amount and trend of hiding cover at a forestwide, GA, or elk herd/analysis unit scale is not an indicator of elk distribution or of the availability of elk for hunting or other uses on NFS lands.

Winter cover

Winter cover on mapped elk winter ranges was modelled in order to compare these habitat elements across alternatives. Guidance established in the 2013 cooperative FS and MTDFWP recommendations paper (U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013) was followed, and the SIMPPLLE model (refer to project file for more information about parameters) was used. Figure 17 shows the estimated winter cover by GA, for the portion of winter ranges on NFS lands managed by the HLC NF, averaged over the 5 decades that were modelled.

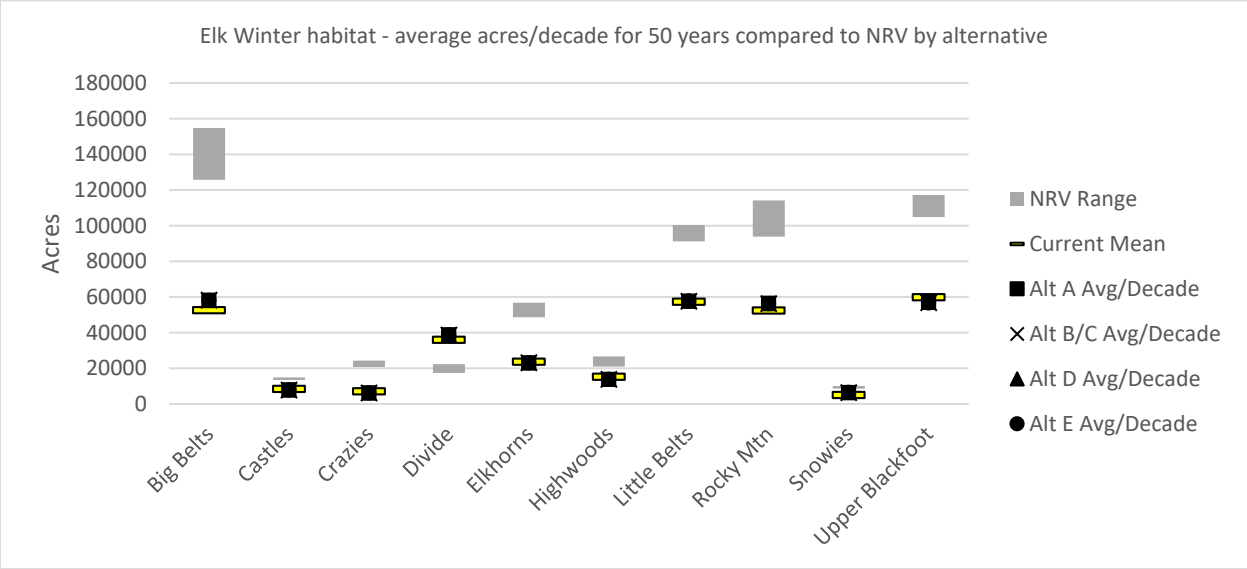

Figure 17. Predicted elk winter cover by GA over 5 decades by alternative

Because all alternatives showed a similar trend and pattern over time, the symbols for each alternative are stacked directly on top of one another and are indistinguishable in the graphic. The Divide GA appears to be the only GA in which existing winter cover is estimated to be at or slightly above the estimated NRV. Under all alternatives, the amount of winter cover is predicted to remain close to the same as current amounts. Note that the estimated NRV for winter cover is a narrow range, reflecting the fact that a relatively small acreage of winter range occurs on lands administered by the HLC NF.

Winter cover is predicted to increase slightly for all alternatives in the Big Belts, Divide, Rocky Mountain Range, and Snowies GAs, although the model shows a slight decline in the fifth decade modelled for the Snowies. Winter cover is predicted to decrease slightly in the Castles, Crazies, Highwoods, and Upper Blackfoot GAs, and remain roughly the same in the Elkhorns and Little Belts GAs. The predicted increases and declines appear to be very slight and if they occurred, would possibly not have a measurable

impact on the ground. Refer to the project file and to Appendix B for more detail regarding modelled estimates of winter cover.

