Both stands proposed for treatment would be changed by the treatments, with species compositions "pushed" toward dominance by seral fire-tolerant conifers, and stand structures "pushed" toward open, but still multi-story, structures with flatter than current diameter distributions. They would still qualify as old growth following the treatment.

Wildlife

Introduction

This section analyzes impacts to wildlife and wildlife habitat from federal activities proposed in the Stonewall Vegetation Project (SVP) Environmental Impact Statement (EIS). It considers regulatory direction related to the wildlife resource, describes the current wildlife habitat conditions that exist within the Stonewall Vegetation Project area, and evaluates effects to federally proposed, threatened and endangered and regionally sensitive (sensitive) species, Helena National Forest (HNF) management indicator species (MIS) and migratory birds. Because wildlife distribution and use is determined by both site-specific and landscape-level conditions, a multi-scale analysis is presented that looks at specific stands proposed for treatment (fine filter analysis), as well as landscape considerations (coarse filter analysis) such as the availability of habitat within and adjacent to the project area. More information on federally listed threatened and endangered (TE) species can also be found in the Stonewall Vegetation Project Biological Assessment (BA)(Reitz 2013).

Regulatory Framework

The principle laws and management direction relevant to wildlife for this project include the; National Forest Management Act of 1976 (NFMA), the Endangered Species Act (ESA) of 1973, the Migratory Bird Treaty Act (MBTA) of 1918 (as amended), the Forest Service Manual (FSM 2600), Montana's Comprehensive Fish and Wildlife Strategy (2005), and the Helena National Forest Land and Resource Management Plan (Forest Plan) (USDA Forest Service 1986).

More information regarding this management direction is available in chapter 1. Forest Plan goals and objectives related specifically to wildlife are available in the Stonewall Vegetation Project Biological Assessment (Reitz 2013), which is available in the project record.

Method of Analysis

Analysis Process

National Forest Management Act (NFMA) regulations (1976) require that habitat be managed to support viable populations of native and desired nonnative vertebrates within the planning area (36 CFR 219.19). USDA regulation 9500-004, adopted in 1983, reinforces the NFMA viability regulation by requiring that habitats on national forests be managed to support viable populations of native and desired nonnative plants, fish, and wildlife. The following five-step process used in this analysis assesses changes in wildlife habitat and determines possible effects to viability:

Step 1: Pre-field Assessment - Once the initial proposed action was developed, information was collected to identify the wildlife present condition or affected environment. This information included aerial photos, GIS data, past timber sale activity, existing wildlife surveys, Forest and District monitoring data, and vegetation data and information on insect and disease related mortality.

Step 2: Field Assessment - Sites proposed for treatment were visited by a biologist(s). During this review, observations and incidental sign of wildlife were recorded, and habitat conditions identified in the pre-field assessment were validated.

Step 3: Wildlife Screening - Collectively information from the pre-field and field assessments were used to identify project design features (pdfs) or modifications to the proposed action that may be necessary to reduce or eliminate impacts to wildlife. This information was then used in combination with scientific literature, Forestwide and Regionwide assessments and monitoring and species conservation assessments to identify species and habitats most likely to be affected by the proposed activities, and identify the appropriate level of analysis necessary to determine effects to wildlife. Based on information provided in steps 1 and 2, a total of 18 threatened, endangered and sensitive species found on the HNF, 4 MIS species and 2 commonly hunted species were evaluated. Eight species either do not have suitable habitat within the project area, or the project area falls outside the current range (table 64). As a result, of the species considered, 16 species are evaluated in detail in this analysis.

Step 4: Habitat & Species Assessment - The analysis of the wildlife resource was done using a multi-scale assessment that includes a combination of three basic strategies.

1. The first strategy is a coarse filter approach (described below), which is used to identify wildlife communities across the landscape. This approach assumes that if the species, genetics, functions and processes are protected at the community level, then the bulk of the biotic species, both known and unknown, would also be protected.
2. The second strategy is the MIS approach (FSM 2620), which assesses effects to wildlife species associated with vegetation communities or key habitat components identified in the Forest Plan (USDA Forest Service 1986) as management indicators. Potential effects of proposed actions are then evaluated by assessing habitat changes to the selected indicator species
3. The third strategy is to assess habitat and effects to those species considered most at risk or those species with potential viability concerns. These include Federally Threatened and Endangered Species and Regionally Sensitive species (FSM 2670.32, 16 USC 1536).

Using information from steps 1-3, anticipated changes in wildlife habitat and the associated communities are predicted under the alternatives considered and associated effects to wildlife and wildlife habitat evaluated. Information from steps 1 and 2 are also used to complete the course filter analysis, identify and evaluate spatial relationships between habitat(s), assess changes in landscape diversity and predict changes and effects to MIS species. Whereas site-specific data is used to assess stand-level changes in habitat and to ensure that unique vegetative and physical habitat conditions are maintained and/or protected. This information is also used to assess changes in population viability in step 5.

Step 5: Population Viability Assessment and Determination - Using information from Steps 1-4, the population viability for all MIS and Threatened, Endangered and Sensitive (TES) species evaluated in detail is assessed under each of the alternatives. Region 1 (R1) uses a principle-based approach to population viability analysis (PVA), which follows Regional guidance (USDA Forest Service 1999). This assessment is based on the best available forest and rangeland vegetation data, the most current scientific information related to species requirements and effects of proposed actions, and when available, Regionwide and Forestwide conservation assessments. Collectively this information is used to assess the availability of suitable habitat and ultimately assess short- and long-term viability to each species.

Collectively, the strategies and assessment described above are used to ensure that National Forest Management Act (NFMA) requirements are met by ensuring that a diversity of plant and animal communities are maintained across the planning area (16 U.S.C. 1604(g)(3)(B); also see 36 CFR 219.10(b); and FSM 2670.12). The information identified in steps 1 through 4 in combination with applicable scientific information (referenced literature) and professional judgment are used to predict anticipated effects, as well as determine the scope of effects.

For sensitive species, a determination is made as to whether or not the federal action would cause a trend toward federal listing or a loss of viability. Listing factors are based on 50 CFR 424.11 including; the present or threatened destruction, modification, or curtailment of the species' habitat or range, overutilization for commercial, recreational, scientific, or educational purposes, disease or predation, the adequacy of existing regulatory direction or other natural or manmade factors affecting the species' survival. A loss of viability is determined though the regional process identified above and would occur if anticipated effects included changes in the number or distribution of reproductive individuals that would affect the continued existence of the species on the Forest (36 CFR 219.9).

Methodologies used to assess individual species are summarized under the individual species sections. More detailed information related to the habitat relationship models used can be found in the project file.

Scale of Analysis

The appropriate methodology and level of analysis needed to determine effects are influenced by a number of variables including the presence of species or habitat, the scope and nature of activities associated with the proposed action and alternatives and the potential risks that could ultimately result in adverse effects. Wildlife distribution and use of an area is largely determined by the availability of suitable habitat, and can be influenced by site-specific needs such as the vegetative structure or physical features on a site, as well as by landscape considerations such as the proximity to other habitat or the need for isolation or seclusion. As a result, a multi-scale analysis that looks at site-specific conditions in stands proposed for treatment (fine filter); as well as landscape considerations such as the proximity and availability to other habitat (coarse filter) are considered. The multi-scale of analyses used in this assessment includes the following:

Site Level Assessment – This level of assessment involves evaluation of individual stands or sites proposed for treatment. Wildlife use is often influenced by specific conditions only identified at the stand or site scale, and can vary from one to several hundred acres. This level of analysis identifies stand-level habitat conditions that influence wildlife use. It is also used to identify habitat features that may need protection or enhancement, and effects based on localized stand structure. Finally, this level of assessment is used to identify site-specific mitigation measures or project design features (pdfs).

Project Area Assessment – Unless otherwise noted in the species-specific section, direct and indirect effects to wildlife are assessed by evaluating effects and changes in habitat on National Forest System lands within the project area boundary. The Stonewall project area encompasses approximately 24,000 acres including 23,668 acres of NFS land and 337 acres of private land. The project area boundary was selected for analysis of direct and indirect effects on wildlife because it includes all areas proposed for treatment and contains an adequate diversity of habitat conditions (vegetative and topographic) to assess wildlife distribution and use.

Cumulative Effects Assessment – Cumulative effects (CE) related to wildlife are evaluated by looking at past, present and foreseeable future activities that could adversely affect wildlife when considered cumulatively over time. A complete list of activities considered in this analysis for cumulative effects can be found in volume 2, appendix C of this document.

The cumulative effects boundary used in this analysis varies by species. For example, cumulative effects for species with small home ranges would be analyzed across the project area. For species that have large home ranges and select habitat based partially on landscape conditions, the cumulative effects analysis area includes the project area combined with adjacent lands affected by mountain pine beetle (MPB) mortality and wildfire. This combined area totals approximately 101,977 acres, including 67,042 acres of NFS land, and 34,935 acres of private land. Rationale for selection of this area includes:

- This area is large enough to assess the individual home range for all species with large home ranges that select habitat based in part on landscape conditions.
- The cumulative effects area includes more developed private lands adjacent to the project area, which contain habitat components or levels of disturbance that may influence wildlife use of NFS lands
- This area includes all of the two Elk Herd Units (EHU) and Lynx Analysis Units (LAU) affected.
- This area is large enough to assess landscape-level considerations and connectivity, including potential impacts to affected Bear Management Units (BMUs), EHUs and LAUs.
- Including lands to the north and northwest would tend to dilute effects because of the large amounts of designated Wilderness and Inventoried Roadless Areas.
- The cumulative effects area includes over 20,000 acres that have been recently (since 2003) affected by wildfire, which influence landscape-level use and effects.

A determination of significance is made for each species/habitat evaluated. For the purpose of this analysis, significant cumulative effects are defined as effects that singly or incrementally could result in long-term impacts to wildlife or wildlife habitat that could result in a loss or reduction in viability (defined above). Activities used to evaluate cumulative effects are displayed in volume 2, appendix C.

Timeframes

Timeframes for direct and indirect effects include short-term effects, which generally go out 10 years or until the proposed activities are completed, and long-term effects, which are greater than 10 years and may go out several decades. Past activities are summarized in appendix C; ongoing and future activities go out to year 2022, which is when all of the proposed treatments are expected to be completed, and when future projects can be reasonably predicted.

Assumptions

A number of factors have recently affected wildlife habitat in the project area, and are also likely to change habitat conditions in the future. Additionally, because many wildlife species utilize a wide range of habitat conditions, this analysis is based on representative habitats identified in available scientific literature. Much of the information comes from field examination of the project are. Where direct observation of local habitat components or wildlife species was not possible, inferences were made from scientific research and ecological theory to fill in data gaps and to provide a broader context for interpreting local wildlife patterns. The analysis presented confines itself to aspects of the environment that are of particularly significance to wildlife. It is by no means an exhaustive review of all the available habitat components. The wildlife species associated with different habitats come from personal observations, observations reported by other biologists and personnel, landbird surveys and studies summarized in the References section.

The following are some of the assumptions related to habitat relationships and factors that are expected to influence future habitat conditions:

Limitations of Wildlife Models

Habitat models are designed to relate the occurrence or abundance of a species to environmental predictors, which can then be used to allow these predictions to be mapped within a particular landscape or region (Barry and Elith 2006). These predictions have inherent limitations and it is important to understand these limitations to allow for transparency in decision making.

Habitat model limitations stem from two general types of errors: deficiencies in data and deficiencies in their ecological realism. Data deficiencies arise from small sample sizes, lack of absence data, and missing predictor variables that may be useful in explaining environmental constraints. Model deficiencies also arise from small sample sizes that are usually not randomly derived. Further, it is difficult to model species' distribution due to the variety of biotic and abiotic factors that comprise species' ecological requirements. Species' responses to environment "depend on the competitive context, and this in turn varies given the dynamic nature of species' distributions, the effects of natural and human disturbance, and the complicating effects of variation in the speed with which different species reoccupy sites from which they have been displaced".

Models are a simplification of complex biological systems and therefore cannot be perfectly predictive. Most habitat models are limited to vegetative structure and do not include other habitat variables (e.g., microclimate) and other life history phases (e.g., dispersal, territory establishment). General models tend to be simpler, which in turn enhances the clarity of the model and increases its applicability over a broader range (Van Horne 2002 p.64).

Habitat models that rely on point of detection (POD) data have been successfully utilized to predict habitat relationships and build species' models. Sergio and Newton (2003, p. 857) describe how (1) "…occupancy (POD) may be a reliable method of (habitat) quality assessment, especially for populations in which not all territories are occupied, or for species in which checking occupancy is easier than finding nests," (2) "…successful conservation should maintain or improve high quality (occupied) sites rather than focusing on poor (unoccupied) sites" (p. 863), (3) occupancy data are often available, either by specific or amateur monitoring schemes, and (4) occupancy through space and time is a reliable measure of territory quality, and thus can provide key information for the development of conservation strategies.

Habitat models described in Samson (2005) are based on peer-reviewed literature, non-peer reviewed publications, particularly unpublished master's theses and PhD dissertations, research reports, and data accumulated by the Forest Service. Where possible, the peer-reviewed professional society literature is emphasized in that it is the accepted standard in science. The models described in Samson (2005, 2006) and summarized in Criteria for Wildlife Models Helena National Forest Version June 2009 (USDA 2009a) are based on research findings and POD data collected in Region One.

Habitat Relationships and Biophysical Settings

The analysis of habitats presented here emphasizes vegetation and structural conditions important to wildlife; additional information on biophysical settings evaluated can be found in the SVP Silviculture Specialist Report (Amell and Klug 2015), the SVP Fire and Fuels Specialist Report (Buhl 2015) and the Montana Partner In Flight (PIF) physiographic plan (PIF 2000).

Many species such as pileated woodpeckers, American marten, and northern goshawk, are strongly tied to individual vegetative types, size classes, stand structural characteristics, landscape-scale patterns or topographic features, or combinations of the above. For instance, pileated woodpeckers nest predominantly in large-diameter ponderosa pine or cottonwood snags (McClelland 1977); American marten occur within dense, mid- to late- seral spruce/fir/lodgepole pine forests (Ruggiero et al. 1994); and goshawks nest within multi-storied, mid- to late-seral forests at all but the highest elevations (Reynolds et al. 2006). Although these habitat associations are well researched and accepted in the scientific community, "outliers" or rare occurrences of individuals using uncommon habitats do occur and are acknowledged in the literature. For instance, research shows that goshawks have a preference for stands no less than 30 acres in size (Reynolds et al. 2006), yet McGrath et al. (2003), sampled nest stands that were much smaller. McClelland (1977) found that pileated woodpeckers almost exclusively nest in ponderosa pine, cottonwood, and western larch (west of the divide), but reported a rare use of Douglas-fir

snags. Researchers typically acknowledge but disregard outlying results when identifying habitat associations. Consequently the analysis presented assumes that species sustainability is best modeled by using what the scientific literature designates as typical habitat for a species and does not consider atypical outliers unless data collected in the project area supports use of 'atypical' habitat relationships.

Geographical Information System Data

Geographical Information System (GIS) and product accuracy may vary. They may be developed from sources of differing accuracy, accurate only at certain scales, based on modeling or interpretation, incomplete while being created or revised, etc. Further, results may vary amongst products and outputs. Therefore, calculations (acres and miles) are usually expressed as 'approximate' to account for this variation. Using GIS products for purposes other than those for which they were created may yield inaccurate or misleading results.

Rate of Mountain Pine Beetle Mortality

In western disturbance-prone forests, the distribution of habitats is strongly influenced by the severity and frequency of natural disturbances. While these disturbances are inevitable, it is usually difficult to predict when, where, and to what extent they would occur. Because of this uncertainty, disturbances are disclosed as "risks." The mountain pine beetle (MPB) outbreak in the Stonewall Project area, however, has approached a point of relative certainty and MPB outbreaks are at epidemic levels. Annual insect and disease detection surveys show greatly increased levels of MPB mortality (Amell and Klug 2015). Vegetation data based on R1-VMAP across the project area are categorized as pre-kill data (what R1-VMAP identified as being present in 2005) and post-kill data (current conditions). Mountain pine beetle mortality has increased and is expected to continue into the future, thus, post-kill conditions best describe the existing condition for most species and establish the baseline against which the effects of different alternatives are compared for wildlife. The pre-kill data, however, provides important context for the vegetative changes that have transpired in the last few years, and may be used to display changes in habitat for some species. The data used is discussed under the methodology sections for each species.

Rate of Snag Attrition Following Mortality

The Stonewall Project area is expected to have a high density of ponderosa pine snags due to anticipated mortality. The Regional Snag Protocol (USDA Forest Service 2000) describes large, old ponderosa pine snags as being highly durable in that they can stand for decades after death. Smith (2000) and Perrakis and Agee (2006) attribute this durability to age, slow growth, and repeated exposure to nonlethal fire scarring that induces damaged trees to exude pitch, which inhibits rot. In contrast, according to Smith (2000), the high density of 80- to100-year-old ponderosa pine snags that result from the current MPB infestation would fall within the decade. This is due to a lack of factors that make these snags durable. The trees are young (80–100 years), grew rapidly, have a high ratio of sapwood, and were not exposed to nonlethal fire-scarring. Observations in the project area and other comparable areas reaffirm Smith's (2000) findings. Snags typically fall 3–4 years after death. Most appear to have rotted off at ground level. While a few snags may stand longer than 3–4 years, it is expected that virtually all would be on the ground within 10–20 years. Consequently, the availability of snags, including large-diameter ponderosa pine snags preferred by the pileated woodpecker (Bull 1987; McClelland 1977) and flammulated owl Hayward and Verner 1994; Wright 2000) is expected to be reduced under all alternatives.

Probability of Severe Wildfires following Mountain Pine Beetle Mortality

Wildfires are inevitable (Arno 2000; Arno et al. 1995; Arno et al. 1997). They are essential for many wildlife species, beneficial to some, and detrimental to others, depending upon the magnitude and severity of the fires. Higher-than-normal severity wildfires that cover larger-than-normal expanses can be detrimental to wildlife (Turner et al. 1994), especially when they occur on landscapes that historically had

low or moderate severity wildfires. Wildfire severity is typically modeled using NEXUS, FlamMap, or other models (Buhl 2015) and is usually based on such factors as stand density and structural complexity (ladder fuels) (Finney 2006). Models are commonly used to address the long-term sustainability of wildlife habitats. In most cases, changes in wildfire severity are considered an indirect effect upon wildlife. Effects are further qualified as to the degree that wildlife habitats can be sustained into the future based on the risks and severity of predicted fires.

Risk of Invasive Weeds on Disturbed Sites

Grasses and forb***s*** underlying open, dry ponderosa pine/Douglas-fir stands provide valuable habitat and forage for wildlife. Invasive weeds such as leafy spurge, spotted knapweed, and Dalmatian toadflax, which are well-adapted to occupy dry sites, can out-compete native grasses and forbs and dramatically reduce the habitat quality (Ortega et al. 2006). Actions that reduce the forest canopy and disturb the soil can make sites vulnerable to invasive weeds. Equipment used to thin forest canopies and roads used for vehicle access further increase the vulnerability of droughty sites to weeds by creating vectors for weed introduction. While measures to avoid invasive weeds can be effective (DiTomaso 2000), it is assumed that future monitoring and treatment would be implemented under all alternatives to help contain or control invasive plants.

Climate Change

Climate change has occurred to some degree and will continue in the future. Ramifications of a changing climate on wildlife are likely to include; reduced snowfall or earlier snow melt in the spring, extended periods of drought or extended dry periods in the spring and summer, more frequent and larger wildfires, increased bark beetle mortality and changes in site characteristics that promote climax vegetation or community changes (USDA Forest Service 2007f).

These changes cause seasonal ranges and food sources for wildlife to shift and can affect the timing of reproduction. Reduced snowpack and changes in precipitation can affect amphibians by reducing water levels in lakes and ponds, as well as affect species such as Canada lynx, marten and wolverine that rely on deep or persistent snow. Forested tracts and remote habitats can also become isolated, reducing landscape connectivity and habitat for species such as wolverine (USDI Fish and Wildlife Service 2013). The timing of spring green up can also affect food availability for migratory birds or forage conditions for big game (United States Geological Survey 2008, USDA Forest Service 2007f, Wolverine Network 2012, USDI Fish and Wildlife Service 2012, USDI Fish and Wildlife Service 2013).

Climate change presents an aspect of uncertainty in future conditions, disturbance regimes, and vegetative and wildlife responses. Strategies that can be used to help reduce impacts include; managing for diverse conditions, maintain healthy and connected populations, reduce the risk of catastrophic fire, prevent and control invasive species, and ensure ecosystem processes and habitat connectivity (Mawdsley et al. 2008). While how well each of the alternatives addresses these strategies varies, it is assumed that to a certain extent, climate change and associated effects to wildlife would occur under all alternatives.

R1-VMAP and Forest Inventory Analysis (FIA) Intensified Grid Data

R1-VMAP data are remotely sensed while FIA (intensified grid data) are from on-the-ground plots. These two datasets are used to describe the habitats in this analysis. R1-VMAP represents a broad-scale, coarse filter depiction. It relies on satellite imagery and describes three main vegetation components—canopy cover, tree dominance type, and stand size. R1-VMAP spatially represents habitats at the landscape level and within the project area. It also provides a context against which to identify treatment effects on a given habitat. The intensified grid data are point data and generally incorporate additional vegetation parameters not included in R1-VMAP. For example, snag and down wood habitat data are collected as

part of intensified grid point data and cannot be derived from R1-VMAP. Point data also provide an opportunity to refine and verify broad scale spatial data (i.e., R1-VMAP) and also provide a baseline against which future management actions may be measured.

Proposed Action and Alternatives

Proposed Action – Alternative 2

Fire suppression and moist growing conditions through much of this century resulted in a loss of open forest conditions and seral species (aspen, ponderosa pine and western larch). This has created a more uniform landscape comprised of dense forests susceptible to insect and wildfire mortality (Douglas-fir and lodgepole pine), than occurred historically. In addition, a large-scale mountain pine beetle epidemic has killed most of the mature lodgepole pine and many mature ponderosa pine within the analysis area. These conditions are elevating fuel levels which pose a wildfire threat to nearby homes and communities in the wildland urban interface (WUI). Additionally, due to decades of fire suppression, fire dependent species and species dependent on disturbance such as whitebark pine, ponderosa pine and aspen are declining within the project area.

In order to address these conditions, as well as concerns associated with increased risk of stand-replacing wildfire and a loss of fire-resistant species, the Helena National Forest (HNF) is proposing the Stonewall Vegetation Project. This project was developed following a watershed analysis for the Stonewall project area and includes three separate areas including two areas that were brought forward to the Forest by the Lincoln Working Group (LWG) of the Montana Forest Restoration Committee (MFRC), and a third area that was a product of watershed analysis. The recommended actions associated with the three areas are consistent with the Forest Plan for the Helena National Forest and the purpose and need for the project, and include:

- Improve the mix of vegetation composition and structure across the landscape that is diverse, resilient, and sustainable to wildfire and insects.
- Modify fire behavior to enhance community protection while creating conditions that allow the reestablishment of fire as a natural process on the landscape.
- Enhance and restore aspen, western larch, and ponderosa pine species and wildlife habitat conditions.
- Utilize economic value of trees with economic removal.
- Integrate restoration with socioeconomic considerations.

The proposed action includes a mix of treatments that are designed to achieve the purpose and need. These treatments, which include commercial and noncommercial timber harvest, reforestation activities (e.g., planting), prescribed burning, fuels treatments and transportation activities are summarized in table 61. Harvest and burning treatments are also listed by Group, which is based on site conditions, objectives and type of treatment.

Table 61. Proposed action treatment summary

Treatment Group	Activity[2]	Amount		Treatment	Objective
		Ac	%[1]		
Timber Harvest and Burning					
Group 1		974	4.1		
	Improvement Cut	**974**	**4.1**	Units contain dense mature forest conditions with high mountain pine beetle mortality. Thin, remove dead trees and prescribe burn surface fuels.	Restore open Douglas-fire and ponderosa pine stands that are resilient to wildfires and insect activity. Promote ponderosa pine, Douglas-fir and large diameter trees.
	Jackpot Burn	36	0.2		
	Underburn	938	3.9		
Group 2		1,132	4.7		
	Pre-commercial Thin	**1,132**	**4.7**	Pre-commercial thin dense young forests, remove dead trees and burn surface fuels.	Reduce stand density, maintain stand health and growth. Promote development of mature open stands of Douglas-fir, ponderosa pine and western larch. Maintain/improve aspen component.
	Hand Pile and Burn	77	0.3		
	Underburn	289	1.0		
	Underburn or Slash	242	1.0		
Group 3		745	3.1		
	Seedtree Cut	**343**	**1.4**	Regenerate mixed ponderosa pine/lodgepole pine stands with concentrated mountain pine beetle mortality. Harvest or slash undesirable or insect infested trees, prescribed burn. Naturally regenerate with supplemental planting of desirable species.	Restore mixed species stands dominated by fire resistant seral species. Promote development of open stand with small groups of Douglas-fir, ponderosa pine, Engelmann spruce, subalpine fir. Maintain/improve aspen component.
	Shelterwood Cut	**402**	**1.7**		
	Broadcast Burn	29	0.1		
	Hand Pile and Burn	43	0.2		
	Jackpot Burn	210	0.9		
	Underburn	337	1.4		
	Site Prep Burn	126	0.5		
Group 4		223	0.9		
	Clearcut	**223**	**0.9**	Regenerate dense lodgepole pine stands with concentrated mountain pine beetle mortality. Natural regeneration of lodgepole with underplanting of desirable species.	Restore insect-damaged stands and improve stand diversity. Reduce fuels and increase resilience to wildfire and insects by increasing Douglas-fire, ponderosa pine and western larch component.
	Broadcast Burn	98	0.4		
	Jackpot Burn	53	0.2		
	Site Prep Burn	54	0.2		
	Underburn	19	0.1		
Group 5		25	0.1		
	Sanitation Cut	**25**	**0.1**	Salvage dead and dying lodgepole from mixed stands with scattered mountain pine beetle mortality.	Maintain current stand conditions while reducing ladder and surface fuels.
	Hand Pile and Burn	25	0.1		

Treatment Group	Activity[2]	Amount		Treatment	Objective
		Ac	%[1]		
Group 6		449	1.9		
	Prescribed Burn and Slash Treatment in Inventoried Roadless Area	449	1.9	Burn mixed forest dominated by ponderosa pine, Douglas-fir and dead lodgepole pine using low severity fire to reduce fuels. Some small trees would be cut to reduce fire severity.	Reduce fuels and promote understory development of fire resistant species. Improve stand structure, including open stand conditions, with 5-10 acre openings. Enhance aspen.
Group 7		410	1.7		
	Prescribed Burn and Slash Treatment in Inventoried Roadless Area	410	1.7	Burn mixed forest dominated by ponderosa pine, Douglas-fir, aspen, white-barked pine and dead lodgepole pine using mixed severity fire. Cut small trees in some areas to reduce fire severity.	Reduce fuels and promote understory development of fire resistant species. Improve stand structure, age class diversity including open stand conditions, with 5-20 acre openings. Enhance aspen and white-bark pine. Reduce risk of catastrophic wildfire and restore historic mixed severity regime
Group 8		4,604	19.2		
	Prescribed Burn and Slash Treatment in Inventoried Roadless Area	4,604	19.2	Burn mixed forest dominated by ponderosa pine, Douglas-fir and some pure lodgepole sites using mixed severity fire. Pockets of concentrated beetle mortality, ponderosa pine at lower elevations and white-barked pine at higher elevations. Scattered grasslands and meadows. Some small trees would be cut to reduce fire severity.	Reduce fuels and promote understory development of fire resistant species. Improve stand structure, age class diversity and open stand conditions, with openings of 30 to 75 acres. Enhance aspen and white-bark pine. Reduce risk of catastrophic wildfire and restore historic mixed severity regime
Harvest and Burning Totals					
Total Treatment		8,564	36		
Total Harvest		3,099	13		
Intermediate Harvest		2,132	9		
Regeneration Harvest		968	4		
Total Burning		8,039	33		
Burn Only (No Harvest)		5,463	23		
Transportation					
Road Maintenance		45.6 miles			
Construction of roads to be used and then obliterated after timber removal		2.6 miles			
Haul Roads		48.2 miles			

Additional Alternatives Considered

Two alternatives to the proposed action were considered including alternative 1-no action, which if implemented current management of the project area would continue, and alternative 3, designed to reduce impacts to wildlife. Alternative 2 is the proposed action described above, whereas alternative 3 was developed based on the issues identified through scoping. The following is a description of each of the additional alternatives considered for the Stonewall Vegetation Project.

Alternative 1 - No Action

The proposed vegetation treatments, reforestation activities, and burning and transportation activities would not be completed under this alternative. While routine custodial or maintenance activities would occur, and 382 acres of pre-approved hazard tree removal would be implemented, there would be no new Forest activities proposed. Alternative 1 would let ecological processes control vegetation development and habitat changes would occur primarily from natural disturbances. This alternative provides a baseline or reference point, from which effects of the action alternatives can be evaluated.

Alternative 3 - Reduced Impacts to Wildlife

A number of public issues were identified during scoping including:

- The proposed action may impact habitat for threatened, endangered and sensitive species and designated critical habitat.
- Management Indicator Species (MIS) may be adversely affected by the proposed action.
- Big game hiding, thermal and security cover and habitat may be reduced.
- Habitat connectivity and the viability of old growth and snag dependent species may be reduced.

Alternative 3 was developed to address these issues by 1) reducing pre-commercial thinning, intermediate and regeneration harvest activities, 2) reducing mixed severity wildfire that would result in larger pockets of mortality (i.e., greater than 20 acres), 3) increasing jackpot burning to reduce fuels, and 4) increasing low-severity burning that would result in smaller pockets of mortality (i.e., less than 5 acres). Table 62 compares proposed activities for alternatives 2 and 3.

Table 62. Proposed treatment activities comparison of alternatives 2 and 3

Group Number: Brief Treatment Description Harvest Treatment, Fuels Treatment	Alternative 1 No Action	Alternative 2 Acres	Alternative 3 Acres
Group 1: Intermediate Harvest to Promote Mature Open Forests	0	**974**	**232**
Improvement Cut, Jackpot Burn	0	36	0
Improvement Cut, Underburn	0	938	232
Group 2: Intermediate Harvest to Thin Young Forests	0	**1,132**	**822**
Pre-commercial Thin	0	523	409
Pre-commercial Thin, Handpile Underburn	0	0	29
Pre-commercial Thin, Handpiling, Burn Piles	0	78	50
Pre-commercial Thin, Underburn	0	289	141
Pre-commercial Thin, Underburn or Slash Treatment along PVT	0	242	193
Group 3: Regeneration Harvest in Areas of High Mortality Retaining Seed and Shelter Trees	0	**745**	**664**

Group Number: Brief Treatment Description Harvest Treatment, Fuels Treatment	Alternative 1 No Action	Alternative 2 Acres	Alternative 3 Acres
Seedtree with Reserves, Broadcast Burn	0	29	29
Seedtree with Reserves, Jackpot Burn	0	73	41
Seedtree with Reserves, Slashing, Handpiling, Burn Piles	0	18	18
Seedtree with Reserves, Underburn	0	223	207
Shelterwood (Group) with Reserves, Jackpot Burn	0	137	137
Shelterwood (Group) with Reserves, Site Prep Burn	0	96	96
Shelterwood (Group) with Reserves, Slashing, Handpile/Burn	0	25	0
Shelterwood (Group) with Reserves, Underburn	0	114	114
Shelterwood with Reserves, Site Prep Burn	0	30	22
Group 4: Regeneration Harvest in Areas of High Mortality Retaining Rare Live Trees	0	**223**	**152**
Clearcut with Reserves, Broadcast Burn	0	98	80
Clearcut with Reserves, Jackpot Burn	0	53	0
Clearcut with Reserves, Site Prep Burn	0	54	54
Clearcut with Reserves, Underburn	0	18	18
Group 5: Intermediate Harvest to Remove Minor Amounts of Dead/Dying Trees	0	**25**	**25**
Sanitation, Slashing, Handpiling, Burn Piles	0	25	25
Total Harvest Treatment (acres)		*3,099*	*1,895*
Group 6: Low Severity Prescribed Fire to Create Mortality Patches 5 to 10 acres	0	**449**	**326**
Low Severity Fire, Openings <5 acres	0	326	326
Low Severity Fire, Openings <10 acres	0	123	0
Group 7: Mixed Severity Fire to create mortality patches up to 5, 10, or 20 acres	0	**410**	**36**
Mixed Severity Fire, Openings <5 acres	0	36	36
Mixed Severity Fire, Openings <10 acres	0	48	0
Mixed Severity Fire, Openings <20 acres	0	326	0
Group 8: Mixed severity fire to create mortality patches up to 30 or 75 acres	0	**4,604**	**3,265**
Mixed Severity Fire, Openings <30 acres	0	3,371	2,032
Mixed Severity Fire, Openings <75 acres	0	1,233	1,233
Group 9: Low Severity Prescribed Fire	**0**	**0**	**638**
Jackpot Burn	0	0	326
Underburn	0	0	311
Group 10: Intermediate Harvest to Promote Mature Open Forests	0	0	**403**
Improvement Cut, Jackpot Burn	0	0	403
Grand Total Treatments (acres)	**0**	**8,564**	**6,564**
Roads			
Roads Constructed for project use then obliterated (miles)	--	2.6	0.4
Road Maintenance (miles)	--	45.6	43.8
Total road miles used	**--**	**48.2**	**44.2**

Habitat and Species Evaluated

Species considered in this analysis include species listed as federally threatened, endangered, proposed or candidate on the HNF (USDI Fish and Wildlife Service 2011b and 2013), Forest Service sensitive species (USDA Forest Service 2011a) and MIS species identified in the Forest Plan (USDA Forest Service 1986). A total of 24 species were evaluated (table 63). In order to determine the scope of analysis, a preliminary evaluation (Step 3 above) was conducted for each potentially affected wildlife species, and table 64 identifies those species that were considered, but would not be evaluated in detail in the analysis. Species evaluated in detail are identified in table 65.

Table 63. Wildlife species considered

Common Name	Scientific Name	Status
Federally Proposed, Candidate, Threatened and Endangered Species		
Grizzly Bear	*Ursus arctos horribilis*	Threatened, MIS
Canada Lynx	*Lynx canadensis*	Threatened
Black-footed Ferret	*Mustela nigripes*	Endangered
Sprague's Pipit	*Anthus spragueii*	Candidate
Regionally Sensitive Species		
Wolverine	*Gulo gulo luscus*	Proposed
Bald Eagle	*Haliaeetus leucocephalus*	De-listed
Peregrine Falcon	*Falco peregrines anatum*	Sensitive
Black-backed Woodpecker	*Picoides arcticus*	Sensitive
Flammulated Owl	*Otus flammeolus*	Sensitive
Harlequin Duck	*Histrionicus histrionicus*	Sensitive
Bighorn Sheep	*Ovis canadensis*	Sensitive
Gray Wolf	*Canus lupus*	De-listed
Fisher	*Martes pennanti*	Sensitive
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Sensitive
Northern Bog Lemming	*Synaptomys borealis*	Sensitive
Northern Leopard Frog	*Rana pipiens*	Sensitive
Plains Spadefoot Toad	*Spea bombifirons*	Sensitive
Western Boreal Toad	*Bufo boreas boreas*	Sensitive
Management Indicator Species		
Northern Goshawk	*Accipiter gentilis*	MIS
Pileated Woodpecker	*Dryocopus pileatus*	MIS
Hairy Woodpecker	*Picoides villosus*	MIS
American Marten	*Martes americana origines*	MIS
Elk	*Cervus elaphus nelsoni*	Big Game
Mule Deer	*Odocoileus hemionus*	Big Game

Table 64. Wildlife species eliminated from detailed analysis

Common Name	Rationale for Elimination	Determination
Spraque's Pipit	No recent documentation (Montana Field Guide 2011) and the project area lacks large low elevation grassland habitat (USDI Fish and Wildlife Service 2011b).	No Effect
Black-footed Ferret	Outside current range (Montana Field Guide 2011) and project area lacks open grassland/shrub steppe habitat (USDI Fish and Wildlife Service 2011b)	No Effect
Peregrine Falcon	Project area lacks suitable cliffline nesting habitat.	No Impact
Harlequin Duck	Project area is outside its current range (MFWP 2006).	No Impact
Bighorn Sheep	Project area lacks cliff/rocky habitat required by this species. Species not present.	No Impact
Northern Bog Lemming	Project area lacks suitable high elevation sphagnum moss habitat.	No Impact
Northern Leopard Frog	Project area lacks low-elevation standing water habitat.	No Impact
Plains Spadefoot	Outside the current range (Montana Field Guide 2011).	No Impact

Table 65. Wildlife species evaluated in detail

Species	Habitat
Federally Listed Species	
Grizzly Bear	The project area is in the Northern Continental Divide Ecosystem and occurs in two subunits including Arrastra, and Red Mountain. The project area provides suitable foraging and den habitat and Grizzly bears are present.
Canada Lynx	The project area is within occupied core habitat and designated lynx critical habitat.
Regionally Sensitive Species**	
Wolverine	Wolverine are uncommon but have been documented within the combined boundary. Suitable remote forest habitat occurs throughout the northern third of the project area and modeled den habitat exists in the northern portion of the project area.
Gray Wolf	Wolves are known to occur within the general vicinity of the project area. Also suitable den, foraging and rendezvous habitat is present. Wolves have recently been delisted in Montana (USDI Fish and Wildlife Service 2011a) and the gray wolf is evaluated as a Forest Sensitive Species.
Fisher	Documented on adjacent lands, potential suitable habitat exists throughout much of the project area and fisher use is possible; however, the likelihood of occurrence is low based on recent and historic accounts, rareness of the species, etc.
Townsend's Big-eared Bat	There is no documentation of this species in the Stonewall project area and the closest documented Townsend's Big-eared bat location is approximately 30 miles from the project area. While the project area does not provide suitable cave/hibernacula, it does contain suitable foraging habitat.
Bald Eagle	An eagle nest was recently documented in the Beaver Creek drainage, outside the project area, but within the combined boundary (cumulative effects). Suitable foraging habitat also occurs along the Blackfoot River. Although de-listed under ESA, the bald eagle is protected under the Bald and Golden Eagle protection act and is evaluated as a sensitive species.
Black-backed Woodpecker	Although not documented within the project area, it has been documented adjacent to the area in the vicinity of the Snow Talon fire (2003). As a result and considering that the concentrated mountain pine beetle mortality has created suitable habitat, it is likely that the Black-backed Woodpecker (BBW) is present.
Flammulated Owl	While not documented within the project area this species has been immediatelyh to the south, as well as within the combined boundary. Suitable low elevation, open ponderosa pine/Douglas-fir habitat exist is common. .

Species	Habitat
Western Toad	Suitable forested wetland habitat exists within and adjacent to the project area and although not documented, occurrence is likely as adult toads travel long distances overland after breeding.
Management Indicator Species	
Northern Goshawk	The project area contains two active nest sites and suitable nest, foraging and post-fledgling habitat is common.
Pileated Woodpecker	Documented from the project area. Suitable habitat occurs at scattered locations across the project area.
Hairy Woodpecker	The hairy woodpecker occurs within the project area and suitable habitat is widespread.
American Marten	Although not recently documented, suitable habitat is available and presence is possible. Marten have been trapped along Stonewall Creek in recent years and are known to occur near Reservoir Lake and higher toward Huckleberry Pass.
Commonly Hunted Species	
Elk	The project area provides summer, transition and winter habitat and elk commonly use the project area.
Mule Deer	The entire project area provides suitable habitat and deer use is common. Most of the project area provides summer and transition range, whereas winter range is limited to lower elevations.

**- Includes ESA de-listed and candidate species

Wildlife Issues

The following issues were identified as a result of public scoping and used to develop alternatives to the proposed action. Also, these issues as well as other issue indicators identified to measure potential impacts to wildlife from activities in alternatives considered for the project environmental impact statement are displayed in table 66. Effect indicators are collectively used to assess species viability.

- Restoration of vegetation communities
- Grizzly bear habitat impacts
- Elk security cover and the LRMP standard.
- Lynx habitat: Designated Critical Habitat and Stand Initiation Phase acreage
- Wildfire hazard, risk, and fuels
- Habitats including ponderosa pine, western larch and aspen: maintenance or restoration
- Road impacts to elk and grizzly bear habitat as well as disturbance factors

Table 66. Wildlife issue indicators

Species	Indicator
Threatened and Endangered Species	
Grizzly Bear	Effects to individuals and changes in security cover and potential conflicts with humans. Security Core habitat, Open Road Density (ORD) and Total Road Density (TRD) are specific measures used to evaluate changes within the recovery area, whereas changes in cover and forage within and outside the NCDE are assessed.
Canada Lynx	Effects to individuals and acres of stand initiation, multi-story and mid-seral habitat affected in Lynx Analysis Units (LAUs bl-7 and bl-8). Compliance with the Northern Rocky Mountain Lynx Management Direction (NRLMD) standards and guidelines.
Sensitive Species	
Gray Wolf	Effects to individuals and changes in big game. Den, rendezvous and foraging habitat affected.
Wolverine	Effects to individuals and acres of natal denning and foraging habitat. Availability of remote and dispersal habitat and changes in connectivity and human access.
Fisher	Effects to individuals and acres of den, rest and foraging habitat. Changes in human access.
Townsend's Big-eared Bat	Effects to individuals and acres of and effect to foraging habitat.
Bald Eagle	Effects to individuals, suitable nest habitat affected, effects to reproduction and nest and foraging habitat availability.
Black-backed Woodpecker	Effects to individuals, acres of suitable habitat, changes in quality and distribution of suitable snag habitat.
Flammulated Owl	Effects to individuals and acres of suitable habitat. Short- and long-term changes in the quality of suitable open-canopy habitat, availability of large diameter (>=19 inches) snags.
Western Toad	Effects to individuals, acres of breeding and upland habitat affected.
Management Indicator Species	
Northern Goshawk	Effects to individuals and reproduction. Acres of nest and foraging habitat, nest, foraging and post-fledgling habitat affected, landscape-level changes in habitat. Ability of the project area to support nesting pairs.
Pileated Woodpecker	Effects to individuals and reproduction. Acres of old growth habitat, existing and affected suitable habitat, changes in quality of foraging and nesting habitat, large snag (>=20 inches d.b.h.) availability and changes in project area distribution and use.
Hairy Woodpecker	Effects to individuals and reproduction, acres of suitable habitat, acres of suitable habitat affected, changes in quality of suitable habitat, snag (all size classes) availability. Changes in project area distribution and use
American Marten	Effects to individuals and reproduction. Existing and affected suitable habitat. Changes in the quality of den and foraging habitat, project area distribution and use, and snag and downed woody debris (DWD) availability.

Species	Indicator
Elk	Acres of hiding and thermal cover, habitat effectiveness, acres of security habitat, changes in access and mortality, acres of foraging habitat, and compliance with the Montana logging study. Changes in hunting opportunity.
Mule Deer	Acres of hiding and thermal cover, acres of foraging habitat, changes in project area distribution and use and hunting opportunities.
Migratory Species	
Migratory Birds	Changes (acres) in available habitat (Biophysical settings), compliance with MBTA.

Affected Environment

Wildlife Habitats

Methodology and Process

Wildlife habitats are assessed by looking at existing conditions and changes to biophysical settings and site-level habitats. Biophysical settings are land delineations based on the physical setting (e.g., elevation and aspect) and the potential vegetation community that characterizes the site and are mapped at the landscape scale using geographical information systems (GIS). The Stonewall project area biophysical settings includes: Dry Forests, Cool, Moist Forests, Upper Subalpine Forest (whitebark pine), Mountain Meadow and Shrub, and Riparian communities. Site-level habitats including aspen, snags and downed woody debris (DWD) are based upon Forest Inventory and Analysis (FIA) data from western Montana intensified grid data, and estimates of snag densities from eastside forests (Bollenbacher et al. 2008). More detailed information on biophysical settings and vegetation information collected can be found in the Stonewall Vegetation Project Fire and Fuels Report and the Silviculture Report (Amell and Klug 2015 and Buhl 2015).

Wildlife use of biophysical settings and site-level habitats is based on information provided in the Montana Partners In Flight Bird Conservation Plan (PIF 2000), the Avian Science Center Landbird Monitoring Program (http://biology.dbs.umt.edu/landbird/mpcp/mtpif/TOC.htm) (2006a and 2006b), the Blackfoot Landscape Analysis (USDA Forest Service 1995a), the Montana Natural Heritage Program (http://nhp.nris.state.mt.us), the Coordinated Implementation Plan for Bird Conservation in Western Montana (Montana Steering Committee: the Birds and Burns Network, and Montana's Comprehensive Fish and Wildlife Conservation Strategy (MFWP 2005) and the Stonewall Silvicultural Report.

This analysis discusses standing and downed woody debris as it relates to wildlife and wildlife habitat. See the Aquatic Resource Report for consideration of large wood recruitment in aquatic systems, the Soils Report for a discussion of the importance of dead wood for nutrient cycling, and the Fire/Fuels Report for a discussion of fuel loading. Also, the Stonewall Vegetation Project Snag Analysis Report summarizes the methodologies used to assess snags and provides more detail on snag availability.

The Region 1 Connectivity Protocol (USDA Forest Service (1997) was used to set the context and categories relative to connectivity. Connectivity is discussed relative to the types of corridors utilized by wildlife, whereas effects are evaluated by looking at remote forest habitat (i.e., elk security and grizzly core), increased human access, fragmentation and landscape-level conditions.

Species diversity is discussed at the coarse filter scale by assessing changes in habitats of similar vegetation composition and structure.

Changes in structural condition resulting from treatment would result in site-specific changes; therefore, direct and indirect effects on habitats are analyzed across the project area. However, to better evaluate possible changes in habitat across the landscape, cumulative effects are evaluated on that portion of the combined boundary in which biophysical settings data is available (approximately 65,000 acres).

Dry Forest Habitats (Ponderosa Pine and Douglas-fir)

Habitat Description

Dry forest types comprise 5 million out of 25 million total forest acres in Forest Service Region 1. Approximately 4 million acres are located in Montana—primarily east of the Continental Divide in a band running through the southwestern, central, and north-central part of the state at lower to middle elevations (5,300 to 7,350 feet) on both public and private lands.

Wildlife species associated with dry forests that occur in the project area include flammulated owls, goshawks, Hammond's and dusky flycatchers, and Williamson's and red-naped sapsuckers, among others; all listed as high priority species by the Intermountain West Joint Ventures (Montana Steering Committee 2005).

This forest community includes open, parkland stands composed almost exclusively of ponderosa pine, with an open understory of shrubs and other herbaceous vegetation at lower elevations. On other dry sites, generally at elevations above the ponderosa pine belt, dry forests include a combination of ponderosa pine, Douglas-fir or grand fir, whereas dry forest sites composed exclusively of Douglas-fir occur on sites that are usually too cold for ponderosa pine (PIF 2000).

Prior to the European settlement, fire intervals in the dry forest types ranged from 5 to 25 years (Brown and Smith 2000). These frequent fires were usually of low intensity and promoted a forest structure of open, uneven-aged ponderosa pine or ponderosa pine/Douglas-fir stands (Arno and Gruell 1983). Douglas-fir encroachment into grasslands was rare and limited to periods with long fire return intervals (Gruell 1983). Due to the increased number of immature trees, dry forests have also changed from stands that were previously open, single-storied and patchy, to stands that are currently dense and relatively continuous across the landscape (Fischer and Clayton 1983; Gruell 1983; Losensky 1993). As a result the rich grass, forb and shrub components have been replaced with young conifers, needle mats and sparse ground vegetation.

In the absence of fire, the cool dry forests in central Montana have expanded in previously nonforested grasslands and shrubland habitats. Aspen stands have deteriorated due to competition from Douglas-fir and ponderosa pine and old growth forest has declined due to logging of older trees, particularly low-elevation ponderosa pine (Fischer and Clayton 1983, Gruell 1983, Losensky 1993).

This change in fire frequency has also resulted in shifts in wildlife species composition today, from what occurred in dry forests historically (PIF 2000). For example, open grown pre-settlement stands provided a unique combination of overstory structure and ground level forage for herbivores of all sizes (Knight and Wallace 1989). This contrast most stands today, which exhibit closed or open canopies with cluttered, multi-layered understories. This structure provides more hiding cover and structural diversity, but less forage than historic stands. Changes in stand structure have also resulted in modifications to the bird community. For example, due to the increased tree density and canopy cover, migratory species such as the Townsend's warbler and ruby-crowned kinglet are more common today (Hutto and Young 2002, PIF 2000). Conversely, species that were closely tied to the late-seral, open, dry structure that occurred historically such as the flammulated owl, Lewis's woodpecker, chipping sparrow, Cassin's finch, Hammond's flycatcher and red-crossbill have declined and are currently listed as priority I and II species

in Montana (Hayward and Verner 1994, PIF 2000). Also the flammulated owl either does not occur or is much less common in dry forests today (PIF 2000).

Project Area Dry Forest Habitat

Fire Regime Condition Class (FRCC) biophysical setting data indicate that dry forest habitats dominated by ponderosa pine and dry Douglas-fir comprise approximately 7,742 acres and 5,579 acres respectively of the Stonewall Project area, with ponderosa pine at lower elevations between 4,400-5,500 feet, and a ponderosa pine/Douglas-fir mix at elevations of 5,500-6,000 feet.

Ponderosa pine was historically more prevalent in the project area. However due to fire exclusion, dry sites within the project area today include primarily a mixture of ponderosa pine and Douglas-fir. Also because of years of fire suppression and past harvest, many dry forest stands have been changed from stands that were previously open, single-storied and patchy, to stands that are currently dense and relatively continuous across the landscape (Fischer and Clayton 1983, Gruell 1983, Losensky 1993). These stands are more susceptible to stand-replacing fires (IWJV 2005), which has increased recently due to the MPB outbreak.

The reference fire regime for this setting was one of high frequency (a 22-year mean fire return interval) and low intensity and severity (24 percent overstory mortality). Currently, the fire frequency is much higher (70 years) than the reference and expected severity is higher than reference conditions (70 percent) (Buhl 2015).

Cool-Moist Habitats

Cool-moist habitats include Douglas-fir/lodgepole pine communities at mid-elevations and lower subalpine fir at mid- to upper elevations. The following is a discussion of each.

Moist Douglas-fir/Lodgepole Pine

Douglas-fir forests are difficult to classify and describe, because interior Douglas-fir (var. *glauca*) has the broadest ecological amplitude of any western tree (Arno 1991). It is moderately shade-tolerant, so it can be a climax species in some areas as well as being a common seral species in many habitat types. The moist Douglas-fir stratum covers the transition zone between warm, dry, lower elevation forests dominated by Douglas-fir and ponderosa pine and the cool, moist higher elevation forests dominated by lodgepole pine and subalpine fir.

Historically, these stands were co-dominated by Douglas-fir and lodgepole pine, and experienced mixed severity fire regimes where fire intervals averaged 30 to 100 years (Arno 1980, Barrett et al. 1991, Brown et al. 1994, Arno and Fischer 1995). Mixed severity fire regimes are marked by variability with some trees dying and many surviving (Brown 1995). The result was a patchy, erratic pattern that fostered development of diverse plant communities and wildlife habitats within forested stands and across the landscape as a whole (Barrett et al. 1991).

Cool/Moist Lower Subalpine Forest

Within the lower, subalpine community, lodgepole pine is generally the most common conifer with Douglas-fir, subalpine fir, and Engelmann spruce occurring as well. Whitebark pine occurs in some of the upper elevations of this setting. Particularly moist sites are dominated by subalpine fir and spruce. Engelmann spruce is prominent particularly on north slopes, in draws, and along streams and other riparian areas. These forests occur at higher elevations in cool, moist conditions, and they occupy all aspects.

Historically, fires were relatively infrequent but often burned with high intensity, replacing entire forest structures over extensive areas. Young forests were initially dominated almost entirely by lodgepole pine because of its ability to regenerate after stand replacing fires. However, the structure of older forests varied. Because lodgepole is a thin-barked tree not likely to withstand fire, where periodic underburning did occur, large, sometimes widely spaced overstory trees with thick understory vegetation occurred. In areas that were not periodically burned, heavier fuels and sub-alpine fir developed on the site, and these areas were highly susceptible to stand-replacing fires.

Both Communities

The combination of logging at the turn of the century and fire-suppression has produced a more homogeneous landscape in the cool, moist forest habitat today than occurred historically (PIF 2000). In the past, stands often formed a complex and intricate mosaic on the landscape as a result of the highly variable fires that occurred. Because succession changes forest structure most rapidly in the early decades, it has only taken a few decades for fire suppression to allow large expanses of continuous forest to form across the landscape as most stands reach a closed-canopy stage (Tande 1979).

Priority bird species historically associated with the more diverse structure characteristic of these communities include sharp-shinned hawk, Northern goshawk, Williamson's sapsucker, pileated woodpeckers, Olive-sided flycatchers, Cassin's vireo and Townsend's warbler, although specialized habitat and structures such as snags, riparian areas, large woody debris or edge are necessary for some species.

Species more commonly found in the more homogeneous mid-seral and late-seral closed-canopy forest that exists today include species such as the red-breasted nuthatch, mountain chickadee, ruby-crowned kinglet, gray jay, dark-eyed junco, pine siskin, red squirrel, deer mouse and mule deer.

Project Area Cool/Moist Habitat

The moist Douglas-fir forest is found on approximately 24 percent (5,862 acres) of the Stonewall Project area. This community is found on all aspects although most frequently on north and east aspects. The cool moist sub-alpine fir community occurs on approximately 3,300 acres or 14 percent of the project area and ranges in elevation from 6,800 to 7,800 ft.

The reference fire regime was one of high frequency (a 30-year mean fire return interval) and low intensity and severity (10 percent overstory mortality). Currently, the fire frequency is much higher (70 years), and the expected severity is higher (70 percent) than the reference condition (Buhl 2015).

Upper Sub-Alpine Forests (Whitebark Pine)

While the following provides a brief discussion of whitebark pine, a more detailed assessment can be found in the Stonewall Vegetation Project Silvicultural Report (Amell and Klug 2015)

Habitat Description

Whitebark pine (*Pinus albicaulis*) is a subalpine conifer that is relatively slow-growing, intolerant of shade, but tolerant of poor soils, steep slopes, windy exposures, and cold environments (Arno and Weaver 1990). The major mechanisms for dispersing whitebark pine seed depends primarily upon the seed harvesting and caching behavior of Clark's nutcracker (*Nucifraga columbiana*) (Tomback 1982, Hutchins and Lanner 1982), although a number of other birds and small mammals also utilize the seeds and store them as winter food. Nutcrackers in Montana typically occupy conifer forests dominated by whitebark pine at higher elevations, and ponderosa pine, limber pine and Douglas fir at lower elevations (Montana Fish Wildlife and Parks 2013). While overall populations of Clark's nutcrackers have been stable or slightly increasing, sharp local declines have been noted in northwestern Montana and the cascades.

These changes may be due to recent pine beetle infestations and the arrival of white pine blister rust, both of which kill the whitebark pines that many nutcrackers depend on (Cornell Lab of Ornithology 2012).

Whitebark pine can be found growing in a wide range of plant communities. It can be found growing in small stands at higher elevations or as a co-climax species on sites capable of supporting shade tolerant species such as subalpine fir. On moister subalpine fir habitat types, it can be present as a major seral species, whereas it is a minor component on dry sites.

Whitebark pine's presence as a seral species in subalpine fir habitat types is maintained by disturbances, mainly fires (USGS 2008). Prior to 1900, fires burned through whitebark pine forests at average intervals ranging from about 30 to 400 years, usually with mixed-severity (Barrett et al. 1991, Brown et al. 1994, Keane and Parsons 2007, Tomback et al. 2001), although the longest fire return intervals were associated with a stand-replacing fire regime (Keane 2008). Some whitebark pine stands have been maintained by low intensity fires that kill the sub-alpine fir. Mixed severity fires, which are necessary to create conditions that allow nutcrackers to cache seeds have been absent from the landscape. Consequently whitebark pine has been declining across its range (Kendall and Keane 2001).

In addition to fire suppression, white pine blister rust has led to the most rapid decline in whitebark pine. Impacts from the disease have been highest in the more mesic parts of its range; although all stands can be considered to be at risk. Whitebark pine has also been affected by mountain pine beetle and increased competition, and collectively these factors have all contributed to the rangewide decline of this species.

With large seeds high in fats, whitebark pine trees are an important source of food for many animal species. Wildlife species that eat whitebark pine seeds include woodpeckers, jays, ravens, chickadees, nuthatches, finches, chipmunks, ground squirrels, bears and probably mice (Hutchins and Lanner 1982, Tomback et al. 2001). Pine squirrels (*Tamiasciurus spp*.) harvest and cache whitebark pine cones in middens (Hutchins and Lanner 1982). Whitebark pine seeds serve as an important food source for grizzly bears (*Ursus arctos*) and black bears (*U. americanus*) which raid the seed middens (Kendall 1983). Whitebark pine are long-lived and can grow large in diameter, so also provide valuable snag habitat.

Project Area Upper Subalpine Forest Habitat

The upper subalpine fir community exists on approximately 580 acres or 2 percent of the project area. Although this community occurs largely at elevations above 7,800 feet, it is commonly found at lower elevations down to approximately 6,900 feet. Project area whitebark pine is highly infected by white pine blister rust and is considered seral to subalpine fir. As a result, it depends on fire to maintain its dominance (Keane et al. 2001, Kendall and Keane 2001). In the absence of fire, subalpine fir has increased in presence and the combination of increases in subalpine fir and associated whitebark pine mortality, and lack of regeneration due to white pine blister rust and mountain pine beetle have resulted in a large decline in whitebark pine.

The reference fire regime was one of infrequent high-intensity and mixed-severity fires. The current frequency and severity is not substantially different from the reference condition ((Buhl 2015).

Riparian Habitats

Habitat Description

Riparian habitats typically support more species of breeding and migratory birds than any other terrestrial habitats in the West. They are diverse, dynamic and complex habitats and are sites of biological and physical interaction at the terrestrial/aquatic interface (Kaufman et al. 2000). Riparian zones have a high

degree of biodiversity and the microclimate of riparian zones is also influenced by its position on the landscape, which is different than the surrounding forest (Thomas et al. 1979).

While riparian habitats occur in a variety of communities (e.g., conifer and hardwood) they make up a relatively small amount of the landscape. However because of the proximity to water and associated habitats, they receive a disproportionate amount of wildlife use. For example riparian areas provide more breeding habitat for birds than any other vegetation type in North America (Kaufman et al. 2000). In the Rocky Mountain Region, they contain more listed and vulnerable bird species than any other habitat type. Also numerous landbird species are relatively restricted to the shrubs or deciduous trees associated with riparian environments (Hutto and Young 2002).