Effects common to all action alternatives

The draft plan includes a number of components that could potentially impact elk habitat, as well as habitat for other ungulate species. A summary of those components and their expected effects is shown in Table 90. Please refer to the draft plan for the complete text of listed components.

Table 90. Summary of plan components pertinent to elk and elk habitat management – revised forest plan

Plan component(s)	Summary of expected effects
General habitat management	
FW-WL-GDL-15 FW-WL-DC-01; 02 FW-VEGT-DC-01 ; 02 FW-VEGT-OBJ-01 FW-VEGF-DC-01-04; 10 FW-LAND-DC-03 FW-WILD-GO-01	These plan components all address general aspects of habitat, guiding managers to provide habitat for native wildlife species, provide vegetation conditions consistent with NRV, move toward vegetation desired conditions, and manage consistent with adjoining lands that are managed for wildlife values. The effects of implementing these components would be to assure that the vegetation conditions that support the life history requirements for elk are met through consideration of habitat needs and managing for appropriate vegetation condition. These components represent coarse-filter management of elk habitat.
Components that support forage	
FW-WL-DC-02; 08 FW-WL-GDL-01; 06 FW-VEGNF-DC-01-04 FW-GRAZ-DC-02 FW-GRAZ-STD-02 FW-GRAZ-GDL-03; 05 FW-TIM-GDL-06 CA-WL-DC-01 SN-VEGNF-GDL-01 EH-WL-GDL-02 SN-VEGF-DC-03; GDL-01	These plan components guide managers to provide for the natural history requirements of native wildlife species, to provide forage for big game on winter range, and to manage livestock and coordinate grazing allotment planning and permitting with Montana Department of Fish, Wildlife and Parks to ensure wildlife forage needs are addressed. Some components are only for certain GAs, where specific wildlife or big game forage needs (e.g., enhancing summer big game forage in the Snowies GA, managing for high quality big game winter range in a portion of the Castles, etc.) are addressed. The effects of implementing these components would be to assure that management activities, including livestock grazing, either maintain or enhance forage for elk and other wildlife species, particularly on key seasonal ranges.
Components that support cover (thermal and hiding)	
FW-WL-DC-02; 08 FW-WL-GDL-06 FW-FWL-GDL-01 to 03 FW-TIM-STD-04 FW-TIM-STD-08-09 DI-WL-GO-01 DI-WL-GDL-01 RM-VEGF-DC-03 UB-WL-DC-01 UB-WL-GDL-01	These plan components guide managers to provide for the life history requirements for all parts of the life cycle of native wildlife species, as well as to intermix forage species with hiding and thermal cover for big game on winter range and elsewhere, to maintain or increase elk security, to use clearcuts only where wildlife habitat needs allow, and set a limit on maximum opening size created by timber harvest. Some components are specific to GAs, guiding managers to maintain or improve wildlife habitat connectivity for wide-ranging species, as well as to acquire, if possible, lands in one GA (Divide) to enhance both security and connectivity for wide-ranging species. The effects of implementing these components would be to maintain or manage for cover where it is needed, which may contribute to habitat security.
Components that limit disturbance by humans	
FW-WL-DC-07; 03 FW-WL-GDL- 05 FW-FWL-DC-05 FW-RSUP-GDL-01 FW-IRA-DC-01 FW-RT-GO-03 FW-RT-GDL-15	These plan components guide managers to minimize disturbance on winter range and other key habitats, balance access needs with needs for wildlife security, decommission unneeded roads when doing so would benefit wildlife, and concentrate human activities in space and time to minimize impacts to wildlife. GA-specific components would limit certain activities in the Elkhorns on winter range and other seasonal habitats. The effects of implementing these components would be to limit or prevent certain types of disturbance, particularly in seasonal habitats, which is