Reptiles use riparian areas for foraging, overwintering, and migration. Most amphibians require riparian areas and aquatic habitat for all (e.g., spotted frogs, tailed frogs) or part (e.g., western toads) of their life cycle. Because of their limited mobility, continuous riparian zones are important for dispersal and migration to other unoccupied habitat. Mammals also disproportionately use riparian zones, because of the high structural diversity, proximity to water, and favorable microclimates that create high plant diversity that results in a varied and abundant forage supply. Consequently, riparian areas serve as migration routes between summer and winter range for big game and provide travel corridors between habitats for many terrestrial species such as carnivores, birds, and bats.

Birds that are known to occur in the project area commonly associated with riparian habitat include ruffed grouse, cedar waxwings, yellow warblers, cordilleran flycatchers, McGillivray's Warbler and song sparrows. Fire return intervals can be longer in riparian zones and mammals such as fisher and wolverine also prefer riparian habitat due to the increased cover and downed woody debris that often occurs there (Self and Kearns 1992 *in* Ruggerio et al. 1994).

Project Area Riparian Habitats

The Stonewall Vegetation Project area contains a small amount of the riparian biophysical setting (24 acres), 66 miles of stream and 26 acres of National Wetland Inventory (NWI) wetland. Because many wildlife species select habitat in close proximity to water, for the purpose of this analysis, riparian habitat is defined as lands within 100 feet of a stream or wetland. Stream riparian habitat exists on almost 1,700 acres or 7 percent of the project area, whereas wetland riparian habitat exists on approximately 300 acres. So collectively the project area contains approximately 2,000 acres of riparian habitat.

Aspen

Habitat Description

Aspen occurs as isolated relatively pure stands commonly associated with conifers along water courses. It is often but not always associated with riparian or more mesic upland sites and is relatively rare in Montana when compared to other Rocky Mountain States (PIF 2000).

Aspen reproduces primarily from sprouting following a disturbance, and fire is the primary factor that perpetuates aspen. In the absence of fire, remaining aspen trees eventually lose vigor, fail to sucker (reproduce), and are eliminated from the community. Consequently without wildfire, aspen will be replaced by coniferous forest (Stam et al. 2008). Fire suppression has resulted in a decrease in the abundance and distribution of aspen stands within the Stonewall project area.

Aspen is an important component of the vegetation of Montana, and whether in pure stands or mixed with conifers, aspen provides habitat for a wide variety of wildlife and adds to habitat diversity. It is often the only broad-leafed tree within coniferous forests and therefore provides unique foraging substrates for a

variety of insectivorous birds (PIF 2000, DeByle 1985, Shepperd et al. 2006). The suckers, twigs and bark are used by wintering ungulates, particularly deer, elk and moose. Snowshoe hares and cottontail rabbits feed on the twigs and buds, while ruffed grouse are highly dependent on the buds in winter. Aspen also provides cavities and snags for cavity-dependent species (PIF 2000), and Birds and Burns surveys conducted from 2002 through 2006 south of the project area found that hairy woodpeckers are strongly associated with aspen on the HNF (Bate 2003; Bate 2004; Bate 2005a and b; Bate 2007, Mosher and Saab 2009). Also many cavity excavators select aspen trees at remarkably high rates compared to their availability (Hutto 1995).

Project Area Aspen Habitat

Historically, aspen was widely scattered in the project area (based on remnant stands and range maps). Stands were generally associated with seeps and springs, riparian areas and other moist sites. Under naturally occurring wildfires, aspen stands provided a diversity of structure and size classes. Fires were frequent enough that it was maintained across the landscape. Due to conifer encroachment, age and fire suppression, existing aspen stands are largely decadent with little or no reproduction. Remaining aspen are widely scattered across the project area.

Mountain Meadow and Shrub

Big sagebrush is the dominant mountain shrub and often occurs as a sagebrush/fescue or sagebrush/wheatgrass community. Sagebrush plays an important role for several wildlife species. It is an important winter food as it may be the only source of green vegetation available. It provides cover for mule deer and breaks up snow pack, providing access to grasses. Throughout the rest of the year, it is an important habitat component as forage, protective cover, and nesting habitat (Ritter and Paige 2000). Sagebrush has always been a common habitat in drier, lower elevation valleys in the West, where distribution and patchiness was a result of natural moisture and fire regimes (Paige and Ritter 1999). Sagebrush and associated perennial grasses and forbs provide food and cover for many wildlife species (Cornell Lab of Ornithology 2012).

Mountain meadows typically consist of native bunchgrasses and forbs, which are often interspersed among shrubs. The herbaceous and shrub structure provides habitat for a variety of species, including migratory birds, deer and elk. These areas can be particularly important for big game when they occur at lower elevations, because of the forage they provide on transition range.

Sagebrush and open-land habitat are decreasing across the West (Grove et al. 2005). Without disturbance, conifers are able to out-compete herbaceous species for sunlight, nutrients and water. Large-scale changes in land use have altered the distribution and condition of these communities. Nonnative species invasions have also reduced habitat.

Project Area Mountain Meadows and Shrub Habitat

Mountain meadows and shrubs currently occur on approximately 700 acres or 3 percent of the project area, whereas shrub habitat exists on 138 acres. Approximately half of the existing habitat was created during the Keep Cool fire in 2006. The remainder is widely scattered at upper elevations in the headwaters of Keep Cool and Beaver Creeks. Due to conifer encroachment, this community has been declining.

Dead Wood

Methodology

Forest and regional management direction, as well as the process and assumptions used to identify snag availability are discussed in detail in the Stonewall Old Growth and Snag Analysis Report (USDA Forest Service 2012c). The Northern Region Snag Protocol Team developed the Northern Region Snag Management Protocol (NRSMP) (USDA FS 2000a). The NRSMP was meant to provide flexible direction rather than blindly following established snag retention and recruitment standards given.The information provided in Bollenbacher et al (2008) does not set forth required direction, but rather provides relatively current snag data for consideration. The HNF uses this report to draw conclusions as to an appropriate level of snags on the landscape, as well as in determining appropriate and realistic snag management targets.

In 2007 and 2008 the HNF measured FIA grid intensification plots within the Stone Dry analysis area. These plots included all mortality through 2008 and were used as a base level of snags per acre greater than seven inches d.b.h. for forested land. Because past harvest/regeneration units cannot be expected to have many, if any snags and are not represented in the FIA grid intensification plots used, we assumed that past harvest/regeneration treatment areas would have no snags and computed the 2008 snags per acre accordingly. Projected snags following treatment assumed that the Forest Plan standard of two snags per acre would remain in sites that received a mechanical treatment, whereas snags created by future burning (outside mechanical sites) were based on Forest Vegetation Simulator (FVS) runs. The Region one summary database is used to estimate dead wood.

Habitat Description

Dead wood, including both standing and downed woody debris is discussed because many species, including threatened, endangered and sensitive species rely on this important habitat component. Dead wood contributes to biological richness in many ways: as substrate, cavity sites, foraging sites, nesting or denning sites, food storage sites, runways and cover or shelter (Bull et al. 1997). It is estimated that about 0.33 percent of the bird and mammal species that live in the forests of the Rocky Mountains use snags for nesting or denning, foraging, roosting, cover, communication, or perching. Rose et al. (2001) lists 57 wildlife species plus 4 species groups associated with snags, and 20 wildlife species associated with hollow living trees. In addition, large snags and downed wood play central roles in diverse ecosystem processes and functions such as nutrient recycling, shelter for growing trees, and habitat for wildlife and fish (Rose et al. 2001).

Snags are often examined in terms of cavity use by different wildlife species. There are two types of cavity users: primary and secondary. Primary cavity users excavate their own cavities, whereas secondary cavity users occupy those cavities already created. Hence it is important to distinguish between types of snags (Thomas 1979). For example, pileated woodpeckers and black-backed woodpeckers excavate trees with hard exterior sapwood shell and decaying heartwood. Weaker excavators, e.g., red-breasted nuthatches and chickadees, select trees with softer exterior wood such as those created by armillaria root rot and other saprophytic fungi (Rose et al. 2001). Woodpeckers usually excavate a new cavity each year (Bull et al. 1997), therefore old cavities are continuously available for secondary cavity users.

Reliance on dead wood habitat occurs at a variety of scales, from large landscapes, to small patches, to individual snags or downed logs. More mobile species that depend on dead wood habitat include black bears, Canada lynx, wolverines, marten, fisher, bats, woodpeckers, and owls. Less mobile species that depend on dead wood include snowshoe hares (the primary prey of Canada lynx), red-backed voles (the primary of prey of marten, fisher, boreal owl, northern goshawk), and shrews (Bull and Blumton 1999, Brown et al. 2003).

The number, species, size, and distribution of snags also affect snag-dependent wildlife. Large-diameter snags are particularly important because they occur in fewer numbers and many species require large diameter snags for nesting. Large diameter snags also remain standing longer and are much more likely to develop suitable decay conditions for cavity-using species (McClelland et al. 1979, Bull et al. 1997).

Ponderosa pine, western larch, Douglas-fir, and deciduous tree snags are the species predominately used by cavity-using birds and mammals in the Stonewall Project area. Most are relatively resistant to windthrow and are less likely to require felling for safety concerns. Smaller-diameter snags also get some use as nest habitat by some species, and can play an important role by helping to keep other snags standing (Russell et al. 2006).

Downed trees and other woody material are critical for many species (Maser et al. 1979 *in* USDA Forest Service 2008a). In the Pacific Northwest, 47 vertebrate species respond positively to downed wood (Bunnell et al. 2002). Downed logs and stumps are required for denning and resting, are vital for hunting below the snow in winter (Buskirk and Ruggiero 1994), and are also used as travel cover, particularly when living plant cover is absent. American marten often den and forage in the under-snow cavities that occur under downed logs. Canada lynx, fisher, and wolverine dens are associated with abundant woody debris, usually large-diameter logs (Bull et al. 2001). Winter wrens do most of their feeding underneath suspended logs and several amphibians and reptiles make use of large woody debris for shelter and breeding sites (Bull et al. 1997). Many ant species that need large-diameter downed logs are major predators of defoliating insects such as western spruce budworm (Torgersen and Bull 1995). Longer, large-diameter downed trees are generally most important because they can be used by a far greater range of species. In addition, they provide stable and persistent structures as well as better protection from weather extremes. However, a variety of sizes and decay classes are needed in downed wood “in order to conserve functional processes that foster sustainable forest ecosystems” (Torgersen and Bull 1995).

Standing and downed dead trees have many ecological roles in a landscape recovering from wildfire (Beschta et al. 1995, Saab and Dudley 1998, Smith 2000, Brown et al. 2003, Beschta et al. 2004, Saab et al. 2004). The snags and down logs that result from fire serve a vital role in the structure and function of healthy forest ecosystems and play an important role in post-fire recovery and long-term site productivity. Also, Hutto (1995) found that 15 species of birds were more frequently found in post-fire habitats than in any other major cover type in the northern Rocky Mountains.

Forest and Project Area Dead Wood

Broad Scale Analysis

The abundance and distribution of snags is dynamic due to natural processes and disturbances including fire, insects and disease and forest management. Broad scale analysis captures these disturbance processes and the project area and third-order drainages were examined to assess the distribution and pattern of snags associated with the project and Forest Plan. Table 9 displays the distribution of snags greater than seven inches for the stonewall project area and the Forest as a whole.

Bollenbacher et al (2008) describes the density and distribution of snags within and outside wilderness/roadless areas, by habitat type groups, dominance groups and seral stages. The authors used the most complete FIA data available, although the dataset did not include all the plots currently available in the Forest summary database. Results show that on the HNF, large snags are mostly found in the cool type group, although larger snags were less common in all groups. This is due to 1) fewer trees living to an older age, 2) as trees age, they grow slower, never reaching very large diameters and 3) the inability of systems to contain large old trees and snags due to various types of disturbance which kill them over time

(Bollenbacher et al 2008). In the Stonewall project area, warm, cool and lodgepole pine groups are best represented with lodgepole pine is experiencing a pulse of snags due to MPB.

Bollenbacher et al (2008) summarize snags in wilderness and roadless areas separately to make a distinction between areas that have been influenced by management and those that have not. The authors recognize uncertainty associated with climate and fire suppression, but note that this is the best quantitative data available to represent natural forested ecosystems. This work suggest that the snags in roadless/wilderness areas may represent a natural snag conditions, and the snags in those areas provide a reasonable target distribution. Forest Plan snag targets (2 per acres by third order drainage, 0.2 to 1.3 per acres at the treatment unit scale) are relatively consistent with snag distribution found in wilderness/roadless areas, although a bit high for large diameters and a bit low for small diameters. Both sources suggest that large snags (>20 inches d.b.h.) are naturally rare.

Large wildfires have created snags and on over 200,000 acres on the Forest since 1970. Insect mortality also creates snags and aerial detection surveys (ADS) show that MPB infestation has created snags in ponderosa, whitebark, limber and lodgepole pine. Seral stage and spatial distribution are important characteristics of snags. For example, cool and lodgepole pine groups have more snags in the early seral stage due to a greater proportion of stand replacing fires and composition of species intolerant to fire. The warm types also show an increase of large diameter snags in the early seral stage, perhaps due to fire's role as a stand replacement agent becoming more pronounced through fire suppression, climate and/or beetle outbreaks. All biophysical settings show fewer snags during mid-seral stages as snags transition to dead wood. Also there is generally an increase in live large trees and snags as forest mature (Bollenbacher et al. 2008).

Project Area Snags

The process used to identify the baseline level of snags for the project area is summarized under methodology and within the FIA Intensification plots, there were an average of about 40 snags per acre greater than or equal to 7 inches d.b.h., which is 20 times the Forest Plan requirement of providing 70 percent of optimum. Snags are also well distributed and snag numbers greater than or equal to seven inches in 2011 were 45 snags per acre for drainage 0203, 41 snags per acre for drainage 0204A and 43 snags per acre for the entire project area (USDA FS 2012c). Consequently snags currently occur in a variety of size classes and are widespread and abundant across the Stonewall project area.

Table 67 summarizes snags by size class within the Stonewall project area, whereas figure 67 displays general snag distribution

Table 67. Snag distribution data by size class from 2008 FIA plots

Diameter (d.b.h.) Class	Project Area Average Snags per Acre	Forestwide
7-11	26	26
12-19	13	7
>=20	1	1
Total	**40**	**33**

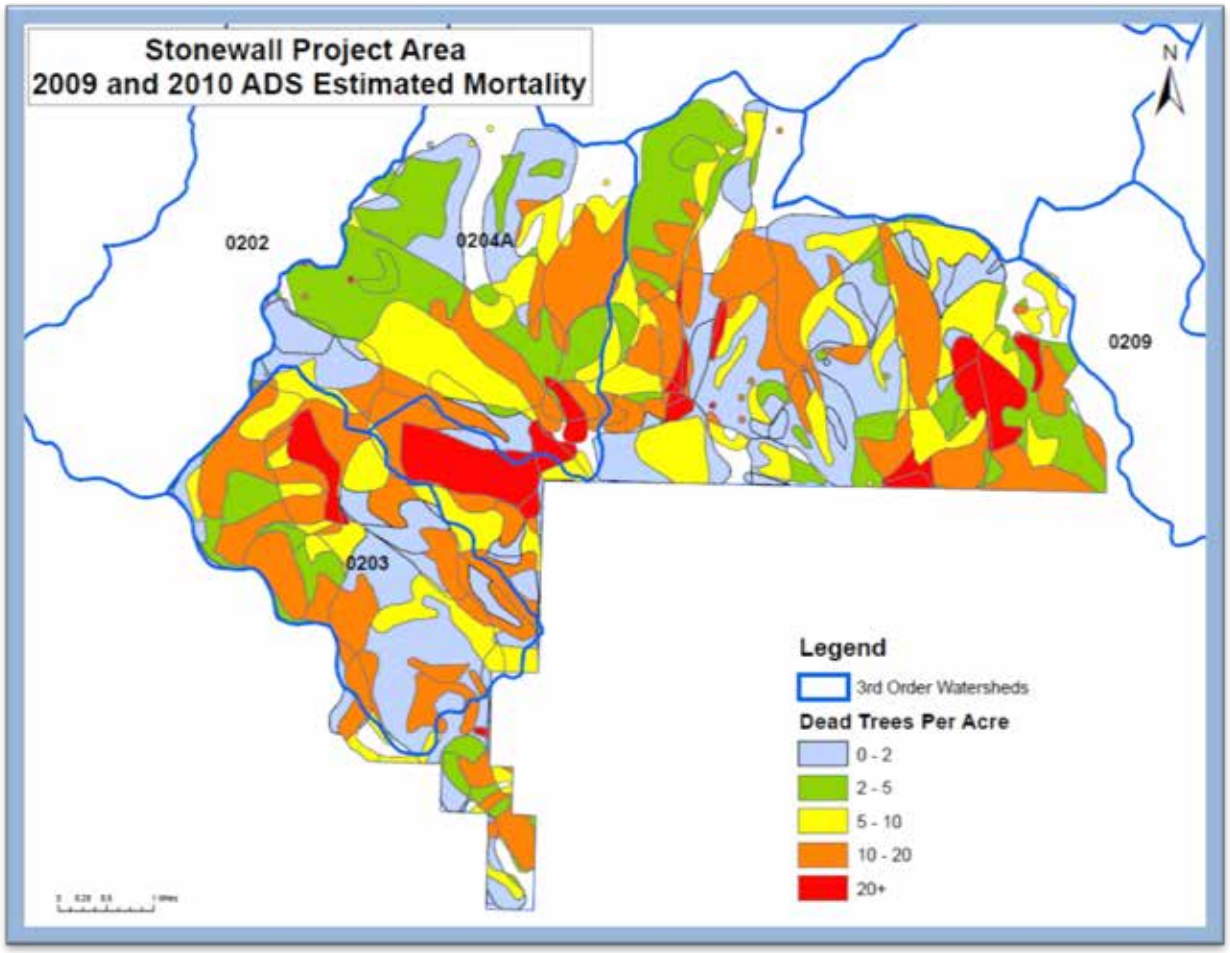


Figure 67. Project area snag distribution

Down Wood

Down wood habitat is estimated in tons per acres from the R1 summary database, as well as from stand surveys. Table 68 displays down wood for the Blackfoot landscape, which includes the project area. Down wood within treatment units is variable. While some young stands contain less than 5 tons per acre, most stands contain between 5 and 20 tons per acre and stands with concentrated lodgepole mortality can contain up to 30 or 40 tons per acre.

Table 68. Down wood Across the Blackfoot Landscape

Down Wood Size	Blackfoot Landscape (tons per acre)
1 hour fuels (<1/4 inch)	0.2
10 hour fuels (1/4 to 1 inch)	0.94
100 hour fuels (1 to 3 inches)	1.86
1000 hour fuels (> 3 inches)	9.51
Total	**12.51**

Landscape Connectivity and Fragmentation

Connectivity refers both to the abundance and spatial patterning of habitat and to the ability of animals to move from patch to patch of similar habitat (USDA Forest Service 1997). Corridors are a means by which connectivity is provided and are defined as strips or stepping stones of "hospitable territory traversing inhospitable territory providing access from one area to another" (USDA Forest Service 1997). The effectiveness of a corridor depends upon the species in question, the type of movement, and the type of corridor (WHCWG 2010). Animals need connectivity to forage within their home range, for dispersal to new home ranges, and for migration between locations.

Connectivity as a concept is being increasingly explored in conservation and is also an area of controversy. While there is no empirical evidence to support the concept of corridors many conceptual models have been built to project connectivity across landscapes (WHCWG 2010).

The Northern Region Connectivity Protocol (USDA Forest Service 1997) provides a framework for describing corridors and the effects of Forest projects and other human activities. Of the five types of corridors outlined in the protocol, four apply to the Stonewall Project area: season migration corridors, dispersal/emigration corridors, travel corridors, and invasive corridors.

Season migration and cyclic corridors: While the project area occurs in well-established continental corridors such as the Central flyway, locally, the most obvious examples of seasonal migrations are spring and fall movements by native ungulates between winter and summer ranges. Historically these routes were dictated by topography, snow conditions, and the availability of resources (particularly forage, water, and cover). Over the past 150 years, these routes have shifted in response to human development. In part, they follow the old resource/topography-driven routes but divert as necessary to avoid roads and other centers of human activity and to take advantage of cover. Wildfire and insect and disease such as concentrated MPB mortality have also affected landscape and watershed level connectivity resulting in local shifts in migration corridors. These corridors are maintained by minimizing human access and fragmentation, and by ensuring contiguous forested upland and riparian areas are available across the landscape.

Travel corridors are local routes established by individual animals or groups of animals to move within home ranges between foraging habitat, cover, breeding sites, and so on. As with local seasonal migration, these routes may shift in response to human activity or landscape-level changes from wildfire and insect and disease infestation. The Stonewall Project area provides connectivity between more remote lands to the north (e.g., Scapegoat Wilderness) and the Blackfoot River and lands to the south extending along the continental divide. The Blackfoot River is an important corridor for species moving up and down the river corridor as well as for movement between habitats to the north and south. Like seasonal and migration corridors, maintaining forested conditions while minimizing human access and development help to maintain existing travel corridors.

Dispersal corridors promote movement into unoccupied habitats. Dispersal behavior is most common when density is too high within an area to support the population, resulting in natural colonization of suitable but unoccupied habitat elsewhere. Because the project area adjoins large blocks of more remote habitat to the north and the Blackfoot River to the south, it provides an important dispersal corridor for a wide variety of species, including Canada lynx, grizzly and wolverine.

Invasive corridors may be continental (e.g., eastern blue jays moving across the Great Plains via wooded river corridors), or local (e.g., cowbirds following cattle trailing up onto National Forest System land). These corridors may affect biodiversity in local ecosystems that have inadequate resistance to invaders, particularly in the case of exotic weeds such as knapweed or leafy spurge. Maintaining landscape-level

conditions and minimizing fragmentation is necessary to ensure that invasive corridors are not established.

Fragmentation is generally considered a change in landscape structure that leads to smaller patch sizes, less interior habitat, and greater distances between patches which can lead to sub-population isolation (Reed et al. 1996, Tinker et al. 1998, Temple and Wilcox 2000).

Fragmentation can affect animal populations by decreasing species diversity and densities due to the smaller patches of habitat created, as well as by increasing edge habitat and effects. Edge is the interface between forest and nonforest, whereas an ecotone is the zone on either side of the edge that is influenced by the transition between contrasting vegetation types (Thomas 1979). Edges and ecotones often support a more diverse array of wildlife species than either of the adjacent habitats alone. Elk, deer and black bears often frequent edges because the forested stands provide cover whereas the openings provide forage. Edges also provide habitat conditions conducive for nest parasites (e.g., cowbirds), invasive species and nest predators (e.g., great horned owls). Consequently increased fragmentation can adversely affect a variety of species including neo-tropical migratory birds as well as increase risks from invasive species. When evaluating effects of fragmentation, landscape conditions such as the amount of intact forest habitat and nonforest habitat need to be considered.

Project Area Changes

Connectivity within the Stonewall Project area and combined areas have been affected by recent wildfires and insect and disease activity. The Snow Talon fire in 2003 (northeast of the project area), eliminated much of the mature forest on most of the 23,000 acres affected. There has also been a reduction in closed canopy (i.e., greater than 40 percent canopy closure) forest due to recent MPB mortality. Prior to the recent mortality approximately 81 percent of the project area was characterized by relatively closed canopy conditions (i.e., greater than 40 percent canopy closure, whereas post-kill, closed canopy forest is reduced to approximately 19 percent of the project area. While forested connectivity is maintained and standing dead trees continue to provide cover for many species, use of the area by species such as fisher that prefer closed canopy habitat would be affected.

Threatened and Endangered Species

Canada Lynx

Methodology

The Helena National Forest Land and Resource Management Plan was amended in March 2007 by the Northern Rockies Lynx Management Direction (NRLMD) (USDA Forest Service 2007b). This multi-region amendment established management direction to conserve and promote the recovery of the Canada lynx, by reducing or eliminating adverse effects from land management activities on National Forest System lands, while preserving the overall multiple use direction in existing plans. This management direction incorporated new science on lynx and was based on recommendations in the Lynx Conservation Strategy Assessment (LCAS) (Ruediger et al. 2000). The NRLMD avoids or reduces the potential for projects proposed under Forest Plans to adversely affect lynx through a suite of standards and guidelines that promote and conserve the habitat conditions needed to produce adequate snowshoe hare (lynx primary prey) densities to sustain lynx home ranges, and thus sustain lynx populations.

Following development of the Canada Lynx Conservation Assessment and Strategy, the Forest Service created maps delineating lynx habitat across National Forest System lands and defined Lynx Analysis Units (LAU) for use in analyzing individual project effects to that habitat.

- The modeling of lynx habitat components, based primarily upon elevation and presence of potential boreal forest vegetative types, was done at the landscape scale and used the best information available. The process used for modeling the different lynx habitat components can be found in the project file and used categories for lynx habitat structure described in the USDI Fish and Wildlife Service Biological Opinion (BO) (USDI Fish and Wildlife Service 2007b) and NRLMD (USDA Forest Service 2007b). Lynx habitat estimates and maps were derived from R1-VMAP and Pfister et al. (1977). Methodologies and assumptions associated with this data are described in; Pfister et al. 1977, R1 Multi-level Vegetation Classification System and its Relationship to Inventory Data, the Region 1 Existing Vegetation Map Products (2009) and the Eastside R1-VMAP Accuracy Assessment (2010).
- LAUs were developed to organize lynx habitat across the landscape into discrete units for analysis purposes. Each individual LAU is intended to be large enough and contain sufficient amounts of lynx habitat to represent the home range of a breeding female lynx (Ruediger et al. 2000). Watershed boundaries and other discrete landscape features were generally used to delineate LAU boundaries. The LAU (or group of LAUs) affected by a project is used as the analysis unit upon which direct, indirect, and cumulative effects analyses are performed.

For the Stonewall Vegetation Management Project, two LAUs, BL-07 and BL-08, are addressed as the analysis area. The Stonewall Vegetation Management Project area is fully contained within these two LAUs, and no other LAU's are affected by the project. Because most NRLMD direction is applied at the LAU level, and the lynx habitat within each LAU has been affected differently by recent wildfire and other landscape-level influences, direct and indirect project effects are evaluated in this analysis by individual LAU, whereas cumulative effects are evaluated across the combined LAU boundaries.

The NRLMD utilizes classifications of National Forest System lands as "occupied" or "unoccupied" by lynx, based on the Amended Lynx Conservation Agreement between the Forest Service and US Fish and Wildlife Service (USDA Forest Servoce and USDI FWS 2006). These definitions are as follows:

- Mapped lynx habitat is considered occupied by lynx when:
  - There are at least 2 verified lynx observations or records since 1999 on the National Forest unless they are verified to be transient individuals; or
  - There is evidence of lynx reproduction on the National Forest
- Areas of lynx habitat not meeting the definition of "occupied" are considered unoccupied.

The NRLMD further classified lynx habitat on National Forest System lands based on the Lynx Recovery Outline (USDI FWS 2005) with respect to their status as core, secondary or peripheral lynx habitat. Definitions of these classifications are provided below:

- **Core areas** have both persistent verified records of lynx occurrence over time and recent evidence of reproduction.
- Areas classified as **secondary areas** are those with historical records of lynx presence with no record of reproduction; or areas with historical records and no recent surveys to document the presence of lynx and/or reproduction. If future surveys document presence and reproduction in a secondary area, the area could be considered for elevation to core. Secondary areas may contribute to lynx persistence by providing habitat to support lynx during dispersal movements or other periods, allowing animals to then return to "core areas."
- In **peripheral areas** the majority of historical lynx records is sporadic and generally corresponds to periods following cyclic lynx population highs in Canada. They contain no evidence of long-

term presence or reproduction that might indicate colonization or sustained use of these areas by lynx. However, some peripheral areas may provide habitat enabling the successful dispersal of lynx between populations or subpopulations.

From a lynx management perspective, the Stonewall Vegetation Management Project area is identified as occupied, core lynx habitat. Therefore, all applicable standards and guidelines in the NRLMD that apply to proposed treatments are addressed (by individual LAU, where applicable) in this analysis. The project area is also located within designated lynx critical habitat (USDI FWS 2104; USDI FWS 2009a). Project effects to designated critical habitat are assessed separately using the combined LAUs as the analysis unit.

Species Status and Biology

The population, distribution, life history, habitat status and recovery objectives for Canada lynx in Region 1 are detailed in Ruggiero et al. (1999), Ruediger et al. (2000), USDI Fish and Wildlife Service (2006) and USDI Fish and Wildlife Service (2007b). The following is a brief summary of lynx habitat preferences and biology.

Canada lynx are medium-sized cats associated with boreal forests, whose distribution and abundance are linked to snowshoe hare, their primary prey (Ruediger et al. 2000). In Montana, lynx habitat generally consists of coniferous forests (lodgepole pine, subalpine fir, and Engelmann spruce), containing a mix of seral stages. Drier forest types (e.g. ponderosa pine and climax lodgepole pine) do not provide suitable habitat (Ruediger et al. 2000, USDI Fish and Wildlife Service 2009b). In the Northern Rocky Mountains, Canada lynx selected home ranges at mid elevations (4,702 ft. to 6,595) with high canopy closure and little open grassland vegetation (Squires et al. 2013).

Daily movements of lynx within their home range are centered on continuous forest and they frequently use ridges, saddles, and riparian areas. They avoid large openings (Squires et al. 2010), either natural or created when moving through their home range. Average daily movements for lynx in Montana were 4.2 miles per day (Squires et al. 2013), with shorter distances moved during the period from parturition until kittens were 2 months old (Olson et al. 2011). Lynx are highly mobile and capable of dispersing long distances (USDI Fish and Wildlife Service 2003b and 2007b), with dispersal distances of up to 620 miles having been recorded. Movement corridors also vary seasonally, with winter corridors providing for local connectivity of neighboring breeding populations, whereas summer corridors may facilitate long-distance dispersal such as from the range core to periphery (Squires et al. 2013).

Snowshoe hares are the primary prey of lynx in Montana (Squires et al 2006) and throughout their range (Mowat et al. 2000). Red squirrels have been reported to be the second most important food source, although in Montana red squirrel abundance was not a factor in lynx habitat selection (Squires et al. 2006). Squires et al. (2006) concluded that lynx foraging and habitat selection was strongly driven by the abundance of snowshoe hares.

Lynx typically inhabit gentle, rolling topography. Across its range, dense horizontal cover, persistent snow, and moderate to high snowshoe hare densities are common attributes of lynx habitat (Squires et al. 2013). Lynx are adapted for hunting snowshoe hares and surviving in areas that have cold winters and deep, fluffy snow for extended periods. These adaptations provide lynx a competitive advantage over potential competitors such as bobcats (*Lynx rufus*) and coyotes (*Canis latrans*) (Ruediger et al. 2000, Ruggiero et al. 1999, USDI Fish and Wildlife Service 2007b). Because of the patchiness and temporal nature of high quality snowshoe hare habitat, lynx populations require large boreal forest landscapes to ensure that sufficient high-quality snowshoe hare habitat is available at any point in time so that lynx may move freely among patches of suitable habitat and among subpopulations of lynx (USDI Fish and Wildlife Service 2009a).

Lynx den sites are located where coarse woody debris, such as downed logs and windfalls, provides security and thermal cover for lynx kittens and the amount of structure (e.g., downed, large woody debris) appears to be more important than the age of the forest stand for lynx habitat (USDI Fish and Wildlife Service 2006). Denning habitat may be located in older regenerating stands or in mature forest where downed woody debris is available. During the winter of 2011/2012 researchers from the rocky Mountain Research Station captured and collared a female lynx denning within the 1988 Canyon creek burn area (Squires 2012). Since no trees were removed and allowed to fall naturally this area supports a high degree of structure and stand regeneration supports a healthy snowshoe hare population. Denning habitat in or near foraging habitat is likely to be most functional and selected by females and multiple nursery sites are often used. Downed logs and overhead cover throughout the home range provides security habitat when kittens are old enough to travel (USDI Fish and Wildlife Service 2007b).

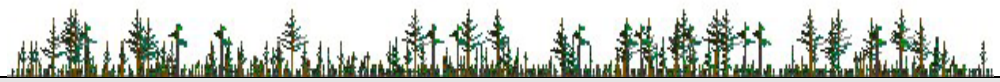
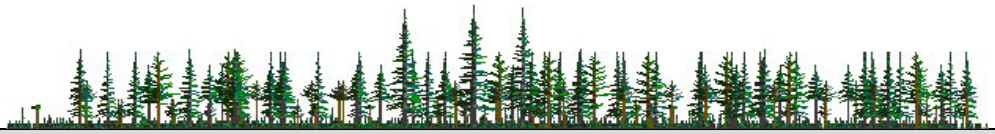
Lynx productivity is highly dependent on the quantity and quality of winter snowshoe hare habitat, which is a limiting factor for lynx persistence. Winter snowshoe hare habitat may be found in dense young regenerating forests where trees protrude above the snowline and in multi-storied forests where limbs of the overstory trees and understory trees provide horizontal cover. Based on research of the Rocky Mountain Research Station in Montana, in winter, lynx preferentially forage in spruce-fir forests with high horizontal cover, abundant snowshoe hares, deep snow conditions and large diameter trees (Squires et al. 2006). During summer, lynx broadened their resource use to select younger forests with high horizontal cover, abundant shrubs, and small diameter trees and dense saplings (Squires et al. 2010). Given that lynx in Montana exhibit seasonal differences in resource selection, Squires et al. (2010) recommend that managers maintain habitat mosaics. Also because winter habitat may be most limiting for lynx, mosaics should include abundant multi-story, mature spruce-fir forests with high horizontal cover that are spatially well distributed (Squires et al. 2010).

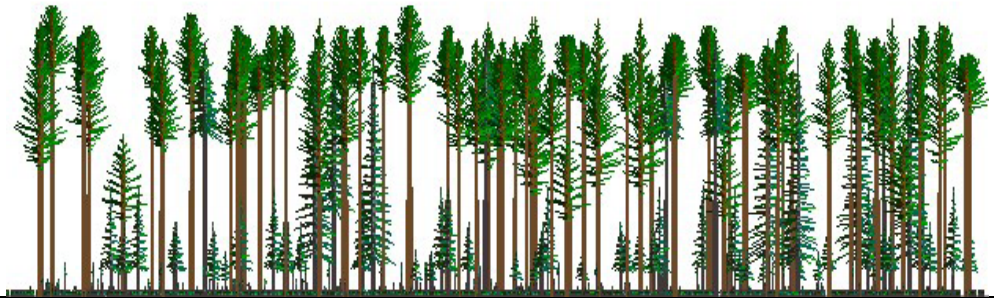
Primary mortality factors include; predation by mountain lions primarily in the spring and fall (31 percent), starvation primarily in winter (29 percent), unknown factors (22 percent) and trapping/shooting (18 percent) (USDA Forest Service 2007b).

Suitable lynx habitat varies greatly depending on the vegetation structure on a site and the amount of cover and forage (i.e., snowshoe hare habitat) provided. The following is a description of the five structural stages for lynx habitat (from youngest to oldest) considered in this analysis and displayed in Figure 68 and summarized in Table 70. Lynx denning habitat conditions could potentially be found in any of the five age groups listed below, depending upon the availability of large coarse woody debris (sometimes provided in younger timber stands by residual material left over from the previous stand). A generalized graphic representation of each of these structural stages is provided in figure 68 below.These are collectively referred to as mapped habitat throughout the analysis.

1. Stand initiation unsuitable - Represents young (less than 15 years old) stands that are regenerating after stand replacing fire, regeneration harves or other disturbance event.The young trees are all about the same age and size and generally do not protrude above the snow, which is the reason this structural stage does not yet provide winter snowshoe hare habitat.
2. Stand initiation - Represents older (15-40 years old) regenerating timber stands dominated by taller saplings and small pole-sized trees. Tree sizes are more variable, with most trees protruding above the snow, providing winter forage and cover for snowshoe hares.
3. Stem Exclusion - Represents relatively even-aged timber stands with high stem densities and closed canopies that have grown out of reach of snowshoe hares. Competition for sunlight and moisture precludes understory development. These stands do not provide snowshoe hare habitat.

4. Mid-seral - Represents the successional stage of the stand at more of a midpoint as it moves from stand initiation toward maturity. These stands have greater variability of stand conditions than those at the stand initiation or stem exclusion phases of development. Stands may be single story or support more than one age class but understory regeneration is generally not yet dense enough to provide winter snowshoe hare habitat. Developmental stages included in this habitat classification range from young multistoried stands to single storied mature stands with little or no understory development.
5. Multi-storied -Represents stands of varying ages with three or more canopy layers. The young multi-storied stands generally do not provide winter snowshoe hare habitat because only limited understory development is within reach of hares. Mature and older multistoried stands do provide snowshoe hare habitat once the understory is dense enough to provide cover and forage, and is within reach of hares.

Structural Stage/Habitat	Description	Contribution to Lynx Habitat
Statnd Initiation. Unsuitable	After a stand-replacing fire or regeneration harvest, new seedlings establish and develop a single-story layer of shrubs, tree seedlings and saplings. Not considered winter snowshoe hare habitat because trees are too short to be available above the snow level.	Considered unsuitable for the first 15 after a disturbance because the trees and shrubs are not tall enough to protrude above the snow to provide year-round habitat. May provide denning habitat if residual coarse woody debris is available.
		
Stand Initiation	Becomes winter snowshoe hare habitat after about 15 years as young trees protrude above the snow and provide cover.	Provides winter foraging and den habitat if residual coarse woody debris is available.
		
Stem Exclusion	Single storied stand with limited understory because little light reaches the forest floor. Little dead and down material is being developed.	Not winter snowshoe hare habitat. Generally not den habitat unless residual coarse woody debris is available

Structural Stage/Habitat	Description	Contribution to Lynx Habitat
Mid-seral	Tree crowns too high to provide snowshoe hare cover. Limited dead and down material is being developed.	Generally not winter snowshoe hare habitat because only a limited understory developed within the reach of snowshoe hares. Denning habitat if there are piles of coarse woody debris.
Multi-storied Habitat Understory Re-initiation	As the forest ages, some overstory trees begin to die or are removed, making openings where a new generation of understory trees can grow in a multi-storied condition.	Winter snowshoe hare habitat if the understory is dense enough to provide cover and forage, and is within reach of hares. Denning habitat if there are piles of coarse woody material.
		

Structural Stage/Habitat	Description	Contribution to Lynx Habitat
	Some old forests develop a multi-storied structure with an understory.	Winter snowshoe hare habitat if understory is dense enough to provide cover and forage, and is within reach of hares. Denning habitat because it generally provides plenty of large coarse woody debris.
Multi-storied Habitat Old Multi-storied		

Figure 68. Description of different structural stages and their contribution to lynx forage and den habitat conditions[26]

Lynx Habitat within the Project Area

The project area is within identified lynx core habitat (USDI Fish and Wildlife Service 2005); is considered occupied (USDA Forest Service and USDI Fish and Wildlife Service 2006) and is located within designated Canada lynx critical habitat (USDI Fish and Wildlife Service 2009a, 2014).

The project area includes two LAUs: BL-07 in the west and BL-08 in the east. The land ownership, total available lynx habitat, and current road density of each LAU are displayed in table 69 whereas the current structural condition of mapped lynx habitat is summarized by LAU in table 70 and displayed in figure 69. Northern Rocky Mountain Lynx Management direction applies to mapped lynx habitat within LAUs in occupied areas, whereas critical habitat applies to all NFS lands.

[26] Taken with some modification from figure 3-2, Northern Rockies Lynx Management Direction, FEIS, volume 1, pages 146−147

Table 69. Ownership and mapped Lynx habitat by LAU

LAU	Ownership				Total LAU Acres	Mapped Lynx Habitat in LAU		General Landscape Patterns
	PVT		NFS					
	Ac	%	Ac	%		Ac	%	
BL-07	478	2	26,184	98	26,662	17,632	66	Large blocks of connected suitable hare habitat throughout the LAU. Road Density 2.8 mi/mi^2.
BL-08	197	1	27,352	99	27,549	21,421	78	Unsuitable winter hare habitat in the north and east due to recent wildfires. Large blocks of well-connected suitable hare habitat in the south and west. Road Density 1.9 mi/mi^2.

Table 70. Mapped lynx habitat – structural stage by LAU

Lynx Habitat – Structural Stage	Lynx Analysis Units			
	BL-7		BL-8	
	Acres	Percent of lynx habitat	Acres	Percent of lynx habitat
Stand Initiation Unsuitable	331	2	7,864	37
Stand Initiation	1,312	7	659	3
Mid-seral	7,431	42	9,015	42
Stem Exclusion	156	<1	373	2
Multi-storied	8,402	48	3,511	16
Total Mapped Lynx Habitat	**17,632**	**100**	**21,422**	**100**

While mapped lynx habitat is abundant within both LAUs, available winter foraging habitat (stand initiation and multi-storied structural stages) varies. For example, BL-08 provides more total lynx habitat than BL-07, it provides less habitat that is considered currently suitable primarily due to the Snow-Talon fire of 2003 which burned over 34,000 acres. Currently, available winter foraging habitat in BL-08 is widely scattered within the LAU. Conversely, BL-07 contains less total lynx habitat; however, BL-07 contains a larger amount of stand initiation hare habitat, as well as over twice the amount of multi-stored forging habitat providing more winter foraging habitat, which is better connected and interspersed throughout the LAU (figure 69).

Due to recent MPB mortality, levels of down woody debris and available denning habitat have increased within both LAUs. While more concentrated mortality generally occurs in the southern portion of the project area, as described under the dead wood section of this analysis, coarse woody debris has increased across the landscape.

In addition to the project area's designation as occupied lynx habitat discussed previously, the two LAUs in the project area (BL-7 and BL-8, table 70) are located within the broad area delineated by Squires et al. (2013) as occupied lynx habitat within the Northern Rocky Mountains. Year-round use of the affected LAUs by lynx is documented (Heritage Data 2012), but data regarding lynx use specifically within proposed treatment units is lacking. Squires et al. (2013) modeled potential movement corridors running

through and beyond the affected LAUs, highlighting how these two LAUS are connected to the surrounding landscape. Annual winter track surveys south of the project area conducted by Wild Things Unlimited since 2009 and Southwest Crown Carnivore survey crews since 2012, have documented winter lynx use in both stand initiation habitat and multi-story habitat. For all these reasons, it is assumed for purposes of this analysis that lynx are likely to be present in the project area.

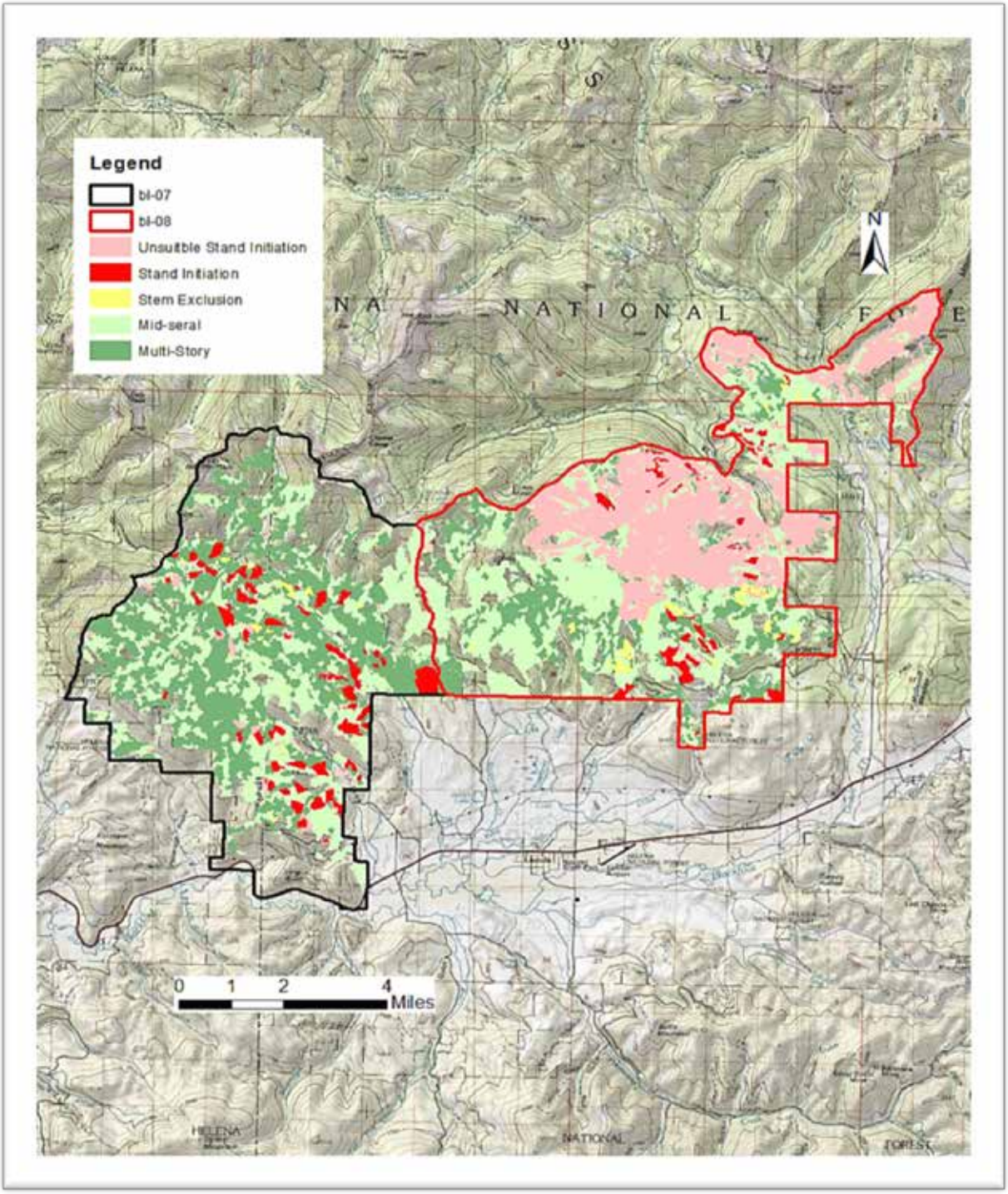


Figure 69. Existing lynx habitat by LAU

Wildland Urban Interface (WUI)

In response to direction provided by the Healthy Forest Restoration Act (HFRA 2003), the Tri-County Fire Working Group developed the 2010 Regional Community Wildfire Protection Plan (CWPP).This plan identified the WUI as the area within 4 miles of at risk urban interface. The CWPP assigned the following wildfire risk categories for lands within the WUI: very high risk for lands within 1 mile of the urban interface; high risk for lands in the 1-2-mile zone; moderate risk for lands in the 2-3-mile zone and; low risk for lands in the 3-4-mile zone. Lands beyond 4 miles are outside the WUI. For the purpose of this analysis, lands with a high or very high risk are sometimes referred to as the 2-mile zone. The NRLMD exempts certain vegetation management treatments within the WUI from the prescribed standards to allow for community protection fuel treatments. These exemptions are discussed further under Environmental Consequences section. Approximately 43 percent of BL-07 and 59 percent of BL-08 falls within the tri-county WUI displayed in figure 70.

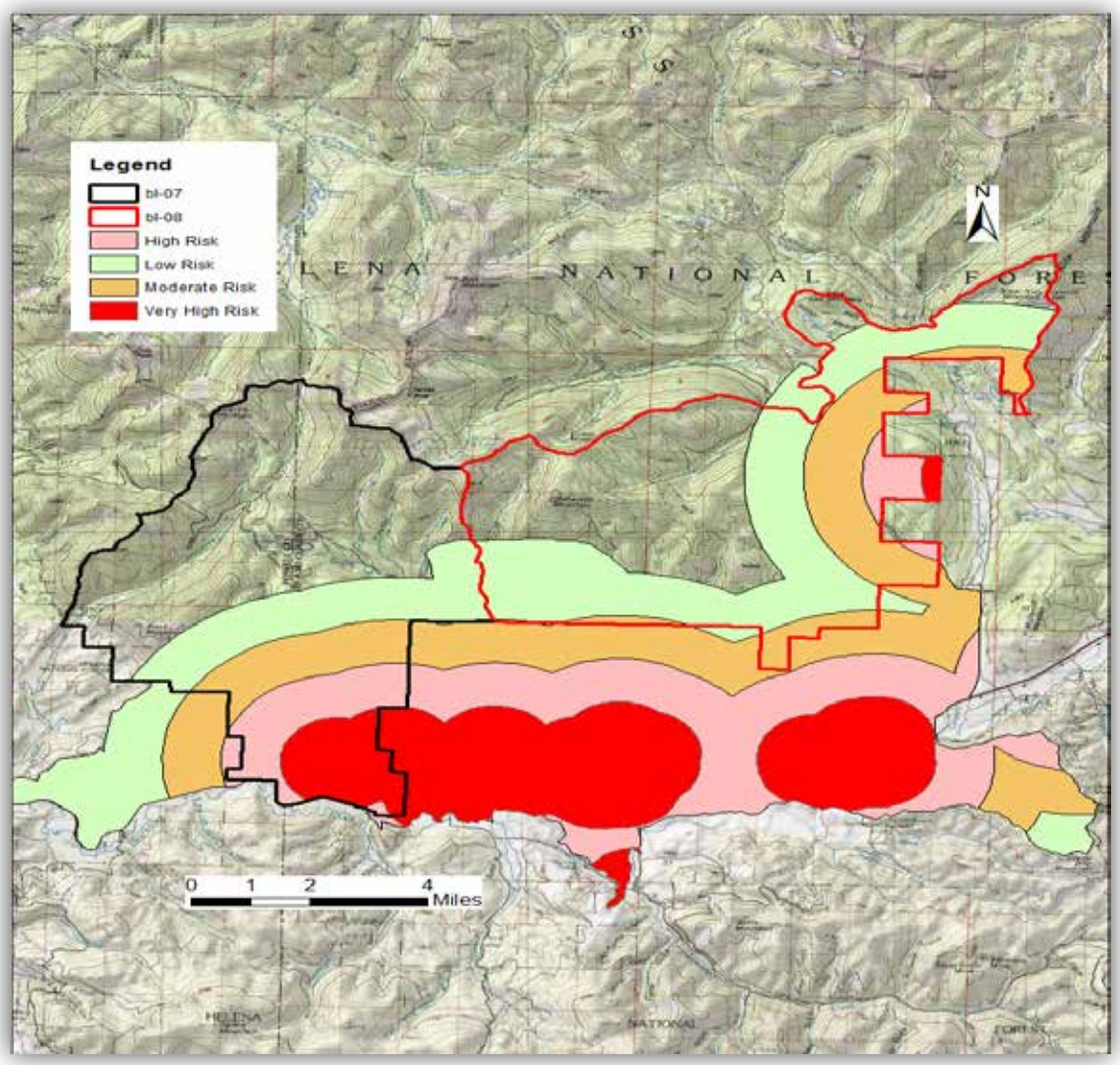


Figure 70. Stonewall Project Lynx LAUs – Tri-County WUI

Grizzly Bear

Methodology and Process

The Stonewall Project area occurs within the Northern Continental Divide Grizzly Bear Ecosystem (NCDE) grizzly recovery area. All National Forest System lands north of Highway 200 are addressed as being within the recovery zone, although approximately 500 acres within the project area are outside the designated recovery zone boundary. In addition to the Grizzly Bear Recovery Plan (USDI Fish and Wildlife Service 1993), the Helena National Forest, Forest Plan, Appendix D, provides guidelines for conservation of grizzly bear habitat within occupied habitat. Since all NFS land north of Highway 200 are addressed as being within the recovery zone, Forest Plan direction for occupied lands is also applied to all lands north of Highway 200. Addressing all lands north of Highway 200 as within the recovery zone, and as Forest Plan occupied habitat, is consistent with future management area designations of the Draft NCDE Grizzly Bear Conservation Strategy that proposes to include all lands north of Highway 200 as the Primary Conservation Area. Forest Plan direction for occupied and/or recovery zone lands is summarized below.

Forest Plan Direction and Access Management

The Helena Forest Plan (1986) provides direction and guidelines for the management and conservation of grizzly bear habitat. This direction is described in the Forestwide Goals (FP-II/1), Forestwide Objectives (FP II/4), Forestwide Standards (FP II/17, 19), Individual Management Area direction (FP III/56, 59, 60), Forest Plan Monitoring Requirements (FP IV/8) Forest Plan, Appendix A (Resolution of Issues and Concerns) and Appendix D (Guidelines for Management of Grizzly Bear Habitat).

For NFS lands within the recovery zone access management is addressed in accordance with the North Continental Divide Ecosystem Grizzly Bear Access Management Protocol and the Flathead NF Amendment 19 (the accepted Motorized Access Density Analysis & Security Core Area Analysis for Grizzly Bear within the NCDE). The moving windows analysis, which measures the exact density of roads, is used to identify the amount of secure habitat within the respective subunits of a Bear Management Unit (BMU) based on: (1) Total Motorized Road Density (TMRD), (2) Open Motorized Road Density (OMRD) and (3) Security Core habitat (CORE). Each BMU and subunit is evaluated against these three criteria to determine if they meet the guidelines or are in a degraded condition (do not meet guidelines).

Relevant Forest Plan direction for T&E species (II/19) specific to grizzly bear management on the HNF includes:

- In occupied grizzly habitat, to minimize man-caused mortality the open road density will not exceed the 1980 density of 0.55 miles per square mile, which was determined to have little effect on habitat capability.
- Apply the guidelines in Appendix D to the Management Situation 1 and 2 (referred to as essential and occupied prior to 1984) grizzly bear habitat on the Forest.

Appendix D of the Helena FP (1986) identifies NFS lands within the recovery zone as either Management Situation (MS) 1 or MS 2 in accordance with the Interagency Grizzly Bear Management Guidelines (IGBC 1986). No Management Situation designations were made for NFS lands outside the recovery zone. Only MS 1 and MS 2 lands are identified in Appendix D of the Helena Forest Plan. Management Situation 1 lands include the Scapegoat Wilderness, Alice Creek non-motorized area, and the upper reaches of the drainages encompassing headwaters of the Copper creek drainage. The remaining lands within the recovery zone and an area of land outside the recovery zone south of Rogers Pass along the

continental divide are classified as MS 2 lands (see GB Occupied and MS map). The following is a description of MS 1 and 2 lands:

- Management Situation 1 – This area contains grizzly population centers and habitat components needed for survival and recovery of the species. Grizzly habitat maintenance and improvement, and grizzly and human conflict minimization will receive the highest priority and management decisions will favor the needs of the grizzly bear over other land uses (USDA Forest Service 1986). The probability is very great that major federal activities or programs may affect the grizzly.
- Management Situation 2 – The area lacks distinct grizzly population centers. Highly suitable habitat does not generally occur, although some grizzly habitat components exist and grizzlies may be present occasionally. Habitat maintenance and improvement, and grizzly and human conflict minimization may be, in some cases, important but not the most important management considerations. The effects of major federal activities or programs on the conservation and recovery of the species are not generally predictable.

In addition to the above management situations descriptions, the Helena National Forest uses the following information for managing grizzly habitat:

- Coordination dates for grizzly habitat use are:
  - Spring habitat (concentrated use areas) – April 1 to June 30
  - Breeding areas (May 1 to July 15).
  - Alpine feeding areas (July 1 to September 15.
  - Subalpine fir/whitebark pine habitats (August 1 to November 30).
  - Denning habitat – October 15 to March 31.
- Maintain existing seasonal grizzly habitat use in constituent elements and habitat components.
- Coordinate man's activities using the measures listed or discussed in "Rocky Mountain Front Grizzly Bear Monitoring and Investigation" (Aune et al. 1984) as appropriate to the habitats and grizzly use on the Helena National Forest.

More recently, the NCDE Access Technical Group (unpublished report 2002) suggested that "grizzly bear access management apply during the non-denning period, and include April 1 through November 30 of each year." In turn, the dates of March 31 for the end of the denning period and April 1 for the start of the spring season were discussed and agreed upon (for consistency among Montana National Forests) by an interagency team of U.S. Forest Service and U.S. Fish and Wildlife Service biologists (the "Montana Level 1 Biologist Team, unpublished notes, 12/9/2003). The chronology of these dates is consistent with the best available scientific information such as the work of Mace and Waller (1997) and other grizzly bear denning studies. Therefore, 12/1 to 3/31 is used to define the grizzly bear denning period for project analysis.

Collectively, the Forest Plan guidelines, NCDE Access Management Guidelines, habitat recommendations, coordination dates, seasonal use considerations and human activity guidelines are used to maintain grizzly bear habitat and reduce impacts to bears.

In addition, the Forest Plan identifies forestwide standards that directly or indirectly benefit grizzly bears and help to minimize effects of roads on grizzly bears across the Helena National Forest. Standards that are directed at maintaining or improving seasonal habitat or security areas for big game species (for example, elk) would indirectly benefit grizzly bears and black bears by improving security and potentially improving the forage base.

Draft NCDE Grizzly Bear Conservation Strategy

The NCDE Grizzly Bear Conservation Strategy, currently in draft form, will provide future management direction for the NCDE population of grizzly bears when the population is delisted. Once the Conservation Strategy is finalized the Forest Plans for those forests in the NCDE will be amended to incorporate management direction of the Conservation Strategy. Under the Conservation Strategy, the NCDE grizzly bear population and its habitat will be managed using an approach that identifies a Primary Conservation Area (PCA) and three additional management zones (Zone 1, Zone 2, and Zone 3). The PCA is the area currently known as the NCDE Grizzly Bear Recovery Zone where the most conservative habitat protections would remain. The remaining National Forest System lands south of Highway 200 are anticipated to be classified as Zone 1 lands. The CS would set an objective of maintaining a recovered grizzly bear population in the NCDE area sufficient to maintain a healthy grizzly bear population in biologically suitable habitats within the PCA and Zone 1. The goal for the agencies implementing the CS would be to maintain a genetically diverse NCDE grizzly bear population with at least 800 grizzly bears. This would be achieved by incorporating habitat standards and guidelines described in the CS into the respective agency management plans. Upon implementation of the CS, management using the NCDE recovery zone line and grizzly bear Management Situations as described in the Interagency Grizzly Bear Guidelines (1986) would no longer be necessary and no longer apply.

Species Status and Biology

The grizzly bear was listed as threatened throughout its range in the lower 48 states on July 28, 1975. The Grizzly Bear Recovery Plan was approved in 1982, updated in 1990 and 1992, and revised in 1993 (USDI Fish and Wildlife Service 1993). The recovery plan identified seven grizzly bear ecosystems, f ive of which are currently occupied. One of these, the Northern Continental Divide Ecosystem (NCDE) occurs in part on the Helena National Forest. The Stonewall Project area is located in the southern most extension of the NCDE grizzly bear recovery zone. The overall goal of the Grizzly Bear Recovery Plan is to remove the grizzly bear from threatened status in each of the occupied or reintroduced ecosystems in the 48 contiguous United States.