Plan component(s)	Summary of expected effects
EH-TIM-GDL-01 EH-EMIN-GDL-01; 02	in turn likely to minimize the potential for elk to be displaced by certain human activities.
Aquatic Ecosystems	This section includes components wherein the vegetation condition helps achieve the desired conditions for these resources, such as water quality and quantity, riparian ecosystems, fish habitat, and soil condition. These components complement those enumerated in the vegetation sections. Some components also specifically guide or limit vegetation management.
Fire and Fuels Management	This section describes the role of natural fire and fire management which are primary drivers of change in terrestrial vegetation. These components complement the achievement of desired conditions especially related to wildland fire management strategies and hazardous fuels treatments.

Effects of alternative A, no action

The existing forest plans include components requiring evaluation and management of elk security (Helena NF plan) or hiding cover (Lewis and Clark NF plan) when carrying out certain management activities. These standards would remain in place under this alternative. Implementation of the current plans has resulted in achievement of plan standards for hiding or thermal cover or security on portions of the HLC NF but not across the entire forest (refer to the Affected Environment section). The inherent characteristics of vegetation and topography, as well as insect, disease, and fire related mortality contribute to limiting the extent to which standards can be met. Additionally, standards relating to elk habitat on the former Lewis and Clark portion of the plan area are applied only for projects "involving significant vegetative removal", so application of standards is limited to those times and areas where these take place. On the former Helena portion of the plan area, existing standards and guidelines are applied during vegetation management actions or during travel management. Neither existing plan includes specific desired conditions for vegetation or for elk habitat, meaning that achievement of standards or guidelines for elk habitat would continue to be driven largely by implementation of projects developed to address other purposes or needs. There would continue to be inconsistency between the two portions of the combined HLC NF, with project-level management for security and thermal cover on the Helena NF portion, and project-level management for hiding cover on the Lewis and Clark NF portion.

Effects of action alternatives

Spring/summer/fall habitat

Refer to Figure 14 and Figure 16 and Table 89 above for a display of predicted impacts to spring/summer/fall cover by GA for all alternatives. The similarity in outcomes modelled for all alternatives indicate that it is likely that all alternatives would result in similar amount and distribution of hiding cover by GA, largely as a result of natural processes and predicted vegetation management.

Alternatives B and E include guidelines for managing elk security. Guideline FW-FWL-GDL-01 states that in areas where lack of secure habitat is an identified concern, vegetation management should retain existing security areas, with the intent of reducing potential displacement of elk from NFS lands during the hunting season (see FW-FWL-DC-01 and FW-FWL-GDL-02). Guideline FW-FWL-GDL-02 states that new motorized routes should not reduce habitat security in areas where it has been identified as lacking. These plan components would specifically guide managers to assess NFS lands managed by the HLC NF according to the BASI, such as the "Collaborative overview and recommendations for elk habitat management on the Custer, Gallatin, Helena, and Lewis and Clark National Forests" (U.S. Department of Agriculture, Forest Service and Montana Department of Fish,, Wildlife & Parks, 2013), to determine where additional measures to maintain or create elk security would help achieve the desired condition of having elk "present and potentially available to hunters on NFS lands during both the archery and rifle hunting seasons" (FW-FWL-DC-01). FW-FWL-GDL-01 and 02 would guide managers to

provide for security if it is determined to be needed, through one or more actions that could include restricting motorized access, managing hiding cover, adjusting livestock grazing, or other methods. Some vegetation management activities could be constrained in some areas, if analysis determines that elk security is needed and that specific vegetation characteristics (such as maintaining hiding cover) are needed to provide it. Refer to appendix C of the Draft Plan for more information about methods and actions that could potentially be used to assess security and implement these guidelines. Although a forestwide assessment of security could be carried out at any time, any actual management measures that are needed would likely be carried out in conjunction with vegetation management projects or future travel management planning.