Grizzly bears are considered habitat generalists, using a broad spectrum of habitats. They are opportunistic feeders and will prey or scavenge on almost any available food; grizzly bear movements are determined largely by their search for food. For example, upon emergence from the den in the early spring, grizzlies move to lower elevations and drainage bottoms in search of plants that are greening up. Throughout the late spring and early summer they move towards higher elevations, often following the snow line as food becomes available. Spring habitat tends to be at lower elevations, therefore, increased potential exists for conflict between bears and humans in these areas. In addition to being utilized for feeding, riparian zones are also heavily used by grizzlies for travel corridors (Moss and LeFrance 1987 *in* USDA Forest Service 2005).

The relative importance of forest cover to grizzly bears has been documented in various studies. A four year sturdy in the Yellowstone ecosystem found that ninety percent of 2,261 aerial radio relocations of 46 radio-collared grizzlies were in forest cover too dense to observe the bear. This same study also noted the importance of an interspersion of open parks as feeding sites associated with cover based on the relocation distances in dense forests from openings (USDI Fish and Wildlife Service 1993). Dense forests are also important for thermal cover, hiding cover, and day beds and most beds are located within six feet of a tree (USDI Fish and Wildlife Service 1993).

Grizzly bear habitat is best described in terms of the availability of large tracts of relatively undisturbed land that provides some level of security from humans (USDI Fish and Wildlife Service 1993). Effective habitat is often described in terms of core habitat or areas free of motorized access during the non-

denning period. Open and total road densities are also important measurements in determining core areas and understanding the extent of habitat security for bears (USDI Fish and Wildlife Service 1993).

The Grizzly Bear Recovery Plan (USDI Fish and Wildlife Service 1993) indicates the most important element in grizzly bear recovery is securing adequate effective habitat. This is a reflection of an area's ability to support grizzly bears based on the quality of the habitat and the type/amount of human disturbance in the area. Controlling and directing motorized access is one of the most important tools in achieving habitat effectiveness and managing grizzly bear recovery (USDI Fish and Wildlife Service 1993).

Analysis Area

Grizzly bears are the largest, most wide-ranging forest carnivore in western Montana. The needs of grizzly bears are met at the Forest level and through management and maintenance of Bear Management Units (BMUs), which help ensure the conservation of this species. The Stonewall Project area is included within the Monture-Landers Fork Bear Management Unit and includes portions of the Arrastra and Red Mountain sub-units.

The analysis for grizzly involves a multi-scale assessment. Direct and indirect effects are evaluated across the 24,000-acre project area, and by subunit, which are meant to approximate the home range of a female grizzly bear. This area was selected because it includes all treatment units as well as adjacent habitat that might affect use of the area by bear. Cumulative effects are evaluated across a larger area that includes: the Arrastra and Red Mountain sub-units, and lands outside the recovery area that are utilized by bear to access the Blackfoot River and lands to the south.

Grizzly Bear Habitat

The Helena National Forest manages more than 76 percent of the land within the Arrastra Mountain and Red Mountain subunits. Table 71 summarizes the status of these lands within the project and cumulative effect areas. The recovery zone occupies 91 percent of the cumulative effects area and 97 percent of the project area. Lands outside the recovery zone include those that connect the project area with the Blackfoot River to the south, as well as private lands within each sub-unit. Management Situation 1 lands include high- quality habitat that adjoins the Scapegoat Wilderness, which occurs on approximately 10 percent of the project area recovery zone, whereas over 85 percent of the project area occurs as Management Situation 2 lands.

Table 71. Project area bear management situation lands

Grizzly Bear Habitat Status	Project Area (24,005 ac)		Cumulative Effect Area (89, 216 ac)	
	Acres	%	Acres	%
Arrastra Mountain Sub-unit	17,616	73[2]	36,931	41
· Management Situation 1	2,264	9	3,187	4
· Management Situation 2	15,101	63	29,361	33
· Lands not Designated (private)	251	1	4,383	4
Red Mountain Sub-unit	5,833	24[2]	44,571	50
· Management Situation 1	14	<1	6,854	8
· Management Situation 2	5,819	24	25,618	28
· Lands not Designated (private)	0	0	12,099	14
Occupied Lands Outside Recovery Zone[1]	506	2	7,714	9

1 - % of project and cumulative effect area
2 - % of project area BMU

Den Habitat

Three primary studies on grizzly den site selection, entrance, and emergence periods have been conducted in the NCDE. These studies also incorporated and/or compared findings with other available North American grizzly bear and brown bear denning information gathered previously. Within the NCDE, Servheen (1981) studied denning in the Mission and Rattlesnake Mountains, Aune and Kasworm (1989) studied denning along the Rocky Mountain Front, and Mace and Waller (1997) studied denning in the Swan Mountains. These three studies provide the baseline for the grizzly bear denning analysis for this project.

Parameters selected to model grizzly bear denning habitat were based on the three studies noted above, literature reviews, and discussions with other wildlife biologists. These parameters are consistent with research findings and other denning habitat mapping efforts within the NCDE. The selected parameters represent the elevational band of habitat most commonly used by denning grizzly bears; higher elevation slopes sufficiently steep and shaded to retain snow throughout the denning season with soil types conducive to den excavation and den structural integrity. The parameters for modeled denning habitat are displayed in table 72 below.

Table 72. Grizzly bear denning habitat parameters for Blackfoot landscape

Habitat Type	Elevation (ft)	Slope (%)	Cover	Aspect (Cardinal)
High Potential	>6,200	>35 and <100	All types except rock	N, NE, and NW
Potential	>6,200	>35 and <100	All types except rock	All other aspects

High potential denning habitat selects for all north aspects while potential denning habitat selects for all other aspects. Various bear denning studies found that when available northerly aspects are most often selected for den sites. North aspects provide the most shading and retain snow longer providing the most consistent micro-climate during hibernation. Acres of high potential and potential denning habitat and the percentage of available denning habitat within the respective subunits are shown in table 73 below.

Table 73. Grizzly bear denning habitat by subunit

Subunit	Subunit Acres	Denning Habitat	Acres	Percent of Denning Habitat	% of Subunit
Arrastra Mountain	69,316	High Potential	7,358	31	11
		Potential	16,023	69	23
		Total	**23,381**	**100**	**34**
Red Mountain	76,735	High Potential	7,451	40	10
		Potential	11,211	60	15
		Total	**18,662**	**100**	**24**
Combined Subunits	146,051	High Potential	14,809	35	10
		Potential	27,234	65	19
		Total	**42,043**	**100**	**29**

Grizzly bear denning habitat occurs at upper elevations scattered across the project area. Collectively, high potential den habitat represents approximately 10% of the combined subunits, whereas potential den habitat represents approximately 19% of the combined subunits. For both the Arrastra and Red Mountain subunits, the majority of denning habitat occurs in the Scapegoat Wilderness. As noted previously, 12/1 through 3/31 is the accepted timeframe for the grizzly bear denning period in the NCDE.

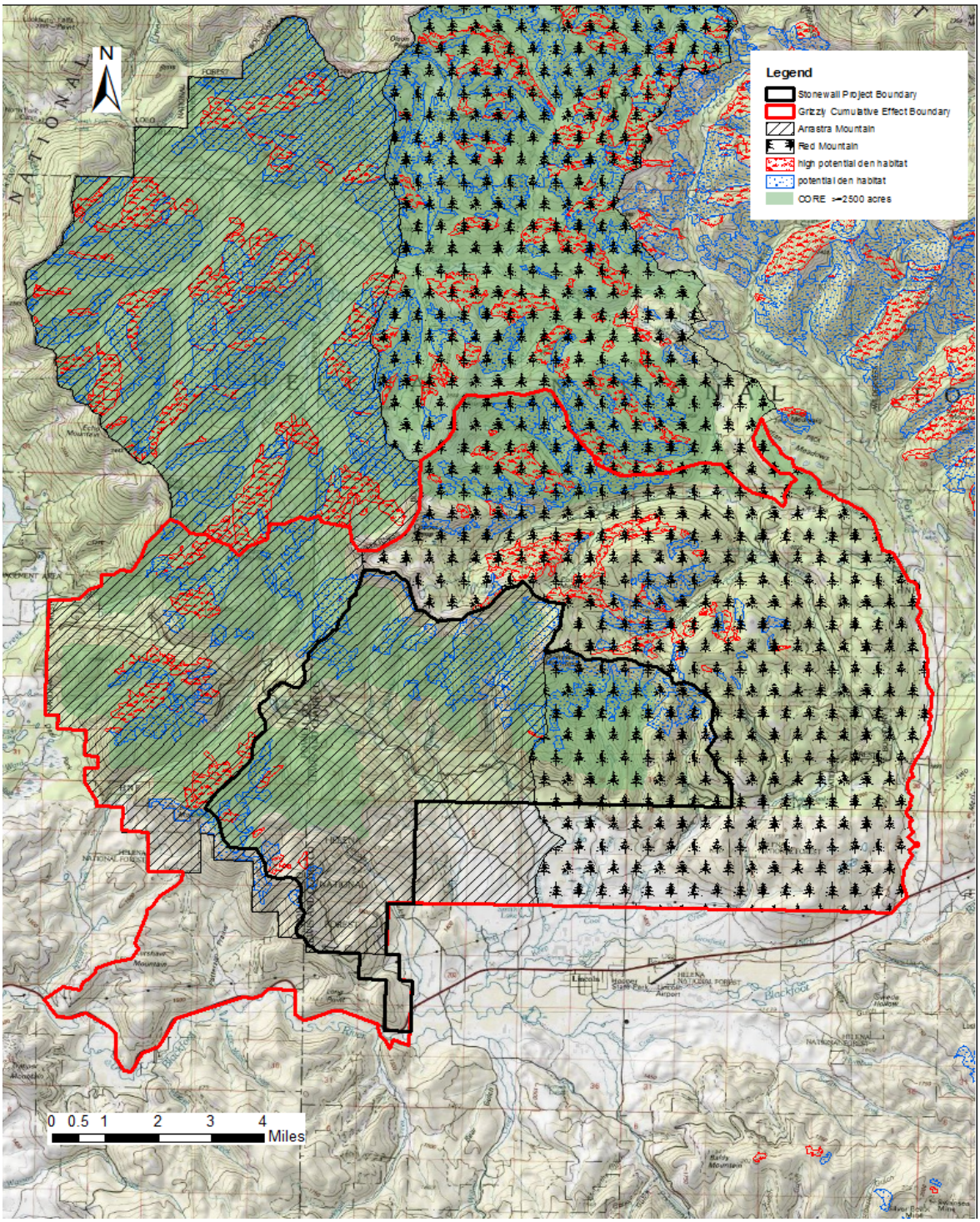


Figure 71. Grizzly bear den and core habitat

Motorized Access Management

Within the Landers Fork BMU, road densities are managed in accordance with the Flathead National Forest Amendment 19, which considers parameters of open motorized route density (OMRD), total motorized route density (TMRD) and secure core habitat (CORE). These measures, referred to as the 19/19/68 guidelines, are collectively used to conserve grizzly bears within the NCDE recovery zone and apply to the non-denning period only (4/1 – 11/30).

Open motorized route density includes roads and trails that are open to wheeled motorized use during any portion of the non-denning period. Total motorized route density includes roads and trails open to wheeled motorized use and those with temporary restrictions, such as gates. Open motorized route density is reported as the percentage of each BMU subunit that has more than 1 mi/sq mi of open routes, and TMRD is reported as the percentage of each BMU subunit that has more than 2 mi/sq mi of total routes. Secure core habitat is defined as those areas more than 0.3 miles from a motorized access route during the non-denning period, and at least 2,500 acres in size. Secure core habitat is expressed as the percentage of the BMU subunit that meets this definition. Table 74 summarizes existing TMRD, OMRD and CORE for the Arrastra and Red Mountain sub-units. Table 74 reflects the moving windows values both with and without late season snowmobile use (i.e. authorized snowmobile use after 3/31).

Table 74. Existing OMRD, TMRD, and CORE habitat

Subunit	Percent of subunit meeting 19/19/68 guidelines								
	Alt 1			With Late Season Snowmobile Use			Without Late Season Snowmobile Use		
	Total Subunit Acres	Total NFS Acres	Percent NFS lands	OMRD	TMRD	CORE	OMRD	TMRD	CORE
Arrastra Creek	69,316	64,936	94%	19	21	72	17	19	74
Red Mountain	76,735	64,606	84%	26	25	56	24	21	58

OMRD - Open motorized route density guideline: ≤19% of each subunit with >1.0 mile/mi2

TMRD - Total motorized route density guideline: ≤19% of each subunit with > 2.0 mile/mi2;

CORE - Greater than 2500 contiguous acres, >=0.3 mi. from motorized route, no roads or trails receive high intensity use and no motorized routes open during non-denning period) guideline: ≥68% of the subunit considered core area

As shown above the Arrastra Mountain subunit currently the meets the 19/19/68 guidelines for OMRD and CORE with or without late season snowmobile use. The subunit does not meet the TMRD guideline when late season snowmobile use is included but does meet it when not included. The Red Mountain subunit currently does not meet any of the 19/19/68 guidelines with or without late season snowmobile use

Approximately 45 percent of project area habitat within each sub-unit occurs as core habitat and these lands connect to larger blocks to the north (see figure 71). Also approximately 64 percent of the modeled den habitat within the project area occurs within core habitat.

Project Area Use

While denning activity within the project area has not been documented, resident bears are known to occur within the project area during the non-denning period. Bears have been observed moving through the area after emerging from hibernation to reach lower elevation spring habitats and other habitats throughout the summer and fall. Generally bears utilize lower elevations in the project area after emerging

from hibernation to forage on herbaceous vegetation in the spring and move to upper elevations following snowmelt. Foraging and use of upper elevation sub-alpine habitat, as well as forested stands containing berry producing shrubs occurs later in the summer and fall. Lands at the southern extent of the project area and to the southwest are particularly important for bears accessing the Blackfoot River corridor. Grizzly bears utilize the Blackfoot River extensively for foraging and seasonal movements, and are known to move through the southern portion of the project area to access the river corridor. Action area lands also provide connectivity for bear movements between the Scapegoat Wilderness and lands south of Highway 200.

Sensitive and Federal Candidate Species

North American Wolverine

Methodology and Process

Data for wolverine occurrence within the project area are derived from the Montana Natural Heritage Program (Montana NHP 2011), from snow-tracking surveys (Wild Things Unlimited 2011) conducted annually since winter 2009/2010, and from Southwest Crown Forest Carnivore Surveys conducted since winter 2011/2012. Wolverine habitat was modeled on late season snow persistence (Copeland et al 2009) and wolverine maternal habitat (Inman et al 2013).

In general, wolverine habitat requirements include, but are not limited to, large areas of unroaded security habitat, secure denning habitat and available ungulate carrion in winter. Existing habitat conditions and potential effects to wolverine were evaluated by looking at the availability of remote habitat, potential effects to suitable den habitat, and changes in human access and ungulate availability.

Wolverines range widely across the landscape in search of suitable habitat and prey. Given their propensity to travel long distances, direct, indirect and cumulative effects are analyzed across the combined boundary, which totals 101,977 acres. This area was selected because it is large enough to assess home range considerations, and evaluate landscape-level effects. It includes preferred remote habitat, lands with persistent snow preferred for denning and dispersal, and lands affected by recent wildfires.

Species Status and Biology

The wolverine is classified as a Sensitive Species by the Regional Forester, Northern Region. At the present time (November 2014), the USFWS is under litigation regarding their August 2014 decision to withdraw their February 2013 proposal to list the North American wolverine Distinct Population Segment (DPS) as a Threatened species. Therefore, the legal status of the wolverine is subject to change before the analysis contained in this report is incorporated into the final NEPA documentation and decision for the Stonewall Vegetation Management Project.

To accommodate and anticipate any potential change in status, this report assesses potential effects of the Stonewall Vegetation Management Project alternatives on the North American wolverine, and presents concluding information based on three possible scenarios:

1. The current litigation is either not resolved at the time the NEPA analysis is released, or the court has upheld the USFWS decision not to list the wolverine under ESA. Under these circumstances, the wolverine would remain as a Regional Forester Sensitive Species.
2. The court has instructed the USFWS to further evaluate their decision not to list the wolverine under ESA and the species is returned to Proposed status until that determination is completed.

3. The USFWS is ordered by the court to list the wolverine as a Threatened species.

Wolverine is a solitary and highly mobile species that tends to inhabit remote areas and occurs at relatively low densities (Banci 1994). Wolverines range widely from subalpine talus slopes to big game winter ranges, occupying higher ranges in the summer and riparian habitats in the spring. Ruggiero et al (1999) found that wolverines used higher elevations in the snow-free season to avoid high temperatures and human activity. In the northern Rocky Mountains, wolverines make extensive use of coniferous forest (Hornocker and Hash 1981). While wolverines are generally regarded as wilderness animals, they may include clear-cut areas in their home ranges (Hornocker and Hash, 1981) and are reported to scavenge around northern Canadian communities (Banci 1994). Wolverines exhibit some fidelity to particular areas for months or years, however, the species is thought to have a flexible behavioral system under changing environmental conditions (e.g., food supply), that supersedes boundary considerations (Hatler 1989).

Wolverines are opportunistic feeders and consume a variety of foods depending on availability. They primarily scavenge carrion, but also prey on small mammals and birds, and eat fruits, berries and insects (USDI Fish and Wildlife Service 2010). In both Montana and Idaho, big game carrion appears to be the major food source with snowshoe hare, squirrels, and small mammals making up the rest of their diet (Hornocker and Hash 1981). Large mammal carrion is an important dietary component, particularly in winter when other prey is scarce (Banci 1994, Pasitschniak and Lariviere 1995) and they rely heavily on the presence of other predators. Wolverines will also search for caches made by itself, other wolverines, or other carnivores during the winter.

Female wolverines use two kinds of dens for reproduction. They use natal (birthing) dens to give birth and raise kits early postpartum, prior to weaning. These are excavated in snow and persistent, stable snow greater than 5 feet in depth appears to be a requirement because it provides security for offspring and buffers cold winter temperatures (USDI Fish and Wildlife Service 2013). In Montana, natal dens occur above 7,874 feet and are located on north aspects in avalanche debris typically in alpine habitats near timberline (USDI Fish and Wildlife Service 2013). Prior to weaning, females may move kits to one or multiple alternate den sites, referred to as maternal dens. The movement of kits from natal to maternal dens may be a response by the female to den disturbance, better food availability in the new location, predation risk, or deteriorating den conditions in the natal den (Magoun and Copeland 1998).

Post-weaning dens are called rendezvous sites. These dens may be used through early July. Females leave their kits at rendezvous sites while foraging, and return periodically to provide food for the kits. These sites are characterized by natural (unexcavated) cavities formed by large boulders, downed logs (avalanche debris), and snow (Inman et al. 2007). They may also occur in talus or coniferous riparian zones.

Wolverine home ranges are generally extremely large and the availability and distribution of food is likely the primary factor in determining wolverine movements and home range. Home ranges of adult wolverines range from less than 38.5 square miles to 348 square miles (USDI Fish and Wildlife Service 2010). Home ranges of adult males and females overlap extensively with the range of one male covering the ranges of two to six females, which is considered one reproductive unit.

Wittmer et al. (1998) suggested long-term conservation of wolverine can be achieved through maintenance of large, remote areas of habitat and engaging in management activities that do not decrease ungulate prey density.

Threats

Wolverines have few natural predators although both interspecific and intraspecific mortalities have been documented. Wolverines are susceptible to mortality through hunting and trapping and human caused

disturbances near den sites (Banci 1994, Hornocker and Hash 1981, Copeland 1996). The State of Montana contains most of the habitat and wolverines that exist in the current range of the DPS, and regulates trapping to reduce the impact of harvest on wolverine populations. Montana is the only state where wolverine trapping is still legal; however the wolverine trapping season is currently suspended.. Based on the best scientific and commercial information available, the USFWS concluded that that level of trapping (including incidental mortality) by itself, or even when combined with the likely effects of climate change, would not be a threat to the wolverine DPS (USDI Fish and Wildlife Service 2014).

In their proposed rule to list the wolverine as threatened (USDI Fish and Wildlife Service 2013), the USFWS concluded that the impacts of climate change constitute the primary threat to the DPS of the wolverine, and that the continued existence of the wolverine could be at risk. Other threats considered, but determined not to be threats to the wolverine DPS included (1) human use and disturbance, (2) dispersed recreational activities, (3) infrastructure development, (4) transportation corridors, and (5) land management. Little information exists regarding effects to wolverines from development or human disturbances associated with them. However, what little information does exist, suggests that wolverine can adjust to moderate habitat modification and human disturbance. The available scientific information does not indicate that potential impacts from activities such as land management, recreation, infrastructure development, and transportation corridors pose a threat to the wolverine DPS (USDI Fish and Wildlife Service 2013). After further consideration and with input from peer review, public comments, and the expert panel workshop, the USFWS withdrew their listing proposal and presented a new conclusion that impacts from climate change also do not pose a risk of extinction to the wolverine DPS (USDI Fish and Wildlife Service 2014).

North American Wolverine Project Area Habitat and Documentation

The Stonewall Project's combined analysis boundary is near the eastern extent of this species range in Montana (MNHP 2011). While foraging habitat is widespread in this area, denning, maternal, and dispersal habitat is restricted to more remote upper elevation lands with deep persistent snow in the northern half of the analysis area. Approximately 4,650 acres of maternal habitat and 8,560 acres of late snow persistence habitat occur within the project area. Both models reflect project area wolverine habitat as the southern extension of large block of habitat that largely occurs in the Scapegoat Wilderness to the north.

Generally, much of the southern half of the analysis area is located at lower elevations; contains less persistent snow cover; is more heavily roaded; and is characterized by year-round human presence. As a result, these lands do not provide preferred den or dispersal habitat.

The project area and combined analysis area do contain both historical and more recent documentation (Montana NHP 2013) of wolverine occurrence, although no den sites are known to occur in the area. Recent tracking surveys have also documented winter use south in the Dalton Mountain area and within lands affected by the 2003 Snow Talon Fire in the Copper Creek drainage (Wild Things Unlimited 2011 and 2012).

Since 2003, over 23,000 acres of wildfire have burned approximately 5,990 acres of maternal habitat based on the Inman et al (2013) model and 7,720 acres of habitat based on the Copeland et al (2009) late snow persistence model for years 1-7.

Gray Wolf

Methodologies and Process

Wolves are considered highly productive habitat generalists (MFWP 2011a), therefore, risks include primarily a reduction in prey (deer and elk), or mortality associated with increased human interaction and tolerance. There are no known den or rendezvous sites within the Stonewall project area, therefore, wolf habitat for this analysis is evaluated by looking at changes in primary prey species and foraging, the availability of remote and dispersal habitat and the amount of and changes in human access.

Elk are considered a primary prey species for wolves, as a result, the analysis of wolf habitat parallels that of elk. Direct and indirect effects are evaluated across the project area, whereas cumulative effects are evaluated across the combined boundary.

Species Status and Biology

The population distribution, life history, habitat status and recovery objectives for the gray wolf are summarized in the recovery plan (USDI Fish and Wildlife Service 1987). The legal status of a wolf under the ESA is tied to its location rather than its point of origin. In Montana, wolves are part of the Northern Rocky Mountain Gray Wolf Distinct population Segment (DPS) and have achieved biological recovery under ESA. Consequently on May 5, 2011, wolves that are part of the DPS segment encompassing Idaho, Montana and parts of Oregon, Washington and Utah were delisted under ESA. As a result, the gray wolf is evaluated as a Regionally Sensitive Species.

Gray wolves are the largest wild members of the dog family (*Canidae*), and typically prey on medium and large mammals. Prey species in the Rockies include white-tailed and mule deer, moose, elk, woodland caribou, bighorn sheep, mountain goat, beaver, and snowshoe hare, with small mammals, birds, and large invertebrates sometimes being taken (USDI Fish and Wildlife Service 2003a). Opportunistic feeders, they will also prey on carrion when it is available. Habitat can include forests of all types, rangelands, brush land, steppes, agricultural lands, wetlands, deserts, tundra, and barren ground areas.

The gray wolf is territorial in most areas. Territories are defended by howling, scent-marking, and physical defense against wolf interlopers. Territories typically range from 20 mi2 to 214 mi2 (Mech 1970 in Tucker 1988, Peterson 1977 in Tucker 1988). Daily pack movements vary and distances traveled are greater in winter than in summer. Lone wolves cover larger areas than packs and their use areas may overlap two or three pack territories (Mech 1973 in Tucker 1988, Fritts and Mech 1981 in Tucker 1988).

Wolves tend to be most active in the early or late evening and travel within their territories at night. Patterns of activity are influenced by weather and season of year. While wolves are generally not considered migratory, they may wander great distances daily, within their home range, predominantly influenced by searching for prey. When reproduction increases population numbers within an area, young adult wolves may disperse to new areas. Wolves may establish “runways” by following the same routes within territories. Vegetative cover affects wolf survival by providing shelter for prey species such as deer and elk, and in general, healthy wolves need little cover (Mech 1970 as cited in Tucker 1988).

Wolf dens are used for bearing and protecting pups, and are often abandoned when pups reach 2 months of age. The same den may be used year after year, or different dens may be selected. Pups are sometimes moved from one den to another. Dens may be holes dug in the ground, rock caves and crevices, old beaver lodges, and hollow logs or other ground debris. Den sites are typically located near water, dug in sandy and well-drained soils, and located in a variety of landforms (Mech 1970 as cited in Tucker 1988 and Fritts 1982 in Tucker 1988).

Wolves are highly social animals requiring large areas to roam and feed. Key components of wolf habitat include; (1) sufficient, year-round prey base of big game and alternate prey, (2) suitable and somewhat secluded denning and rendezvous sites, and (3) sufficient space with minimal exposure to humans (USDI Fish and Wildlife Service 1987).

Gray Wolf Project Area Habitat and Documentation

Wolf habitat within the project area is variable, with more marginal denning habitat occurring in much of the southern portion of the project area due to the density of roads and proximity to human activity. More remote habitat conditions preferred for denning occur in the headwaters of the Lincoln Gulch, Klondike, Yukon and Park Creek drainages.

Wolf occurrences have consistently been documented in and around the project area for several years. Most of the occurrences were believed to be those of transient individuals. In the winter of 2008/2009 a pack was verified in the Marcum Mountain area less than 10 miles from the project area. This pack was known to use the Arrastra Creek area, and suspected in the Patterson Prairie area adjacent to the project area. There have not been recent accounts of the pack however; so it is currently not known if they are still established in the area.

There are no known den or rendezvous sites within the project or combined areas, although individuals from the Arrastra and Alice Creek packs have been documented within or immediately adjacent to the combined boundary. Also the Landers Fork pack utilizes private and adjacent NFS lands to the southeast. In general, management for wolves is best achieved by maintaining adequate habitat for big game species to provide sufficient prey for wolves and by minimizing wolf/human interactions. Predation of ungulates (i.e., deer and elk) by wolves as well as other predators has been high and MFWP is proposing actions to moderate both wolf and mountain lion densities in the vicinity of the project area (Kolbe 2012).

Fisher

Methodology and Process

Fisher were initially evaluated using the habitat estimates for maintaining viable populations of the Northern Goshawk, Black-backed woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten and Fisher (Samson 2006b), as described in the criteria for wildlife models, Helena National Forest (USDA Forest Service 2009a). Habitat was based on data that estimated anticipated MBP mortality and was identified as summer and winter habitat, based on canopy closure and tree size class.

Region 1 revised the fisher model in 2012 (USDA Forest Service 2012f). This effort was based on information from published scientific literature on fishers, especially studies from the Northern Rockies, and on previous habitat modeling efforts by Samson (2006a) and Hills and Lockman (2003). This model identifies two types of habitat including, (1) resting/denning/foraging habitat that includes moist, mesic forests with dense canopies in mid- to late-successional stages, providing the full suite of fisher life history needs, and (2) other foraging habitat or moist, mesic forests with dense canopies including younger successional stages providing foraging opportunities (USDA Forest Service 2012f).

Specific parameters in the revised model include; (1) potential climax vegetation preferred by fishers, (2) a minimum canopy closure of 40 percent, (3) tree size class including trees greater than 10 inches d.b.h. for resting/denning/foraging habitat and trees up to 9.9 inches d.b.h. for other foraging habitat and (4) a maximum elevation of 6,500 feet. Small isolated habitat less than 160 acres in size or greater than 600 feet from the nearest existing habitat was eliminated. Habitat estimates from the updated model identified a total of approximately 4,400 acres of widely scattered habitat across mid- to low elevations within the project area.

Both models used R1VMAP data and considered changes in habitat due to recent wildfires, The models differed somewhat in that the revised model identified some large blocks of low elevation den/rest/forging habitat in areas where there has been concentrated MPB mortality. So while the revised model (Buhl 2015) is used to identify fisher habitat, based on field observation in the project area and estimates of future mortality, it is expected that some lands currently identified as suitable fisher habitat would fall below 40 percent canopy closure in the next 5 to 10 years, making these areas marginally suitable or unsuitable.

Fisher tend to select habitat based on structural conditions, therefore, fisher habitat is also evaluated by looking at availability and changes to horizontal (landscape) and vertical (site level) structure, including downed woody debris and large snag availability. Changes to suitable riparian habitat are also assessed because of strong support in the literature for the association of fishers within riparian habitat (USDA Forest Service 2012f).

Management recommendations for fisher include; (1) conservation of 20 percent late-successional forest at low to mid-elevations, (2) maintenance of riparian corridors for use by individuals and populations, (3) maintenance of links between populations and, (4) management of trapping pressure (e.g., facilitated by road access) (Wittmer et al. 1998).

Direct and indirect effects to fisher are evaluated across the project area (24,000 acres), which is large enough to evaluate landscape-level effects at the home range scale. However, in order to evaluate landscape-level influences across all ownerships and assess impacts from recent wildfire, cumulative effects are evaluated on the combined boundary, which exceeds 100,000 acres.