In contrast, alternatives C and D do not include specific guidelines for assessing and managing elk security. Those alternatives retain the desired condition to have elk "present and potentially available to hunters on NFS lands during both the archery and rifle hunting seasons" (FW-FWL-DC-01). There would be no specific guidance about assessing elk security under these alternatives, although management actions such as vegetation management, access management, and others would need to move NFS lands toward the desired condition, or not preclude achieving the desired condition (refer to appendix C of the draft plan).

In addition to elk security, which is specifically defined (J. L. Lyon & Christensen, 1992) as applying to elk during hunting season, the action alternatives differ somewhat in terms of general habitat security. Habitat security, generally speaking, refers to habitat characteristics that allow wildlife to forage, rest, move among habitats, rear young, and carry out other life requirements without disturbance (usually by humans) that would cause them to be displaced from key habitats or disrupt normal activities. Areas that are remote and have minimal use by humans, particularly minimal motorized use, usually have higher value as secure habitat than areas with a greater human presence. Areas such as IRAs, RWAs, designated wilderness, and Conservation Management Areas all provide some degree of security for wildlife using those areas.

Under all alternatives, the acreage and distribution of IRAs, designated wilderness, and conservation management area would not change. Alternatives B and C both include over 213,000 acres of RWAs, with alternative B removing existing motorized uses on 12 miles of road within RWAs. Alternative D would include more than twice as much RWAs (over 474,000 acres), and would remove existing motorized uses on 23 miles of road and 59 miles of trail. In contrast, alternative E would have no RWAs, although many areas that are recommended in other alternatives overlap partly or entirely with IRAs. Nevertheless, it is likely that alternative D would provide the most general habitat security for elk and other wildlife, followed by alternative B and then alternative C.

Winter habitat

Figure 17 shows that at a GA scale, predicted winter cover would increase very slightly over time under all alternatives, but would remain below the estimated NRV. That predicted trend appears to have no discernable differences among alternatives except possibly in the Snowies, where under alternative D there could be a slightly greater decline in winter cover in the fifth decade modelled, as compared to a very slight decline under the other alternatives (refer to appendix B and project file). Given the uncertainties in modelling processes and in estimating parameters, the similarity in outcomes modelled for all alternatives indicate that it is likely that all alternatives would result in similar amount and distribution of winter cover by GA, as a result of natural processes and predicted vegetation management.

Effects of forest plan components associated:

Aquatic ecosystems, fire and fuels management, infrastructure, livestock grazing, and timber harvest

The effects of these plan components are in Table 90 above.

Terrestrial vegetation; plants at risk, and invasive species, terrestrial wildlife, cultural, historic, and tribal resources, land status and ownership and land uses, special uses, and energy and minerals

The effects of these plan components are discussed in the terrestrial wildlife diversity section.

Recreation settings, opportunities, access, and scenery

The effects of these plan components are mostly discussed in the terrestrial wildlife diversity section.

The draft plan does not directly constrain public uses, but it does set desired conditions, placement of recreation facilities, and puts constraints on permitted special uses. As discussed in the environmental consequences section above, recreation access via roads can have an effect on elk distribution and therefore on elk availability on the HLC NF. Some recreation special uses, such as permitted outfitter and guide operations that provide hunting opportunities, may impact elk numbers and distribution in concert with other factors (including forage, weather, other hunters, etc.).

Plan components for management of recreation would potentially result in some impacts to elk and other big game species where specific facilities exist or activities occur, but would minimize impacts to individual animals and to the population as a whole by including constraints designed to reduce conflicts, disturbance, displacement, or negative impacts to habitat. Some components would improve wildlife habitat by moving facilities out of sensitive areas such as riparian areas, and by rehabilitating unauthorized access routes.