Species Status and Biology

The State rank for the fisher is S3 (MFWP 2011a), and although they are a Montana State species of concern, they are also classified as a furbearer. As a result it is legally trapped under a limited quota system, allowing for take of seven individuals statewide. Presumed extirpated by the 1920s, until recently, fisher populations in Region 1 were thought to be derived from re-introductions that occurred from populations in B.C., Canada, and Minnesota in the 1960s and late 1980s (Vinkey 2003). Genetic testing of fisher in western Montana indicates that statewide individuals are part of the original population that existed prior to any reintroductions (Vinkey 2003).

The home range of fishers varies in size from 4 to 32 square miles; but the average for a female fisher is expected to be about 15 square miles (Jones et al 1991). Optimum habitat is thought to include mature, moist coniferous forest with a woody debris component, particularly in riparian/forest ecozones in low- to mid-elevation areas that do not accumulate large amounts of snow (Heinemeyer 1993; Ruggiero et al. 1994). A review of fisher research suggests the species uses a diversity of tree age and size class distributions at the patch or stand level that provides sufficient overhead cover (either tree or shrub). Banci (1989) believes the best fisher habitats are multi-aged stands interspersed with small openings containing riparian habitats. Fisher feed on snowshoe hares, porcupines, carrion, squirrels, small mammals and birds (Banci 1989; Powell and Zielinski 1994 in Ruggiero et al. 1994). This diverse diet makes them less vulnerable to shifts in prey abundance than lynx and other predators that rely heavily on one or two prey species.

Like marten, fishers avoid large openings (parks, meadows, early seral clearcuts, and burns). Also like other forest carnivores, fishers maintain relatively low population densities and range widely in search of prey and key habitat sites (structurally complex forest) (Banci 1994). Because of their aversion to openings, they seek out forested connections between the key habitats in which they focus activity (Banci 1994). These connecting habitats may consist of a variety of forest formations and seral stages and do not

necessarily exhibit the complex structure and prey density of their preferred habitat sites (Heinemeyer and Jones 1994).

Fishers are strongly associated with riparian zones (Jones 1991, Heinmeyer and Jones 1994, Ruggiero et al. 1994). Jones et al. (1991) found that 80 percent of fisher relocations were within 300 feet of a riparian zone or wet area, and in Montana, fishers were found to prefer areas within 600 feet of water (Heinemeyer and Jones 1994). Many have documented that riparian corridors are used extensively as travel corridors (Heinemeyer and Jones 1994), and Jones (1991) suggests that preferred resting habitat and prey are likely more available within forested riparian areas.

Fishers appear to select structure rather than forest type—vertical and horizontal complexity, down woody debris, light gaps, and overhead cover. Fishers need structure that leads to high diversity of dense prey populations, as well as desired structure at dense and resting sites (Ruggiero et al. 1994). They also appear to be associated with areas of low snow accumulation—flat areas and bottoms—and avoid mid slopes (Ruggiero et al. 1994).

Dense coniferous and mixed coniferous/deciduous forests are preferred and this species is always found in or near forests with continuous overhead cover. Fisher prefers forests with high canopy closure (greater than 80 percent) and avoid areas with low canopy closure (less than 50 percent). Forest stands with low canopy closure were used only if they were adjacent to areas with dense cover (USDI Fish and Wildlife Service 1983). Documented den sites have occurred in cavities of live and dead trees in forested areas with some structural diversity (i.e., forb/shrub cover, down wood and multiple canopy layers) that maintain a diversity of prey species (Ruggiero et al. 1994). Young are born in early March to mid-April (NatureServe 2011).

Region 1 forests contain a total of 4,239,280 acres and 1,882,031 acres of rest/den/foraging and other foraging habitat respectively. As a result regionwide, available fisher habitat is well above any of the minimum threshold amounts reported by Smallwood (1999) or Samson (2006a) and fisher habitat is abundant to support a viable population of fishers. Of the available habitat regionwide, the Helena National Forest contains approximately 4 percent or 230,381 acres of habitat (USDA Forest Service 2012f).

Fisher Project Area Habitat and Documentation

The Stonewall Project area is near the southeastern extent of this species range in Montana. While fisher were not detected during recent (since 2004) surveys within the project area in the Beaver Creek drainage, they were recently documented in the Arrastra drainage west of the cumulative effects boundary (USDA Forest Service 2012f, MNHP 2013), as well as on lands to the south.

Alteration of forest structure due to natural or human-caused disturbances can adversely affect habitat for fisher. For example, while a pulse of logs on the ground due to fire or insect and epidemics can provide denning structures and cover, these areas would likely be avoided if the canopy cover is less than 40 percent. Because of recent MPB mortality, canopy closure and suitable fisher habitat has been reduced, particularly on low elevation lands that contain a predominance of lodgepole pine. Conversely, this mortality has increased the amount of standing dead and DWD available providing the structural conditions preferred by fisher. Using the revised Region 1 model parameters described in the methodology section, potential fisher habitat currently occurs on approximately 4,400 acres or 18 percent of the project area, which is within the historic range of variability for fisher on the Helena National Forest of 13.1 to 18.4 (Hills and Lockman 2003).

The best available science was used in identifying potential fisher habitat for this analysis, which indicates that older forests less than 6,300 feet in elevation within 300 feet of perennial riparian features

provide key habitat for resting and denning (Hills and Lockman 2003). Within the project area, there are approximately 400 acres of mature, older forest within 300 feet of a stream. Connectivity of fisher habitat is variable (see figure 83). Lands in the eastern third of the project have the largest amount of and most connected riparian and upland habitat, whereas connectivity is reduced in the lower Beaver Creek and Lincoln Gulch drainages, due to the dryer site conditions and larger lodgepole pine component.

Samson (2006b) determined that approximately 74,378 acres of habitat (summer and winter) would be needed to maintain minimum viabable populations of fishers in the Northern Region. Currently, based on FIA data, there are 199,905 acres of fisher habitat (summer and winter) on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

Townsend's Big-Eared Bat

Methodology and Process

Data presented on Townsend's big-eared bat are based on available research and surveys from Montana (Hendricks and Maxell 2005; MNHP 2011; USDA Forest Service 2011c). The project area lacks suitable hibernacula, so effects to this species are evaluated by looking at the availability of, and changes to, foraging habitat. Since this species would be most affected by the structural changes from proposed treatment (i.e., understory and overstory conditions), direct, indirect and cumulative effects are evaluated across the project area. This area is also large enough to evaluate landscape-level changes in habitat.

Species Status and Biology

A year-round resident, the State rank for the Townsend's big-eared bat is S2 (MNHP 2011). It is considered at risk because of very limited and potentially declining population numbers, range or habitat, making it vulnerable to extirpation in the state.

The Townsend's big-eared bat has been documented throughout most of Montana, with the exception of the far northeastern corner of the state. They are found at elevations between 1,968 and 7,820 feet. Townsend's big-eared bats are generally found at low densities across occupied habitats, and Montana is no exception. Only five maternity colonies have been located, ranging in size from less than 20 adult females to an estimated 50-75. The best-known colony is at Lewis and Clark Caverns State Park (approximately 125 miles from the project area), although less than 30 hibernacula have been located, most with just a few hibernating bats (MFWP 2006).

Townsend's big-eared bats are found in mesic to dry conifer forests, ponderosa pine and limber pine woodlands, juniper, mountain mahogany, riparian, and shrub-steppe habitats where suitable roost sites are present. Studies in other states indicate that Townsend's big-eared bats also forage over wetlands and agricultural areas. Caves and abandoned mines are the primary roost sites through most of the range, although buildings have been used by maternity colonies in the northern, cooler portions of the range. In Montana, four maternity colonies are in natural caves and one is in an abandoned mine (MFWP 2011a).

The Townsend's big-eared bat is a moth specialist with over 90 percent of its diet composed of moths. They forage in edge habitats along streams and woodlands, and within a variety of woodland types. They can travel long distances while foraging, including movements of over 90 miles during a single evening (WBWG 2005).

Townsend's big-eared bats feed on various nocturnal flying insects near the foliage of trees and shrubs, but appear to specialize primarily on small moths. There are reports of gleaning insects from foliage, but most are captured in the air.

Townsend's Big-Eared Bat Project Area Habitat and Documentation

While the project area does not contain caves suitable for hibernacula or maternity colonies, Townsend's big eared bats have been documented from Powell County approximately 30 miles southeast of the project area (USDA Forest Service 2011c). Also suitable foraging habitat occurs at lower elevations. So while the project area lacks hibernacula and roost sites, considering the long distances this species can travel in a single night (WBWG 2005), it is possible that portions of the project area could be utilized for foraging.

Bald Eagle

Methodology and Analysis Area

A bald eagle nest was recently documented south of the project area, therefore, the analysis addresses the availability of, and changes to eagle nest, roost and foraging habitat. Information used includes forest- and district-wide nest observations, state monitoring data and information provided in the Montana Natural Heritage website (MNHP 2011). Potential effects and identification of pdfs (WL-29, 30) were based largely on the 2007 National Bald Eagle Management Guidelines (USDI Fish and Wildlife Service 2007a).

The combined boundary includes the Beaver Creek eagle nest, as well as foraging habitat along the Blackfoot River, therefore, this area was used to evaluate direct, indirect and cumulative effects.

Species Status and Biology

Until recently the bald eagle was listed as Federally Threatened under the Endangered Species Act. However effective August 8th, 2007, the U.S. Fish and Wildlife Service officially delisted the bald eagle and this species has been added to the Northern Region (R1) sensitive species list. The Forest Service would continue to follow management direction outlined in the Montana Bald Eagle Recovery Plan (USDI-BOC 1994) and this species is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The State rank for the bald eagle is S3, and although it may be abundant in some areas, it is potentially at risk because of limited or decline in numbers, range or habitat.

Bald eagles are associated with large bodies of water and major river drainages, which provide most of their foraging opportunities. Wintering habitat may include upland sites, and nesting areas are generally located within larger forested areas near lakes and rivers. In Montana, bald eagles nest in stands containing large trees (greater than 30 inches d.b.h.) with uneven canopy structure, and in direct line of sight of a river or lake generally less than 1-mile away (MFWP 2011a). Nest site selection is dependent upon maximum food availability and minimum disturbance from human activity. Eagles are opportunistic feeders, preying on fish, waterfowl, small mammals and carrion (MNHP 2011). During migration and at wintering sites, eagles tend to concentrate on locally abundant food and often roost communally.

General objectives of habitat management for bald eagles in Montana include; maintaining prey bases; maintaining forest stands currently used for nesting, roosting, and foraging; maintaining potential nest habitat; and minimizing disturbances in nesting territories, communal roosts and at feeding sites (MFWP 2011a).

Bald Eagle Project Area Habitat and Documentation

A new eagle nest was documented in 2011 on private land, approximately 1.5 miles south of the project area in lower Beaver Creek drainage. Also, suitable eagle nest habitat occurs on private and NFS lands within approximately 1 mile of the Blackfoot River. The combined boundary contains approximately 14 miles of suitable foraging/roost habitat along the Blackfoot River, as well as foraging habitat along

approximately 25 miles of lower elevation streams in the Beaver Creek, Keep Cool, Lincoln Gulch and Landers Fork drainages.

Black-Backed Woodpecker

Methodology and Analysis Area

The analysis for the black-backed woodpecker (BBW) is based on the northern region model developed by Samson (2006a, 2006b), and the BBW Northern Region Overview (USDA Forest Service 2007c), whereas information from R1-VMAP was used to identify potentially suitable habitat. Also habitat quality is based on work by Russell et al. (2007) and Dudley and Saab (2007), who define "high quality post fire BBW habitat as having the following attributes: a large pre-fire patch size (approximately 200 acres), moderate to high pre-fire canopy cover (40 to 100 percent) and moderate to high burn severity. Data used to evaluate effects to habitat are based on the Black-backed Woodpecker Northern Region Overview – Key Findings and Project Considerations (USDA Forest Service 2007c).

Because BBWs appear to be strongly dependent upon 1- to 6-year-old burns (Hutto 1995; Caton 1996; Hitchcock 1996; Saab et al. 2004), and considering that the combined boundary contains over 20,000 acres of recently burned forest, this area was used to evaluate existing habitat, as well as assess direct, indirect and cumulative effects.

Species Status and Biology

Although the BBW is considered secure with a Global Rank of G5, in Montana it is a species of special concern with a rank of S3 (MNHP 2011). Black-backed woodpeckers are a resident species of Montana, and observations in the State indicate that this species normally does not move outside of its breeding range in the winter (Montana Natural Heritage 2011).

The BBW is considered opportunistic and responds to outbreaks of wood-boring beetles (*Cerambycidae* and *Buprestidae*) and bark beetles (mountain pine bark beetles, *Dendroctus* spp.) in conifer forests following windfall, disease, or fire (Samson 2006a). In the Northern Region the BBW is known to use three types of forest habitat including; (1) post-fire areas, (2) areas with extensive bark beetle outbreaks causing widespread tree mortality, and (3) landscapes with a natural range of disturbances resulting from fire and insect use (Samson 2006a).

Research has shown that use of post-fire habitat is temporary and that beetle foraging woodpeckers like the BBW rapidly colonize stand-replacing burns within 1 to 2 years after the fire (Saab et al. 2007). However the favorable effects of fire are not long-lasting, and population levels of both the bark beetle and wood-boring beetle drop within 4 to 8 years after a fire depending on location (Werner and Post 1985 *in* Samson 2006a). This decline results in reduced densities within 5 years post-fire, after which beetle foraging woodpeckers such as the BBW are considered rare (Saab et al. 2007).

Even though many studies have shown BBWs to primarily use post fire habitat (Hitchcox 1996; Caton 1996, Hejl and McFadzen 2000, Powell 2000, Kotliar et al. 2002 *in* USDA Forest Service 2007c), some studies have found these woodpeckers in areas without recent fire. For example, both Bonnot (2006 *in* USDA Forest Service 2007c) and Goggans et al. (1988 *in* USDA Forest Service 2007c) found BBWs within extensive mountain pine beetle outbreaks that occurred in the absence of fires.

In an effort to document the use of BBW in beetle-killed areas, in 2006 the Avian Science Center and Region 1 (2006c) focused survey efforts for BBWs in beetle outbreak areas (Avian Science Center 2006b). Survey areas were located on the Lolo, Bitterroot, Helena, Beaverhead-Deerlodge and Nez Perce NFs, and 428 point counts were conducted. No BBW were found in beetle outbreak areas during these

point counts in Montana. There were two detections of BBW on the Nez Perce NF in Idaho, which gave a detection rate of BBW at 0.46 percent of the points in beetle outbreak areas. A concurrent survey of post-fire areas had a detection rate of BBW at 7.1 percent of the points.

Even though few BBW were located in bark beetle-infested stands in Region 1, these stands may still provide some secondary habitat. Samson (2006b) estimated that 29,405 acres of habitat are needed to maintain a viable population of BBWs across Region 1. Dead and dying trees resulting primarily from MPB are widespread across the Helena National Forest. Even though these dead trees do not provide the abundant food source that post-fire stands produce, this bark beetle habitat alone greatly exceeds the amount of habitat that Samson (2006b) estimated was needed to maintain BBW viability across the entire region.

Suitable post-fire BBW habitat currently occurs on over 200,000 acres of the Helena National Forest. Of this, almost 23,000 acres occur within or immediately adjacent to the Stonewall Project area. While some of these lands have been salvaged, considering the availability of burned habitat regionwide, adequate habitat exists across the landscape to maintain viable BBW populations (Samson 2006a).

Black-Backed Woodpecker Project Area Habitat and Documentation

Black-backed woodpeckers have been observed in the Snow Talon Fire area that contains approximately 22,800 acres of post-fire high-quality BBW habitat, as defined by Russell et al. (2007). In addition, lower quality foraging habitat exists in concentrated areas of MPB mortality, including over 2,000 acres that have experienced tree mortality of 40 or greater trees per acre (Amell and Klug 2015). As a result, and considering that BBWs have been documented adjacent Snow Talon Fire area, the Stonewall Project area is used by this species.

Flammulated Owl

Methodology and Analysis Area

Flammulated owl documentation is based on data derived from the Montana Natural Heritage Database (2011), and the USDA Forest Service Natural Resource Management Wildlife Database (2011c). Habitat is based on information provided in “A Conservation Assessment of the Northern Goshawk, Black-backed woodpecker, Flammulated Owl and Pileated Woodpecker in the Northern Region, USDA Forest Service” (Samson 2006a), “Habitat Estimates for Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten and Fisher” (Samson 2006b), and “Criteria for Wildlife Models Helena National Forest” (USDA Forest Service 2009a).

Habitat estimates and maps are derived from R1-VMAP, R1-Summary Database and Helena National Forest Summary Database. Methodologies and assumptions associated with this data are described in “Region One Vegetation Council Classification Algorithms” (USDA Forest Service 2006a) , “R1 Grid Intensification using CSE Protocols – Field Procedures” (USDA Forest Service 2007d), “R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System” (USDA Forest Service 2007e), and “FIA Field Guides, Methods, and Procedures” (available at http://fia.fs.fed.us/library/field-guides-methods-proc/).

This species relies heavily on site-specific structural conditions that may be affected by treatment or lack of treatment. As a result, and considering that this area is large enough to evaluate landscape-level conditions that may affect use, direct and indirect effects are evaluated across the project area. However, because flammulated owl have been recently documented within and adjacent to the combined area, this analysis area is used for cumulative effects.

Species Status and Biology

The flammulated owl has a conservation status rank of G4 (NatureServe 2011) and this species is considered uncommon, but usually widespread. The Montana Partner in Flight (PIF) Plan (2000) considers the flammulated owl a Priority Level 1 species; or a species in which Montana has a clear obligation to implement conservation action (PIF 2000).

The flammulated owl is poorly monitored in Montana, but known to have a preference for open, dry forest conditions. It is considered a species potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some areas. It has a state rank of S3 (breeding) (MNHP 2011).

Flammulated owls are a common raptor of the montane forests of the western United States. They primarily forage on insects, especially moths and beetles (McCallum 1994). They forage by “hawking” which consists of the bird perching on a branch at the lower portion of the forest canopy and waiting for a moth to fly by, or a grasshopper to walk by (Wright 1996). Such foraging behavior is presumably facilitated by the open, park-like conditions typical of ponderosa pine forests. Home range size varies on average from approximately 35 acres in Colorado (Linkhart et al.1998) to 40 acres in Oregon (Goggans 1985).

Flammulated owls are seasonal migrants that occupy home ranges in the northern Rocky Mountains during spring, summer, and early fall. They are strongly associated with ponderosa pine forests during breeding and prefer open, single-storied stand structures for foraging (PIF 2000). The Montana PIF Plan (PIF 2000) considers this species to be associated with forests of dry ponderosa pine and Douglas-fir with open understories, largely covered with grasses and a few shrubs or small clumps of regenerating trees. The flammulated owl subsists nearly exclusively on insects, especially moths and beetles, and forages in the tree canopy and on the ground (Samson 2006a). Linkhart et al. 1998 *in* Samson 2006a) reported a mean territory size of between 27 and 45 acres.

A study by Wright (1992) in the Bitterroot Valley concluded that this species selects for microhabitat features such as large trees and snags, but only within an appropriate landscape context. Flammulated owls were not present unless the larger landscape consisted of open understory ponderosa pine/Douglas-fir forests, and then only where grassland or xeric shrubland openings were present at a home-range scale. Flammulated owls appear to avoid clear cuts and intensively cutover areas, but they would use thinned or selectively logged stands.

Samson (2006a) estimated flammulated owl breeding habitat available in each national forest in R1. These models were then used to query the FIA database, resulting in statistically reliable habitat estimates by national forest. Results indicate that breeding habitat is well distributed regionwide. Although a modest decline in ponderosa pine from 1942 to present has been reported in 9 of 12 national forests, Douglas-fir has increased in abundance more substantially, suggesting an overall increase in habitat for the owl.

Although dry ponderosa pine and Douglas-fir habitat are naturally limited on the HNF (Samson 2006b); FIA estimates prior to the MPB epidemic show flammulated owl habitat exists on approximately 8,000 acres of the HNF, which is 1.7 times the amount needed to maintain a minimum viable population regionwide.

Loss of large-diameter ponderosa pine and increasing stand densities from long-term fire exclusion, are major threats to flammulated owls (Hayward and Verner 1994). Wherever possible, management of dry forest sites should address the needs of flammulated owls by incorporating structural and component complexity at the microhabitat and home range scale in the form of suitable nest snags and trees, open,

mature vegetation around the nest site, small clearings, and roost sites in close proximity to each other (PIF 2000).

Flammulated Owl Project Area Habitat and Documentation

The presence of large diameter snags and open understory conditions make it likely that ponderosa pine/Douglas-fir stands that characterized the project area historically met the needs of flammulated owls. Over time preferred habitat conditions have declined due to decades of fire suppression and increased stand density resulting in closed-canopy conditions and smaller-diameter trees. The recent MPB epidemic has increased the availability of large-diameter ponderosa pine snags and opened the forest canopy, improving flammulated owl habitat; however, many of these stands are regenerating conifers, which may make these areas largely unsuitable in the next 20 to 30 years. Potential habitat has been modeled based on methods described above, and currently approximately 1,500 acres of suitable flammulated owl habitat are within the project area. While widely scattered, virtually all of this occurs as low-elevation bottomland and lower-slope ponderosa pine habitat.

While the project area does not provide high quality flammulated owl habitat, and the flammulated owl has not been documented within the project area, flammulated owls were documented in 2005 and 2008 at two locations within 5 miles of the project area, including two within the combined boundary (USDA Forest Service 2011c). Considering this documentation, the increased availability of large-diameter snags, the predominance of ponderosa pine/Douglas-fir at lower elevations, and presence of suitable habitat, it is likely the project is used for foraging, if not nesting.

Samson (2006b) determined that approximately 8,895 acres of habitat would be needed to maintain minimum viabable populations of flammulated owls in the Northern Region. Currently, based on FIA data, there are 25,231 acres of flammulated owl habitat on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

Boreal (Western) Toad

Methodology and Analysis Area

Information presented on boreal toads is based on Werner et al. (2004), Maxwell et al. (2003), the heritage database (MNHP 2011) and USDA Forest Service (2011c).

Due to the small home range for this species, direct, indirect and cumulative effects are evaluated across the project area.

Species Status and Biology

This species has a global ranking of G4 and is apparently secure, although it may be quite rare in parts of its range. The State of Montana lists the boreal toad as a special concern species with a S2 ranking. As a result, statewide, the boreal toad is an at risk species because of very limited and/or potentially declining population numbers, range and/or habitat.

This toad is a subspecies of the western toad, *Bufo boreas*, which historically was widely distributed across the Pacific Northwest and Rocky Mountains. Adult boreal toads are largely terrestrial and are considered habitat generalists that use a variety of habitats. They generally breed in lakes, ponds and slow streams and roadside ditches, where they prefer shallow areas with mud bottoms (MNHP 2011). Egg laying usually takes place 1 to 3 months after the snow melts (Reichel and Flath 1995, Werner et al. 2004 *in* NatureServe 2011). These toads may wander miles from their breeding sites through coniferous forests and subalpine meadows, lakes, ponds and marshes (Werner et al. 2004). Generally boreal toads are active

during the day and night, with the active period generally running from April or May through October in Montana (MNHP 2011).

In Montana, this toad occurs in mountainous terrain on both sides of the continental divide. These toads were once common and widespread in western Montana, but they are now uncommon and few breeding populations were found in recent surveys on six national forests in the state (Werner et al. 2004). Declines have also been noted in adjacent states (Reichel and Flath 1995). There are no clear reasons for these declines, and possible causes range from acid rain, pesticides, parasites, ozone depletion, and habitat loss and climate change. Declines have even been noted in remote locations such as wilderness areas and national parks.

Primary risk factors include those that affect breeding and riparian habitat; including activities that result in the elimination of key riparian vegetation or that adversely affect water quality.

Boreal (Western) Toad Project Area Habitat and Documentation

Boreal toads have been documented at two locations within the project area including Reservoir Lake in the head of Beaver Creek, and at the confluence of Klondike and Beaver Creek. They have also been found at numerous locations within the combined area including Red Creek, several locations within Copper Creek and south of the project area on private land along Stonewall Creek. Numerous juveniles and tadpoles have also been documented at Snowbank Lake in 2004, a year after the Snow Talon fire (MNHP 2013). Potentially suitable breeding habitat is widespread and the project area contains approximately 30 acres of wetlands and open water habitat, and 66 miles of streams and numerous roadside ditches (MNHP 2011). As a result, project area riparian and upland habitat is utilized for both breeding and dispersal. .

Management Indicator Species

Management indicator species (MIS) are used in concert with other indicators to gauge the effects of management on wildlife habitat. Management indicator species represent groups of wildlife associated with similar vegetative communities or key habitat components. In general, the MIS approach is used to reduce the complexity of discussing all the wildlife species on the Forest. Evaluating the effects of management practices on selected MIS and their habitat also displays the effects of alternatives on the ecological communities they represent and helps to ensure that biodiversity is maintained. Forest MIS include the northern goshawk, pileated woodpecker, hairy woodpecker, and American marten. The following is a summary of habitat conditions for Helena National Forest MIS that have been documented and either occur or are likely to occur within the project area.

Methodology and Analysis Area

The Helena Forest Plan provides specific direction related to providing for and managing old-growth habitat, which is described below. Old growth definitions are based on Green et al. (2005 errata). More detailed information can be found in the Forest Plan (USDA Forest Service 1986).

The National Forest Management Act (1976) and Forest Service direction prescribe an ecological approach to old growth that considers it important to biological diversity (Green et al. 2005 errata). The Helena National Forest Plan (USDA Forest Service 1986) also recognizes old growth as an important forest component and 5 percent of each 3rd-order drainage is to be managed for old growth. All stands meeting old growth definitions (as defined by Greene et. al. 2005 errata) are designated old growth. If this amount does not constitute at least 5 percent of each 3rd-order drainage than additional stands would be designated.

The Stonewall Old Growth and Snag Report (Amell and Higgins 2014) summarizes the Forest process related to old growth, and identifies the steps used in designating old growth within 3rd-order drainages, as well as identification of lands outside drainages that are managed as old growth.

The analysis boundaries used to evaluate old-growth habitat and effects to old-growth-dependent species vary and are described under the specific species sections.

Existing Old Growth

Following the process identified in the project old growth report, 5 percent of each 3rd-order drainage was designated as old growth. Additionally, because over half of the project area occurs outside of the 3rd-order drainages, and to better identify old growth across the landscape, lands to be managed as old growth outside of 3rd-order drainages were also identified. Therefore, the project area contains 592 acres of designated old growth within 3rd-order drainages, as well as 175 acres of verified old growth and 436 acres of potential old growth on NFS lands outside of the 3rd-order drainages. These lands are summarized by analysis area in table 75 and displayed in figure 72.

Table 75. Existing project area old growth

Old Growth by Analysis Area	Acres
Project Area	
Designated old growth	592
Other old growth[1]	611
Total old growth	*1,203*
Cumulative Effect Boundary	
Designated old growth	1,415
Other old growth	611
Total old growth	*2,026*

1 – meets the old growth definition identified by Green et.al. 2005, 2007, 2008 errata

Designated old growth is widely scattered across the cumulative effects analysis area and includes one block greater than 100 acres (112 acres), eight blocks between 50 and 100 acres and 28 blocks less than 50 acres. Also all of the project area old growth occurs in the western half of the area in the headwaters of Beaver Creek and Lincoln Gulch. Old growth MIS include northern goshawk and pileated woodpecker. The following is a discussion of the status, biology and project area habitat for each species.