Designated areas, including RWAs

The effects of these plan components are discussed in the terrestrial wildlife diversity section, and in the environmental consequences section above.

Cumulative effects

Portions of the HLC NF adjoin other NFs, each having its own forest plan. The HLC NF is also intermixed with lands of other ownerships, including private lands, other federal lands, and state lands. Some adjacent lands are subject to their own resource management plans. The cumulative effects of these plans in conjunction with the HLC NF revised forest plan are summarized in the terrestrial wildlife diversity section for wildlife species, including elk.

Conclusions

Under all alternatives, seasonal elk habitat would continue to be widely available across the entire HLC NF. All alternatives would provide for similar amounts of spring/summer/fall hiding cover and winter cover both forestwide and by GA. Under all alternatives, the desired condition of providing habitat for native wildlife species across their range (FW-WL-DC-01), and providing vegetation composition, structure, and distribution that would fulfill elk life history requirements (FW-WL-DC-02) would be supported, allowing elk to continue to be present in the plan area in support of the planning rule requirement to maintain the diversity of native wildlife species.

The prevalence of spring/summer/fall hiding cover under all alternatives is a good indication that hiding cover, which contributes to elk security, would be present and available with and without specific plan components to manage for it.

Plan components for security and cover in alternative A would require managers to evaluate and provide for very specific amounts of security and thermal cover on the Helena NF portion of the plan area, and hiding cover on the Lewis and Clark NF portion of the plan area, which would result in continued inconsistencies across the plan area and likely difficulty in meeting standards because of insects, disease, and fire. Whether those standards actually result in retaining elk on NFS lands during the hunting season

is unclear, and may be outweighed where private lands with little or no hunting access occur nearby. Components for evaluating and managing for elk security in alternatives B and E would provide greater consistency in approach than under the current plans or under alternative A, but would not guarantee that elk remain on NFS lands, particularly were private land refuges are available. Alternatives C and D, without specific components to manage for elk security, would likely have less constraint on vegetation management projects, would potentially have different impacts on the amount and distribution of secure habitat for elk, but would meet or move toward the desired condition for elk to be available on HLC NF lands.

The alternatives with larger amounts of RWA (D, followed by B and C) could provide greater general security than the existing plans (alternative A) or Alternative E. However, on the ground the difference may be minimal because of the presence of IRAs in alternative E similar to that of the other alternatives. Furthermore, it is not possible to predict whether the differences in the amount and location of RWAs, or the differences in whether motorized travel is allowed or not would have any measurable impact on elk presence or distribution.

3.17 Recreation Settings

3.17.1 Introduction

Recreation is recognized as a critical resource on the HLC NF due to its contributions to the local economy, its influence in connecting people to the land, its impact on public understanding of natural and cultural resources, and its role as a catalyst for public stewardship.

To address both the challenges and opportunities in recreation management, the FS strives to provide a set of recreation settings, opportunities, and benefits that are sustainable over time. Sustainable recreation is defined as the set of recreation settings and opportunities on the NF that are ecologically, economically, and socially sustainable for present and future generations. For best effect, all aspects of recreation should include the principle of sustainability. As such, the HLC NF developed plan components aimed at providing direction for a sustainable recreation program.

Issues

A number of issues were raised during the scoping period for the proposed action. The issues that drove alternatives for recreation settings were:

- Changes to ROS settings associated with requests to limit mechanical means of transportation (including bicycles) in some areas on the Forest.
- Site specific changes to ROS settings to address mapping errors found during the analysis period.

Another issue that was analyzed in this section includes:

- The effects to ROS settings associated with RWA designations.

Measurement indicators

Effects to ROS settings will be measured by determining the acres of desired summer and winter ROS settings by alternative.

Analysis area

The geographic scope of the analysis is the lands administered by the HLC NF. All lands within the forest boundary form the geographic scope for cumulative effects, and the temporal scope is the life of the plan (approximately 15 years).