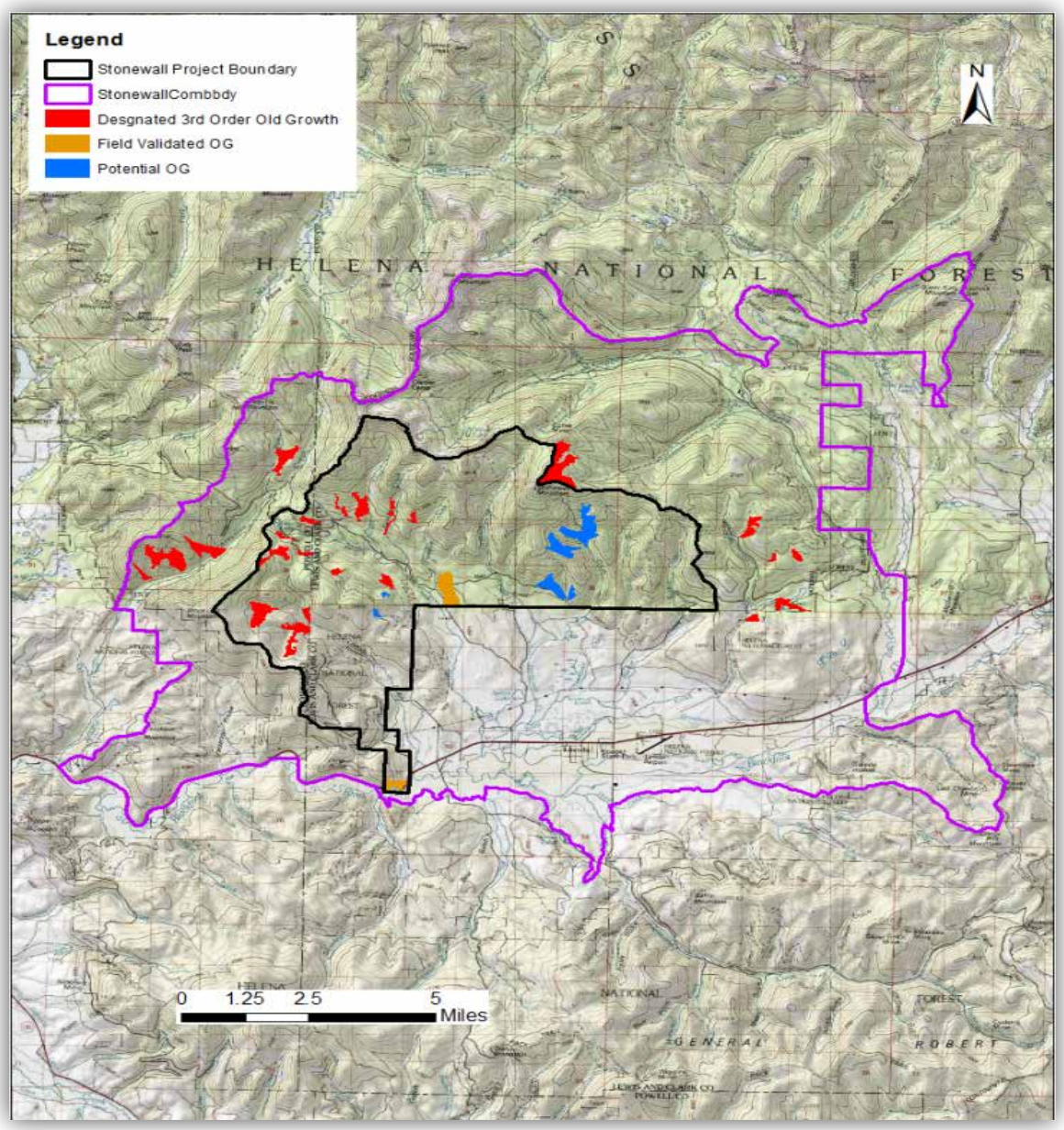


Figure 72. Project and Combined Boundary Old Growth

Northern Goshawk

Methodology and Analysis Area

Documented use is based on Forest and District observation and monitoring data, the Heritage Database (MNHP 2011) and the USDA Forest Service NRM Database (USDA Forest Service 2011c). Habitat information is based largely on the Northern Region Model (Samson 2006a) and Conservation Assessment (Samson 2006b) for this species, as well as information provided in USDA Forest Service 2006b, USDA Forest Service 2007e, USDA Forest Service 2009c and "Criteria of Wildlife Models on the Helena National Forest" (USDA Forest Service 2009a). Effects are evaluated by looking at changes in

nesting, foraging and post-fledgling habitat (Samson 2006a, b) and the "Northern Region Overview: Key Findings and Project Considerations" (USDA Forest Service 2009c).

Recent MPB mortality has reduced canopy closure in much of the project area, so goshawk habitat in the project and cumulative effects areas are based on R1-Vmap values using MPB post-kill data. Modeled habitat includes nest habitat, or dominant tree types include Douglas-fir, ponderosa pine, lodgepole pine, aspen, and mixed stands with tree sizes greater than 10 inches in diameter and canopy cover greater or equal to 25 percent, and foraging habitat, or dominant tree types include Douglas-fir, ponderosa pine, lodgepole pine, aspen and mixed stands with greater than or equal to 40 percent canopy closure. Diversity matrices are also used to describe foraging habitat and the post-fledgling area (PFA) (USDA Forest Service 2009c). Samson (2006a) and (USDA Forest Service 2009c) provide a detailed rationale on the basis for these structural characteristics used to describe goshawk habitat.

All recent goshawk nesting occurs within the project area, which provides adequate habitat for the home range of existing nests, therefore, direct and indirect effects are evaluated across the project area. The combined boundary was used to assess cumulative effects because historical use occurred within the combined boundary, and this area includes impacts from recent wildfire as well as private land influences.

Species and Population Status

The northern goshawk has a conservation status rank of G5 (NatureServe 2011) and this species is considered globally secure (common; widespread and abundant). In Montana it is identified as a species of special concern with an S3 ranking (MNHP 2011). The Montana PIF Conservation Plan identifies the northern goshawk as a priority II species or a species that the State is responsible for monitoring regarding status and conservation actions (PIF 2000).

The North American Breeding Bird Survey (BBS) indicates that northern goshawk trends have been increasing since 2002 for the northern Rockies Region, which extends from Wyoming into southerly portions of Canada (Available at: http://www.mbr-pwrc.usgs.gov/bbs/bbs.html). Data specific to Montana indicate that goshawk trends have been declining since 1966. However Anderson et al. (2005 p. 7) concludes that BBS data are inadequate to estimate population trends for goshawks because the number of routes where goshawks are detected and the encounter rate of goshawks are too low.

Some authors have hypothesized that goshawk populations may be declining (Bloom et al. 1986 *in* Anderson et al. 2005; Zinn and Tibbits 1990 *in* Squires and Kennedy 2006). Hoffman and Smith (2003) analyzed migration data and concluded that uncertainty exists as to the status of western goshawk populations, and Kennedy (1997) and Anderson et al. (2005) concluded that current sampling techniques may be inadequate to determine if goshawk populations are declining, increasing or stable. Finally Squires and Kennedy (2006) conclude that this difficulty is due to several factors, including that goshawks are secretive and difficult to survey and that many studies have small sample sizes.

The most recent petition for listing the goshawk under ESA occurred in 1997. After a formal 12-month review by a scientific committee, the USFWS determined that listing under ESA was not warranted. Analysis of data from 17 states comprising 222 million acres indicated "that the goshawk population is well distributed and stable at the broadest scale."

Until June 2007, the northern goshawk was listed as a Region 1 sensitive species. However, regional studies demonstrated that (1) habitat exists to support reproductive individuals on each forest, (2) habitat is well distributed, and (3) individual goshawks can interact with one another across the region; hence, the goshawk did not meet the sensitive species criteria in FSM 2670.5 and was removed from the R1 sensitive species list. Although the goshawk is no longer a sensitive species, on the HNF the goshawk is considered an MIS and analysis of goshawks and their habitat are assessed at the project and forest levels.

Species Biology

Goshawks are the only large diurnal raptor adapted to interior forest environments in the northern Rockies. Key elements of goshawk habitat are extensive blocks of mature forest with groups of large nesting trees, abundant prey (squirrels, grouse, hares, larger songbirds), and mid-level flyways. Goshawks are most commonly associated with mature and old-growth Douglas-fir and ponderosa pine forest. However, surveys over the past 15 years on the Helena, Beaverhead-Deerlodge, Lewis and Clark, and Medicine Bow National Forests have found that goshawks make extensive use of lodgepole pine stands as long as the basic structural attributes that they require are in place and prey is adequate (Lemke 1994; Squires and Ruggiero 1996).

In the more fragmented forest environments east of the Continental Divide where mountains and plains intermingle, goshawks often occupy mosaics of forest and grassland or a mixture of different forest seral stages. They are capable of foraging through open parks and woodlands and along forest edges, and in certain circumstances do so on a regular basis. Competition from red-tailed hawks and great-horned owls confines goshawks to dense forest, but this applies primarily to nest sites and potential predation on young rather than to foraging by adults (Reynolds et al. 1992).

In Montana the northern goshawk is a year-round resident (MFWP 2011a) and breeding season habitat includes three areas including the nest area, post-fledgling area (PFA) and foraging habitat. The following is a discussion of each.

Nest Habitat

Although the goshawk is considered a habitat generalist and uses a wide variety of forest types, it tends to nest in a relative narrow range of structural conditions (Reynolds et al. 1992; Squires and Reynolds 1997; Kennedy 2003). Goshawks prefer mature forests with large trees, relatively closed canopies and open understories (Reynolds et al. 1992; Hayward and Escano 1989; Squires and Reynolds 1997). Despite differences in some habitat characteristics, high canopy closure and tree basal area at nest areas were the most uniform habitat characteristic between study areas in northern Idaho and western Montana (Hayward and Escano 1989; Kennedy 2003; Clough 2000). Goshawk nest sites include the nest tree and approximately 40 acres around the nest (USDA Forest Service 2009c) and breeding areas often contain several alternate nests that are used over several years and are usually located within 0.25 mile of each other (Roberson et al. 2003). Because of their large home ranges and their natural tendency to cycle among different nest sites between years, they are able to adapt to many environmental changes (such as fire and timber harvest) by moving to adjacent undisturbed sites.

Key findings in the literature that characterize nest areas include; (1) goshawks nest in a variety of forest types throughout their range, (2) in general, the nest area vegetation is described by a comparatively narrower range of structural characteristics than the post-fledgling area (PFA) or foraging area, and includes mature forests with larger trees and relatively closed canopies, (3) average size of the nest area varies, and (4) in west central Montana, goshawks selected nest stands of mature and older forest approximately 40 acres in size and surrounded by a mix of younger and nonforested habitat (USDA Forest Service 2009c).

More than habitat composition or any other factor (i.e., prey abundance), territoriality determines nest distribution and spring weather determines nest success (Joy 2002; Reich et al. 2004).

Post-fledgling Area Habitat

The post-fledgling area (PFA) habitat surrounds the nest area and is defined as the area used by the family group from the time the young fledge, until they are no longer dependent on the adults for food (Roberson et al. 2003). During the fledgling-dependency period (4 to 6 weeks) the activities of young are centered

near their nests, with the distance they move from the nest increasing over time (ibid.). These areas may be of importance to fledglings by providing prey items to develop hunting skills, as well as cover from predators and prey.

The Northern Region recommends that each pair of nesting goshawks should be provided with a 420-acre PFA within their home range (USDA Forest Service 2009c). Based on habitat and occupancy data collected in northern Idaho, the region recommends maintaining at least 40 percent of the PFA in trees greater than 5 inches d.b.h., with greater than 50 percent canopy cover, and some structural diversity in the understory (USDA Forest Service 2007c). Unlike foraging habitat, post-fledgling habitat is actively defended (USDA Forest Service 2007c).

Foraging Habitat

Goshawks are opportunistic predators that kill a wide assortment of prey that varies by region, season, vulnerability, and availability. Main foods include small mammals, ground and tree squirrels, rabbits and hares, large passerines, woodpeckers, game birds, and corvids (Squires and Reynolds 1997). Goshawks are classified as prey generalists (ibid.) and typically forage on a suite of 8–15 species (Reynolds et al. 1992). Preferred goshawk foraging habitat varies in the literature (USDA Forest Service 2009c), however key findings or conclusions that characterize goshawk foraging include:

1. Size of the typical home range or foraging area for the goshawk (1,409 to 8,649 acres) may vary depending on prey abundance and availability, age and sex of the bird and local habitat conditions.
2. Goshawk foraging areas are heterogeneous and may include mature forest, as well as a mix of other forest and nonforest components.
3. Emphasis should be placed on creating or maintaining vegetation diversity and that a juxtaposition of seral stages including mature timber should be provided (USDA Forest Service 2009c).

Goshawk foraging areas are approximately 5,000 acres and comprised of a diversity of vegetative types. The composition of vegetative types characterized by higher canopy closures, mature trees, and open understory conditions located outside the nest area blend into the surrounding landscape beyond the PFA scale, to the degree that differences in habitat composition in occupied versus random foraging areas cannot be detected (McGrath et al. 2003 in Samson 2006a). As such, management efforts are generally concentrated at the PFA and nest area scales.

Home Range and Landscape Considerations

Goshawks use large landscapes, integrating a diversity of vegetation types over several spatial scales to meet their life-cycle needs (Squires and Kennedy 2006). In The Northern Goshawk Status Review (2009c), the U.S. Fish and Wildlife Service found that the goshawk typically uses mature forests or larger trees for nesting habitat, however, it is considered a forest habitat generalist at large spatial scales (USDI Fish and Wildlife Service 1998). The Service found no evidence in its finding that the goshawk is dependent on large, unbroken tracts of “old growth” or mature forest (63 FR 35183 June 29, 1998) (USDA Forest Service 2009c). Nonetheless, the pattern of goshawk nest site selection in coniferous forests, especially mature forests with closed canopy and open understory conditions, has emerged repeatedly in numerous studies throughout western North America (Squires and Ruggiero 1996; Clough 2000).

The issue of goshawks selecting for some level of mature forest in the home range was the subject of recent debate in the literature. Greenwald et al. (2005) prepared a literature review of a few selected studies and concluded that goshawks select mature to older forests in their home range. Greenwald et al. (2005) criticized Reynolds et al. (1992) on their recommendation to maintain a mix of seral stages and

vegetation types that reflect historical landscape patterns. Reynolds et al. (2007) provided a rebuttal to Greenwald et al. (2005) finding that Greenwald's criticisms were based on an incomplete review of the literature; misunderstandings of the desired goshawk habitats described in the "Management Recommendations for the Northern Goshawk in the Southwestern United States" (Reynolds et al. 1992); an under-appreciation of the extent of variation in vegetation structure among forest types and seral stages used by goshawks; a limited understanding of the ecological factors limiting goshawks; and a failure to understand the dynamic nature of forest habitats. Reynolds et al. (2007) findings were consistent with the Service's 1998 status review of the species (USDI Fish and Wildlife Service 1998).

The breeding season home range for the northern goshawk varies depending on sex and habitat characteristics (Squires and Reynolds 1997) and can range from 1,250 acres to over 6,000 acres (Squires and Reynolds 1997; Reynolds et al. 1992; Kennedy 2003). Also several authors have suggested that forested habitat for the northern goshawk should be managed at both the landscape and stand levels to provide adequate foraging and nesting habitat (Reynolds et al. 1992). In order to meet all the nesting requirements of this species, the Northern Region goshawk guidelines recommend that at least 240 acres of nesting habitat should be maintained in patches of at least 40 acres per home range. Recommendations related to providing desired home range and PFA habitat also include maintaining a variety of habitat conditions and a mosaic of vegetation structural stages (USDA Forest Service 2009c). Finally sustaining goshawks across the landscape requires maintaining habitat at the home range scale (Reynolds et al. 1992).

Viability

The four criteria used to evaluate goshawk viability are (1) habitat availability, (2) human disturbance, (3) biotic interactions, and 4) managing for ecological processes. The following is a brief discussion of each, from which effects of proposed actions are evaluated.

Habitat Availability

Currently habitat is abundant for the northern goshawk in the Northern Region, as well as by national forest and ecological region. Samson (2006b) determined that approximately 133,436 acres of habitat (nesting and foraging) would be needed to maintain minimum viabable populations of northern goshawks in the Northern Region. Currently, based on FIA data, there are 361,963 acres of northern goshawk habitat (nesting and foraging) on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

Human Disturbance

Northern goshawks in the Northwest United States are reported to select areas to nest near human activities (McGraath et al. 2003 *in* Samson 2006a). Human disturbance is not a factor for northern goshawks as long as 70 percent of the nest stand structure is maintained and timber management operations are restricted.

Biotic Interactions

Inter-specific competition for habitat and prey is not well understood. Other raptors may exclude goshawks from nest areas, although goshawks and other raptors are known to nest in close proximity to one another (Squires and Kennedy 2006). Numerous raptors and mammalian predators prey on many of the same species as goshawks. These predators include red-tailed hawk, Coopers hawk, great horned owl, barred owl, fox, coyote, Canada lynx, weasel, and American marten (Squires and Kennedy 2006, Samson 2006a). The extent to which species co-exist with goshawks may depend on the openness of habitat (USDI Fish and Wildlife Service 1998). Natural and man-made changes that result in reduced forest canopy may favor the habitat needs of more open-forested competitors, such as red-tailed hawks, and

reduce goshawk habitat; although to date no scientific studies have conclusively documented such a replacement. Reynolds et al. (1992) recommend vegetation management treatments that maintain habitat at a home-range scale to sustain goshawks across the landscape.

Ecological Processes

While suppression of natural fire processes in the Northern Region has benefitted the northern goshawk by increasing the distribution and abundance of forested habitats, it has also resulted in increased fuel loading and creation of ladder fuels that puts existing goshawk habitat at risk. Additionally, fire and other ecological processes are important to maintain a continuing supply of mature trees, and either an understory or open understory depending on need (e.g., PFA vs. foraging and heterogeneity required in foraging habitat) (Samson 2006a). Consequently, re-introduction of fire needs to be implemented in order to maintain preferred goshawk habitat conditions, while reducing the risk of long-term loss of habitat from catastrophic wildfire.

Northern Goshawk Project Area Habitat and Documentation

Goshawk use within the project area includes both historical (1995) documentation, as well as recent activity, including two active goshawk nests located in 2010. Young goshawks successfully fledged from one of these nests. While the second nest did have young, the defense of the nest by the adults precluded a final determination on fledging status. The nest from which goshawks successfully fledged in 2010 was active again in 2011; however, nest success was not determined. Both active nests (Stonewall East and West) are located in the southern portion of the project area on lower slopes within 0.25 mile of drainages (see figure 73).

Nesting and Forging Habitat R1-VMAP Analysis

R1-VMAP is used to describe nesting and foraging habitat in the project area and within the combined boundary or cumulative effect area, according to models developed by Samson (2006a, b) as described in the Criteria for Wildlife Models Helena National Forest (USDA Forest Service 2009a). Of the project area acres, approximately 758 acres and 1,051 acres of nesting and foraging habitat respectively are also designated as old growth.

Existing nesting and foraging habitat for both the project and cumulative effect areas is summarized in table 76 and displayed in figure 73. Due to MPB mortality, goshawk nesting habitat has declined from 13,205 acres (48 percent reduction), and foraging habitat has declined from 18,841 acres (57 percent reduction).

Table 76. Existing goshawk nesting and foraging habitat (Samson 2006a)

Analysis Area	Size	Nesting Habitat		Foraging Habitat	
	Acres	Acres	Percent	Acres	Percent
Project Area	24,005	6,342	26	4,445	19
Cumulative Effect Area	101,977	17,258	17	9,437	9

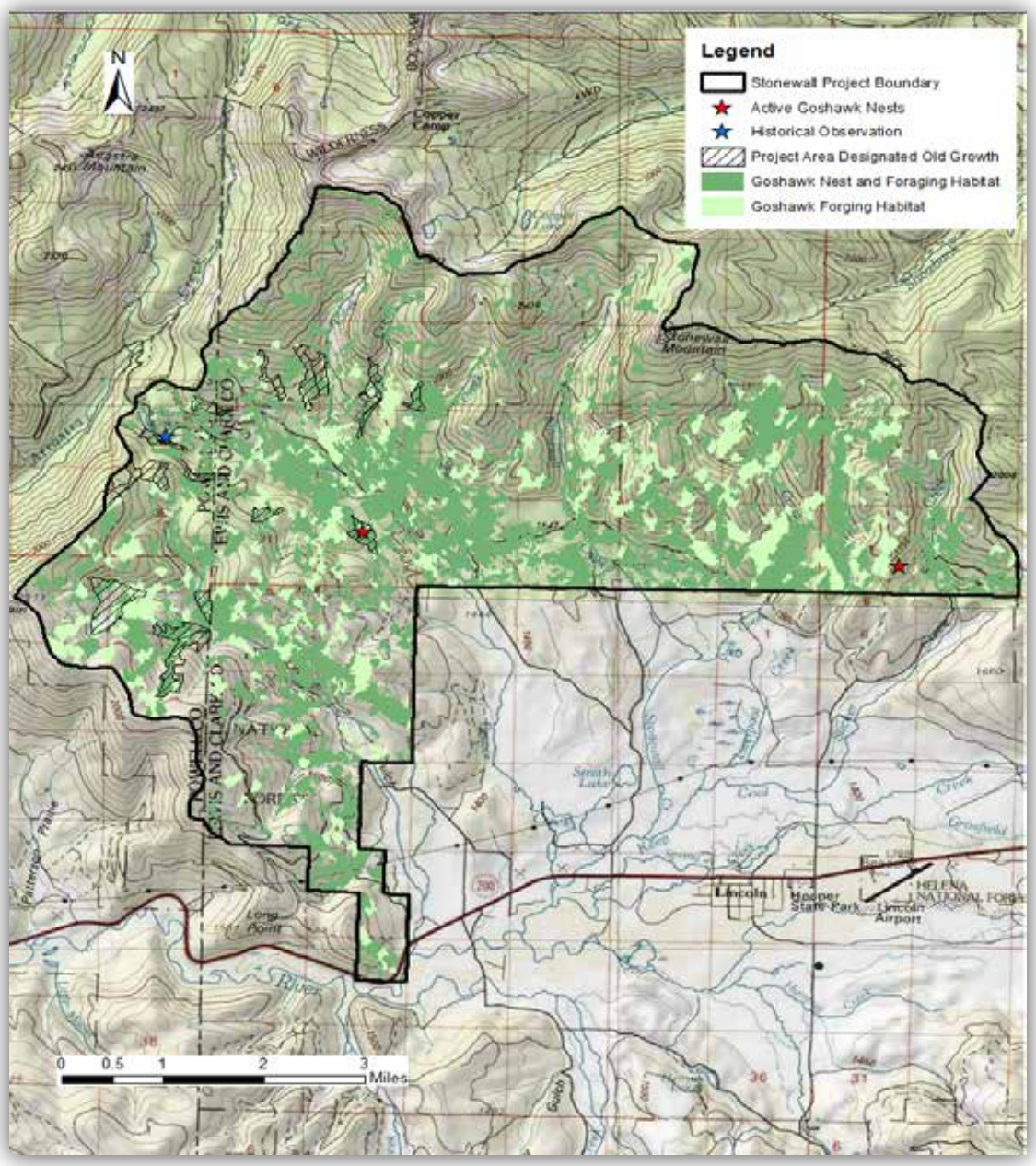


Figure 73. Project area goshawk habitat and nest sites

Home Range Analysis

Foraging Habitat

Goshawk nesting and foraging habitat characteristics in the project area and PFA are based on diversity matrices described in the guidelines identified for the Northern Goshawk Northern Region Overview: Key Findings and Project Considerations (USDA Forest Service 2009c). Table 77 summarizes the vegetation composition of suitable habitat from Reynolds et al. (1992) and Clough (2000) and compares it with habitat conditions within the project area.

Table 77. Percent of goshawk nesting and foraging habitat recommendations[3]

Landscape Habitat	Clough (Montana)	Reynolds[1] (SW U.S.)	Project Area Habitat
Seedling/Sapling (0-4.9 inch d.b.h.)	9.3%	10%	16%
Young Forest (5-9.9 inch d.b.h.)	65.7%[1]	20%[1]	44%
Mature Forest (10 inch+ d.b.h.)	11.3%	60%	35%
Mature (>40% CC and > 5 inches d.b.h.)[2]	69.0%[2]	60%[2]	18%
Grass/Forb/Shrub	7.3%	10%	4%

1 – recommended size class in Reynolds for young and mature forest is 5-12 inches d.b.h.
2 – includes stands with >50 percent canopy cover
3 – based on Reynolds et al.(1992) and Clough (2000)

Clough's (2000) and Reynolds et al. (1992) findings for grass/forb stands or natural openings and young seedling stands are similar to each other despite vegetative differences between the two regions, although grass/forb/shrub habitat within the project area falls below both authors findings. Conversely the project area contains a larger amount of seedling/sapling stage forest. The two authors differ in that in Montana a high percentage of young forest was used, whereas mature forest predominated in the Southwest. Existing project area habitat falls between the two, whereas it falls well below the amount of closed canopy forest that characterizes goshawk home ranges in both Montana and the Southwest United States. While the project area deviates somewhat from conditions found by Clough (2000) and Reynolds et al. (1992), it has a diversity of habitat conditions and provides habitat conditions consistent with goshawk use.

Nest Habitat

Reynolds et al. (1992) recommends that 5,000 acres of habitat (home range) are needed to support a nesting pair of goshawks. Recommendations are that 40 acres of habitat be provided at each nest site, and a total of 240 acres of nest habitat should be available for each home range (USDA Forest Service 2007f). The project area contains over 6,300 acres of nest habitat. Of this approximately 4,100 acres occur in blocks greater than 40 acres in size. The project area is large enough to support four, 5,000-acre home ranges, and contains adequate nest habitat per home range (i.e., greater than 240 acres in 40-acre blocks). Thus, there is more nesting habitat available in the project area than the amount that is needed to provide for four nesting pairs of goshawks; according to Reynolds et al. (1992) guidelines that recommend at least 180 acres in patches of 30 acres or more of nesting habitat per pair, or according to the Northern Region Overview (USDA 2009b) guidelines that recommend up to 240 acres per pair in patches of 40 or more acres.

Post-Fledgling Area Habitat

The PFA area includes 420 acres immediately around the nest site that are used by young-of-the-year. Table 78 displays PFA habitat for the Stonewall east and west nests, and compares it with PFA conditions documented by Clough (2000) and Reynolds et al. (1992).

Table 78. Research Findings on Percent Vegetation Composition of PFA Compared to Stonewall PFAs*

Structural Condition	Clough	Reynolds	Project Area PFAs	
			Stonewall East	Stonewall West
Forest	92.7%	90%	100%	99%
Shrub/herb	7.3%	10%	<1%	0%
Trees (<4.9 inches d.b.h.)	9.3%	10%	19%	12%
Trees (5.0-9.9 inches d.b.h.)[2]	65.7%	20%	53%	37%
Trees (>10 inches d.b.h.)	11.3%	60%	28%	51%
Canopy Cover (>40% and >5.0 inches d.b.h.)	68.9%[1]	60%[1]	23%[1]	31%[1]

*Based on R1-VMAP

1 – use 50 percent canopy closure

2 – recommended size classes in Reynolds for young forest is 5-12 inches d.b.h.

Both PFAs are similar to landscape-level habitat in terms of the amount of seedling/sapling and young forest. While the amount of closed-canopy, mature forest falls short of that characteristic of other PFAs studied, the Stonewall West PFA contain three times the amount of closed-canopy forest than the project area as a whole. Similarly, the amount of closed-canopy mature forest in the Stonewall East PFA is well above that found across the landscape. So while the composition of the existing PFA habitat is similar to that found across the landscape for most structural attributes, the data indicates that areas that contain more closed-canopy conditions are being selected as nest sites.

Both PFAs lack the grass/forb/shrub component that is commonly associated with goshawk PFAs (Clough 2000; Reynolds et al. 1992), and both nests are approximately 0.50 mile from an open road.

Pileated Woodpecker

Methodology and Analysis Area

Potential effects to this species are evaluated by looking at changes in the availability of large-diameter snags and suitable nesting and foraging habitat. Pileated Woodpecker habitat models are derived from A Conservation Assessment of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, and Pileated Woodpecker in the Northern Region, USDA Forest Service (Samson 2006b), Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten, and Fisher (Samson 2006b), and Criteria for Wildlife Models Helena National Forest (USDA Forest Service 2009a). Analysis area documentation is based on the Heritage and Forest Service NRM Databases (MNHP 2011; USDA Forest Service 2011c), landbird survey data and field observations.

Minimum habitat model values (USDA Forest Service 2009c) are based on R1-VMap values and include Douglas-fir, ponderosa pine, aspen and mixed forest types that contain tree sizes greater than 10 inches d.b.h. to include forage and nest trees. Landscape-level old-growth estimates are nonspatial and are based on FIA and intensified grid data. Old-growth polygons at the 3rd order drainage scale are mapped using stand exam data.

Habitat estimates and maps are derived from the HNF Intensified Grid Summary Database. Methodologies and assumptions associated with these data are described in the following documents: Region One Vegetation Council Classification Algorithms (updated 2006a), R1 Grid Intensification using CSE Protocols – Field Procedures, R1 Multi-level Vegetation Classification, Mapping, Inventory, and

Analysis System (USDA Forest Service 2007e), and FIA Field Guides, Methods, and Procedures at http://fia.fs.fed.us/library/field-guides-methods-proc/. Methods related to snag and coarse woody debris are described under the section that addresses dead wood.

Species Status and Biology

Although common in parts of its range, the pileated woodpecker has a global ranking of G5 which is defined as common, widespread and abundant. Although it may be rare, it is not vulnerable in parts of its range. It has a state ranking of S3 (potentially at risk) and is a species of concern that is potentially at risk (MNHP 2011). The North American Breeding Bird Survey indicates that pileated woodpecker trends have been increasing since 1966 (http://www.mbr-pwrc.usgs.gov/bbs/bbs.html).

The pileated woodpecker is used as an indicator of old-growth forests primarily because of its preference for large-diameter snags as nest trees that tend to occur more frequently in mature forests (Bull and Holthausen 1993, Bull and Jackson 1995). While forest with structure characteristic of old growth are preferred, this species is not an old-growth obligate and the presence of large trees for nesting appears to be more important than forest age.The pileated woodpecker also appears to do well in young and fragmented forests with abundant remnant older structure (Kirk and Naylor 1996).

Many tree species are used by the pileated woodpecker to excavate nest cavities and selection of the tree appears to depend mainly on the availability of suitable trees (McClelland and McClelland 1999). The pileated woodpecker can excavate a cavity in solid wood (Bull 1987) but most often uses trees partially softened by fungal decay. Pileated woodpeckers excavate a new cavity each year and reuse of old cavities is rare (Bull and Jackson 1995).

In the Northern Rockies, pileated woodpeckers tend to use mature cottonwood bottoms, mixed conifer, and ponderosa pine, among other habitats (Hutto 1995). Forests with a component of western larch, ponderosa pine, or black cottonwood are also used in the northern Rocky Mountains (McClelland and McClelland 1999). Bull and Holthausen (1993) found that the presence of snags greater than 20 inches d.b.h. were found to be the best predictor of occupied habitat.

Dead and downed trees and snags are used for nesting and foraging (Bull 1987). They forage primarily for carpenter ants and other wood boring beetles in both live and dead wood, and often forage on or near the ground in logs, snags, live trees and stumps (Bull and Holthausen 1993). The literature does not define any size requirements for foraging material, although the consensus from researchers (Bull 1987; McClelland 1977) is that the larger and more abundant the material, the more opportunities it will provide for foraging pileated woodpeckers.

In general, there is a positive correlation between forest age and the amount of wood decay (McClelland and McClelland 1999). So, while this species prefers late-successional and old-growth habitat, foraging within younger stands is documented and territories are not confined just to old-growth habitat (McClelland et al. 1979 *in* USDA Forest Service 2008a). Bonar (2001 *in* Samson 2006a) found that the pileated woodpeckers used all available habitats at all scales to select suitable nest cavity trees and foraging habitat.

Pileated woodpeckers are very mobile and are considered a large patch size species There home range is large and requires a high percentage of unlogged forest with a good distribution of large trees. In the Northern Region their home range size is considered to be approximately 1,000 acres (Samson 2006a). Smaller home ranges tended to have a high percentage of the area in grand fir, old growth, unlogged stands and stands with greater than or equal to 60 percent canopy closure (Bull and Holthausen 1993).

Pileated Woodpecker Project Area Habitat and Documentation

Forest pileated woodpeckers monitoring has included recorded observations since 1994, data provided by the Northern Region Landbird monitoring program and Birds and Burn surveys. Pileated woodpeckers are not common on the Forest. Westside forests generally have between 5 and 10 percent occurrence rates compared to 1.5 percent on the HNF (USDA FS 2008d). While uncommon, most occurrences have been around the Stonewall Mountain area and foraging activity was observed in several stands.

Pileated woodpecker habitat in the project area generally includes stands with moderate to high levels of canopy closure that contain overstory inclusions of large ponderosa pine. These stands historically met the needs of pileated woodpeckers because large, ponderosa pine snags provided nest habitat and other smaller snags of a mix of species and down woody debris provided habitat for carpenter ants, and excellent foraging habitat. Existing pileated woodpecker habitat within the project area and cumulative effects area are summarized in table 79 and displayed in figure 74. Due to MPB and high stand densities, canopy cover has been declining and mortality of large ponderosa pine within the project area has been high, increasing the availability of large-diameter snags. While pileated woodpeckers have been documented in areas affected by MPB mortality (Dresser et al. 2012), within the next 10-20 years most snags will fall to the ground and nest tree availability will decline. The dense Douglas-fir understories that develop will hinder ponderosa pine regeneration and reduce recruitment of future ponderosa pine and large-diameter snags. Recent wildfires have also reduced habitat and the large amount of unsuitable habitat in the northeast portion of the CE area is due to the 2003 Snow Talon fire.

The home range size for a pair of pileated woodpeckers depends on the suitability of the nesting and foraging habitat. Suitable habitat is generally characterized as areas with greater than 30 percent canopy cover and tree size greater than 20 inches diameter for nesting and greater than 10 inches diameter for feeding. The less suitable a given area is the more habitat that is needed to meet the needs of pileated woodpeckers. Because project area canopy cover and suitable pileated woodpecker nest habitat has been reduced, it is likely that a pair of pileated woodpeckers in the project area would need up to 1,000 acres per home range. Assuming that a nesting pair of pileated woodpeckers requires 1,000 acres per home range, the project area can currently support up to seven nesting pairs.

Table 79. Existing pileated woodpecker habitat

Analysis Area	Acres	Percent
Project Area	7,824	33
CE Area	27,178	27

Samson (2006b) determined that approximately 91,923 acres of habitat (nesting and foraging) would be needed to maintain minimum viabable populations of pileated woodpeckers in the Northern Region. Currently, based on FIA data, there are 193,112 acres of pileated woodpecker habitat (nesting and foraging) on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

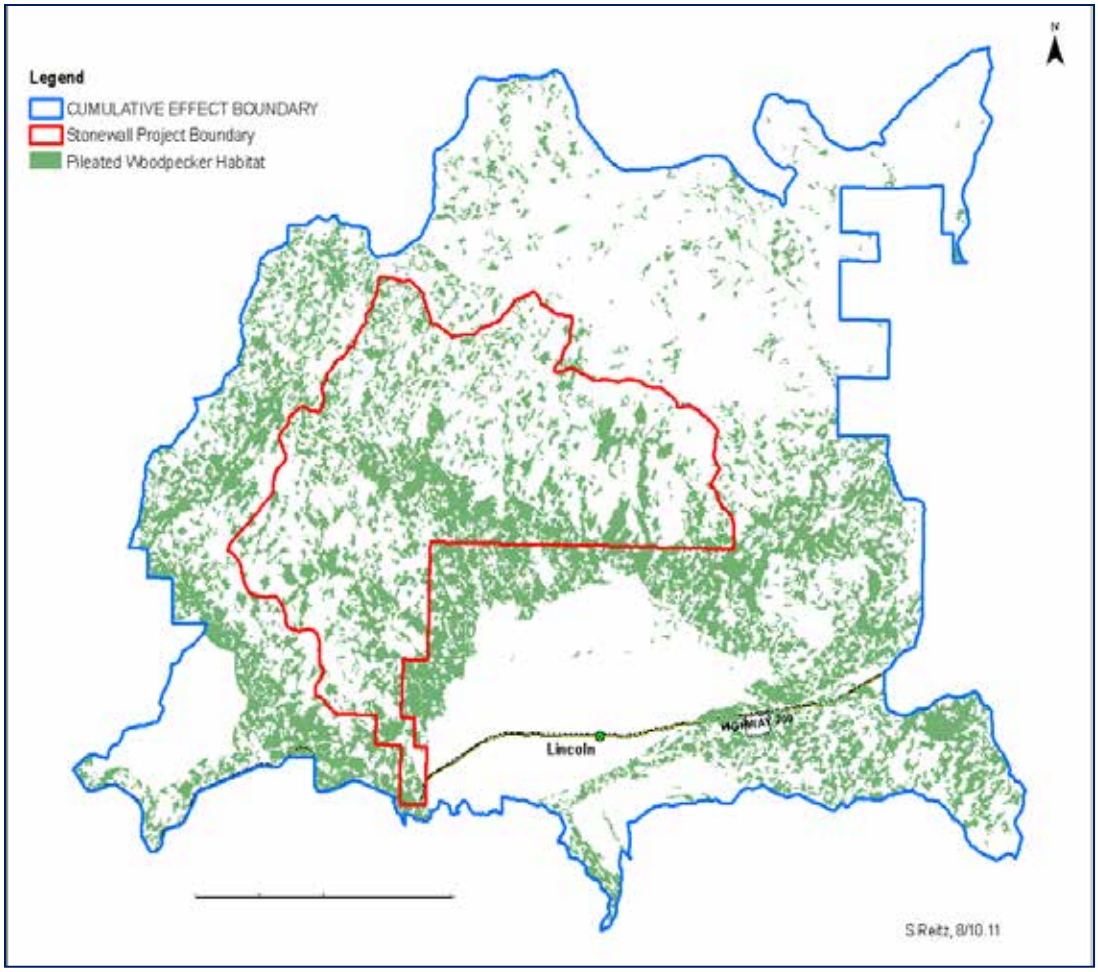


Figure 74. Existing pileated woodpecker habitat

Current Snag Availability

Due to decades of overstocking and widespread MPB mortality, snags and coarse woody debris currently occur in a variety of size classes and are widespread and abundant across the Stonewall Project area. Data collected in 2007 and 2008 show that there were an average of about 40 snags per acre greater than or equal to 7 inches d.b.h., which is 20 times the Forest Plan requirement of providing 70 percent of optimum. Table 80 summarizes snags by size class within the Stonewall Project area, whereas snag distribution is displayed in figure 67. It should also be noted that due to ongoing mortality, particularly in larger diameter ponderosa pine, the availability of 20-inch snags today would be greater than indicated in table 80, which is based on 2008 data.

Table 80. Snag distribution data by size class from 2008 FIA plots

Diameter (d.b.h.) Class	Average Snags per Acre
7-11	26
12-19	13
>=20	1
Total	**40**

Hairy Woodpecker

Methodology and Analysis Area

Documentation of this species is based on field observation, landbird data and data provided in the Heritage Database (MNHP 2011). Hairy Woodpecker habitat models are derived from the R1 Draft Model Set All Species (USDA Forest Service 1998) as described in the Criteria for Wildlife Models Helena National Forest (USDA Forest Service 2009a), based on R1-VMap values and include: dominant tree types Douglas-fir, ponderosa pine, Engelmann spruce, and aspen as well as mixed stands that include these types (with the exception of Engelmann spruce), tree sizes greater than 10 inches diameter, and canopy cover greater than 10 percent.

Habitat estimate maps are derived from R1-VMAP. Methodologies and assumptions associated with these data are described in the Region One Vegetation Council Classification Algorithms (updated USDA Forest Service 2006a), and R1 Multi-level Vegetation Classification, Mapping, Inventory, and Analysis System (USDA Forest Service 2009c).

Because of this species' small home range and the widespread availability of suitable habitat, direct, indirect and cumulative effects are evaluated across the project area.

Species Status and Biology

The hairy woodpecker has a state ranking of S5 and although it may be uncommon, in parts of its range it is considered common, widespread and abundant (MNHP 2011). The North American Breeding Bird survey indicates that hairy woodpecker trends have been increasing since 1966 (BBS 2011).

The hairy woodpecker represents species dependent on snags, and is a mid-sized bird found from low- to high-elevation forest cover types. They nest and forage in mid- to large-sized snags and have been documented within the project area. The only species of woodpecker that is perhaps more common is the northern flicker. Nests can occur within short, small diameter snags, although like pileated woodpeckers, they often locate cavities near the tops of snags (Bull 1987; Thomas 1979). The landbird survey (Hutto and Young 2002) found hairy woodpeckers widely distributed across most forest community types.

Hairy woodpeckers are year-round resident primary cavity nesters, which subsequently provide nest cavities for myriad small birds and mammals. They reside in many forest communities and use a variety of tree sizes. They feed on insects, primarily ants, wood borers, and grubs as well as fruits and berries (Birds of North America 2011). Hairy woodpeckers forage on a variety of substrates, including snags and down woody debris (DWD) They may concentrate in areas of insect outbreaks in response to the increased food source (Sousa 1987). Territory size ranges from about 2.5 acres to 37 acres (Sousa 1987). Because of ongoing MPB epidemic, small to medium diameter snags are not limited in the project area.

Hairy Woodpecker Project Area Habitat and Documentation

Hairy woodpeckers have been documented across the project area and suitable habitat occurs on over 7,800 acres. Available habitat has increased since the MPB outbreak and suitable small-to medium-diameter snags are widespread and abundant (see table 80 under pileated woodpecker and figure 67). Both bird and nesting surveys were conducted in areas affected by MPB mortality in the Elkhorn Mountains in 2012, and compared with pre-outbreak surveys. Fifteen hairy woodpecker nests were monitored, including eight in ponderosa pine and seven in aspen. Forty percent of the nests in areas affected by MPB outbreak successfully fledged young. While the nest survival rate did not show a statistically significant response to the MPB outbreak, a higher nest survival rate trend was observed for the hairy and American three-toed woodpeckers during post-outbreak years (Dresser et al. 2012).

Assuming an average home range of 10 acres, the project area can potentially support a large number of nesting pairs.

American Marten

Methodology and Analysis

Analysis area documentation is based on the MHNP Database (2011) and the USDA Forest Service NRM Database (2011c). Habitat estimates are based on intensified grid data and information provided in Habitat Estimates For Maintaining Viable Populations of the Northern Goshawk, Black-backed Woodpecker, Flammulated Owl, Pileated Woodpecker, American Marten and Fisher (Samson 2006b). Throughout most its distribution, American marten are reported to be closely associated with relatively closed canopies (greater than 30-50 percent) (Bushkirk and Ruggiero 1994) and in some areas may utilize areas with canopy cover greater than or equal to 25 percent (Chapin et al. 1997). For the purpose of this analysis, canopy cover greater than or equal to 25 percent is used to predict marten habitat.

Habitat models used in Samson (2006b) are described in the Criteria for Wildlife Models Helena National Forest (USDA Forest Service 2009b). Model values are based on R1-VMap values and include: dominant tree types Douglas-fir, ponderosa pine, Engelmann spruce, subalpine fir, lodgepole pine, and aspen as well as mixed stands that include these types, tree sizes greater than 10 inches diameter, and canopy cover greater than 25 percent.

The average territory ranges from 160 to 1,800 acres, so the project area is large enough to evaluate direct and indirect effects. However, because use of an area is largely determined by landscape-level influences (Powell et al. 2003), and considering the widespread MPB mortality and recent wildfires, the combined boundary is used to assess cumulative effects.

Species Status and Biology

Marten have a global rank of G5 and are considered common, widespread and abundant, although they may be rare in parts of their range. They are not vulnerable in most of their range (MNHP 2011). In Montana the marten has a status of S4, and although apparently secure, it may be declining and rare in parts of its range (MNHP 2011).

The American marten is identified as an indicator to monitor the quality of large continuous blocks of mature cover; although research has shown that they appear to be dependent primarily on mature forests with a relative abundance of large woody debris and an adequate distribution of standing snags (Ruggiero et al. 1994). Preference for mature forests is strongest during the winter. This may be related to snow depths and increased success of encountering and capturing prey (Thompson and Colgan 1994).

The American marten is associated with late-seral coniferous forest characterized by closed canopies, large trees, and abundant standing and downed woody material. Of particular importance is the quantity of downed debris on the forest floor as it provides protection from predators, access to the under snow environment for hunting and resting, and thermal protection from heat and cold (Ruggiero et al. 1994). Chapin et al. (1997) found that vertical and horizontal structure was more important than age or species composition, and Thompson and Colgan (1994) found higher densities of marten in unlogged forests versus logged forests possibly due to reduced predation. Thomson and Colgan (1994) hypothesized that martens do not necessarily avoid openings but are more vulnerable to larger predators when crossing openings. Thus, landscapes containing large, well-connected patches of mid- and late-seral forest are more likely to sustain higher numbers of martens than more fragmented or naturally-patchy lands.

Marten are primarily found in mid- to high-elevation forests with a strong component of subalpine fir, Engelmann spruce, and lodgepole pine with pockets of coarse woody debris. Marten are rare in lower elevation ponderosa pine and dry Douglas-fir forests (Buskirk and Ruggiero 1994), although these habitats sometimes provide linkage between forests suitable for long-term occupancy.

Research indicates that martens abandon, or fail to colonize home-range size landscapes with less than 60 percent mature forest (Powell et al. 2003), reinforcing other studies that indicate that martens avoid regenerating clearcuts for several decades. Managers should provide adequate densities of snags, large trees, and logs and provide large blocks of interconnected mature forest (Powell et al. 2003).

Marten population densities and trends are notoriously difficult to evaluate: long-term data sets are rare, and populations often fluctuate dramatically over short periods of time, in large part because of variable trapping pressure. Where reasonably accurate data have been obtained, population densities have been very low compared to most other mammals—generally in the range of 0.4 to 2.4 marten per km² (Buskirk and Ruggeiro 1994).The average territory size for marten varies from 160 acres (Kirk and Zielinski 2009) to 1,804 acres for transient males (Slough 1989). In addition, home range size varies by habitat quality and food availability, and in the northern Rockies, it is estimated that 1,920 acres are necessary to provide adequate habitat in years when food is scarce.

While marten and fisher have similar habitat requirements, marten are largely restricted to higher elevations, engage in more arboreal and subnivean activity (i.e., tunnels under snow), eat smaller prey, can forage in deep snow and are more strongly related with coniferous stands (Ruggiero et al. 1994).

American Martin Project Area Habitat and Documentation

Marten have been consistently observed to the west and north (MNHP 2011, USDA Forest Service 2011c) and a DNA hair sample was obtained from Stonewall face in 2011. There are also trapping records from upper elevation lands in the Stonewall Creek drainage (within the project area) and from the Copper Creek drainage in the combined area (MNHP 2013).

Mountain pine beetle mortality has altered potential habitat patterns for marten, particularly on lands with a large lodgepole component; whereas the increase in snags and downed wood benefit marten. Currently the project area contains approximately 6,800 acres of suitable marten habitat (28 percent of the project area). When viewed across the larger landscape (cumulative effect boundary), there is little marten habitat to the northwest of the project area, and generally the project area does not contain the landscape-level mature forest conditions preferred (Powell et al. 2003). While it is unlikely that the project area would be utilized for denning, and habitat conditions have been reduced, snag and CWD habitat are abundant and suitable marten habitat is present. Because marten are considered rare in lower-elevation ponderosa pine and dry, Douglas-fir forests (Buskirk and Ruggiero 1994), suitable habitat largely occurs at upper elevations in the project area.

Samson (2006b) determined that approximately 3,459 acres of habitat would maintain minimum viabable populations of martens in the Northern Region. Currently, based on FIA data, there are 293,064 acres of marten habitat on the Helena NF, well in excess of the amount of habitat needed at the Northern Region scale.

Snowmobile use occurs throughout much of the lower elevations, primarily along groomed trails and roads, although some cross-country use in larger openings off-trails does occur. Use at higher elevations where marten would likely exist is primarily along designated trails.

Commonly Hunted Species

Elk

Methodology and Analysis Area

Elk serve as a management indicator for hunted species and management for elk requires meeting basic elk habitat requirements, including understanding the socioeconomic value of elk. Lonner (1991) identified the following primary considerations in elk management, (1) maintaining habitat security to protect elk during the hunting season, (2) preserving/recovering desired elk population characteristics as determined by elk managers and distribution relative to land management, and (3) satisfying the growing demand for quality hunting and non-hunting experiences. Several methodologies have been developed that measure elk vulnerability, or the relationship between elk, land management practices and the demand for elk hunting and non-hunting experiences. These methodologies are the focus of much of the analysis presented and include an assessment of summer range, security habitat and winter range.

Elk are evaluated in part by looking at three variables including summer range hiding cover, road densities during hunting season, and winter range thermal cover. The following is a summary of how Forest Plan standards relevant to elk management focus on these variables:

- **Summer Range Hiding Cover** – Forest Plan standard 3 addresses both summer and winter range. For the purpose of this analysis, the Montana Fish, Wildlife and Parks definition of hiding cover (a stand of coniferous trees having a crown closure of greater than 40 percent) is used with a minimum patch size of 40 acres. Using this definition, the requirement for Forest Plan standard 3is to maintain a minimum of 50 percent hiding cover within each herd unit (USDA Forest Service 1986 p. II/18).
- **Winter Range Thermal Cover** – Forest Plan standard 3 also requires that 25 percent of each herd unit winter range provide elk thermal cover. The Forest Plan defines thermal cover as a stand of coniferous trees 40 feet or more tall with an average crown closure of 70 percent or more, and a minimum size of 15 acres. Based on currently available vegetation mapping (VMap) this analysis uses stands 40 feet or taller with a canopy closure of 60 percent and a minimum size of 15 acres to describe thermal cover.
- **Road Density** – Forest Plan standard 4a addresses a road management program to improve big game security during the hunting season. This standard uses a hiding cover to open-road density within a herd unit during the October 15 to December 1 hunting period. The standard was intended to “provide for a first week bull harvest that does not exceed 40 percent of the total bull harvest…” (USDA 1986, pp. 11/7-18). When the Forest Plan was crafted, MFWP collected data to determine the percentage of bulls harvested during the first week of the general big game hunting season, as reflected in Standard 4(a). However, MFWP no longer collects that data. Rather, MFWP now relies on bull to cow ratios measured through aerial survey trend counts. These trends are used to determine and adjust harvest regulations that allow MFWP to achieve their elk population objectives (MFWP 2005). This analysis utilizes those bull to cow ratios set forth in the Elk Management Plan as a means of gauging the effects to big game security during the hunting season.

In addition to analyzing these parameters for compliance with Forest Plan standards 3 and 4a, two additional analysis tools are used to assess potential effects at the elk herd unit level: Habitat effectiveness and elk security. The following is a summary of each:

- **Habitat Effectiveness** – Habitat Effectiveness evaluates open road densities with respect to habitat use of summer range outside the big game season. Habitat Effectiveness is based on work conducted by Lyon (1979 and 1983) and is based on roads open to the public from May 16 to October 14. The Forest Plan does not include a specific threshold for habitat effectiveness.

- **Elk Security** – An elk security analysis is completed to address elk vulnerability during the hunting season. It is based on Hillis et al. (1991) and includes large areas greater than or equal to 250 acres in size that are equal to or greater than 0.50 mile from an open road. The security definition used in this analysis does not rely on the availability of cover or on the presence of closed roads—two components of security discussed by Hillis et al. (1991). Although Hillis et al. (1991) define security as "non-linear blocks of hiding cover", they also suggest that effective security areas may consist of several different cover types if the block is relatively unfragmented. The studies considered by Hillis et al. (1991) were conducted in areas of contiguous forest cover. In their discussion of security areas, Christensen et al. (1993, pages 4-5) speak to the significance of cover in this equation and note that where cover is ubiquitous, security can be controlled by road management alone.They recommend that in the more naturally open elk habitat in central Montana, cover considerations should extend beyond the hunting season and therefore be assessed at a landscape level (See also Edge et al. 1987). Their data suggest that "elk are less selective about the specific vegetative characteristics of coniferous cover and more responsive to the size of units, connectiveness with adjacent units, and the scale of cover on the landscape" (Lyon and Canfield as cited in Christensen et al. 1993, page 5). Hillis et al. (1991) only speak to "open roads" and "closed roads". They suggest that hunting pressure is concentrated along open roads, but that closed roads located within security areas may increase elk vulnerability by providing walking and shooting lanes. Unsworth and Kuck (1991) note that road closures may have varied effects on animal distribution and hunter use and success. They cite to several studies where road closures allowed elk to remain in more preferred sites for longer periods of time (Irwin and Peek 1979). Basile and Lonner (1979) reported that when vehicular travel was restricted, hunters spent more time walking, saw more elk, and had greater success and reported having a higher quality hunting experience. Based on these studies and the recent review from McCorquodale (2013) on elk and roads, the Hillis et al. recommendation to "minimize" closed roads within security areas was deemed unnecessary. While the security area analysis is not a Forest Plan requirement, and specific Forest Plan thresholds to be met are not established, it does consider distance from open roads and patch size, along with a recommended goal for the amount of security area within a herd unit.

The Stonewall project area is located in two elk herd units including Beaver Creek and Keep Cool. Because elk have a strong fidelity to specific areas, and considering elk use and numbers are determined largely by conditions specific to the Stonewall area such as proximity to wilderness, conditions resulting from the 2003 Snow Talon fire and dryer conditions that characterize National Forest and private lands, direct and indirect effects are evaluated by herd unit, by specific management areas, and across the project area as a whole (depending on the measures and effects discussed). Cumulative effects are also evaluated at the herd unit boundary.

Assumptions and Information Used

Elk documentation is based on field surveys and herd unit information provided by the Montana Fish, Wildlife and Parks (MFWP 2004) elk management plan, as well as by more recent assessment of herd conditions (Kolbe 2012). The Montana Fish Wildlife and Parks Elk Distribution GIS layer was used to identify summer and winter range within both project area herd units across all ownerships. All of the Beaver Creek-Lincoln and Keep Cool Creek HUs (76,730 acres) are considered elk summer range, while only a portion provides winter range. Elk security areas, hiding cover and thermal cover are derived from R1-VMAP, and are based in part on the “R1 Vegetation Council Classification Algorithms” (USDA Forest Service 2006a), and the “R1 Multi-level Vegetation Classification, Mapping, Inventory and Analysis System” (USDA Forest Service 2007e). Forest Plan hiding and thermal cover calculations are based on R1-VMAP data and HNF wildlife models for this species (USDA Forest Service 2009a). While canopy cover has recently been reduced due to MPB mortality, standing dead trees continue to provide screening and some snow intercept properties, therefore, pre-kill canopy closure is used to identify Forest Plan

thermal and hiding cover. Existing hiding cover was validated with field surveys, as described in the document "Stonewall Elk Hiding Cover Synthesis/Management Area T2 and T3 Focus" in the project record (USDA Forest Service 2015).

Road density information is derived from the HNF INFRA database and Montana's roads database. For Open Road Density during the hunting season (Standard 4a), private roads are assumed to have less impact on elk than public roads. Rowland et al. (2000) examined the relationship between open, closed and administrative roads on elk habitat use. He found that administrative roads (restricted vehicle use, not open to the public) are similar to private roads as far as vehicle use, and open roads have the greatest impact on elk habitat use. Based on this and other research (Lyon 1979; Witmer and deCalesta 1985) this analysis assigns a weight of 0.25 to private and administrative roads. A value of 1.0 is assigned to open roads, which include all roads and motorized trails open to public use between May 16th and October 14th. The analysis for Standard 4a during project implementation includes those roads that are closed to the public that will be used for project activities. This is the same approach utilized for the habitat effectiveness analysis.

Elk Management Plan Summary

The Montana Elk Management Plan (2004) provides detailed information on the Elk Management Units (EMU) relative to goals, objectives, and management challenges. Hereafter, Elk Plan is used interchangeably with Montana Elk Management Plan (2005). The project area is located in Hunting District 281 of the Bob Marshall Wilderness Complex EMU and contains the Beaver Creek-Lincoln Herd Unit (HU) on the west and the Keep Cool Creek HU on the east. Approximately 94 percent of the project area herd units occur in Hunting District (HD) 281, which is the focus of the Stonewall elk population/habitat analysis. HD 284, which makes up approximately six percent of the project area herd units is an archery only zone along the Blackfoot River occurring entirely on State and private lands.

In parts of the EMU, including the Blackfoot Valley, excessive road densities were a concern in the 1992 Elk Plan (MFWP 2005). Currently, however, road closures due to endangered species management have reduced open road densities in most areas to the point where security for elk is no longer a significant concern (MFWP 2005). For HD 281 the Elk Plan notes that access to elk hunting is most significantly affected by the remote character of Lolo and Helena NF lands outside the wilderness boundary and walk-in hunting on heavily roaded Plum Creek Timber Company (PCT) and other private parties managed through the block management program (MFWP 2005). Hunting District 281 is one of three hunting districts supporting the largest amount of elk habitat on private land within the EMU. Within project area herd units approximately 65 percent of the HD 281 winter range occurs off NFS lands.

Hunting District 281 contain 127,781 acres of elk summer range and 101,591 acres of winter range. More than 80 percent of the elk observed in this EMU use Wilderness habitats during at least a portion of the year. Based on herd counts, the Elk Plan (2005, page 108) noted that elk populations wintering in HD 281 were near modern day highs. Of the approximately 650 post season wintering elk counted in HD 281 and 285, about 200 were counted in the Beaver Creek wintering area which is within the project area (MFWP 2005, Figure 3 page 109). Population objectives include maintaining 500 to 700 elk observed post-season, with 150 to 200 elk in the Beaver-Keep Cool area, and maintaining at least 15 bulls:100 cows or 8 percent bulls among total elk observed post-season (MFWP 2005 p. 119).

The overall objective for this EMU is to manage elk populations in a healthy condition at levels commensurate with available habitat in order to provide a variety of recreational experiences, including hunting and general enjoyment by the public. Specific habitat management strategies include; (1) use of natural and prescribed fire on wilderness and roadless public lands to improve elk habitat, (2) maintain elk habitat security and associated walk-in hunting opportunities (via enforcement of existing road

closures and retention/recruitment of effective cover blocks in selected areas of HD 281 and 285, and 3) cooperate with other land managers in the development of integrated strategies to improve the prevention and control of nonnative invasive plants (NNIS) (MFWP 2005 pages 116-117).

Species Status and Project Area Habitat

Elk in Montana have a status of S5, and although rare in parts of its range, statewide they are considered common, widespread and abundant (MFWP 2011a). Elk are also considered habitat generalists that are mobile, adaptive and wide ranging. They occur in a variety of habitats ranging from high mountainous areas to highly managed forests to cold deserts (Skovlin et al. 2002).

The elk herd unit (76,731 acres in two herd units) is considered elk summer range, whereas winter range occurs on portions of the two herd units, approximately 31,540 acres or 41 percent of noth EHUs. The southern portion of the project area also provides transition range, or range between high elevation summer (National Forest) and low-elevation winter habitat (National Forest and Private/State).The project area contains approximately 28 percent of the total HD 281 winter range and 57 percent of the total HD 281 summer range.

Post-season surveys conducted by MFWP in 2014 observed 651 elk, and estimated 814 elk in the hunting district. There were 14 bulls per 100 cows observed (J. Kolbe, pers. comm. January 27, 2015). MFWP reports that in 2013, 64 elk were harvested from HD281, with bulls comprising 78 percent of the harvest and 40 percent of those bulls with 6 or more points (MFWP 2014, accessed online at http://fwp.mt.gov/hunting/planahunt/harvestReports.html). Overall numbers of elk are within Elk Plan objective (MFWP2005), although number of bulls is slightly low.

The following is a summary of key elk habitat components as they pertain to the Stonewall Project area.

Summer Range Hiding Cover

Summer range includes upper-elevation lands where elk typically migrate following snowmelt. All of the Beaver Creek-Lincoln and Keep Cool Cr. HU's (76,730 acres) are considered elk summer range. Much of the summer use occurs on high elevation cool/moist areas, including wilderness lands to the north (HD 280). For example radio telemetry data indicates up to 50% of elk wintering in HD 281 migrate into HD 280 in early summer and accomplish the reverse migration in early winter (MFWP 2005). Some research indicates that the quality of summer range is one of the more important variables when determining annual variation in herd growth. The quality of summer range is measured in terms of percent of hiding cover on summer range and habitat effectiveness, which is a measurement of open road densities during the summer.

Decades of fire suppression have resulted in closed-canopy conditions that have increased elk cover across the project area, although this has been reduced somewhat due to recent MPB mortality. Hiding cover has been further reduced due to wildfires in the last 10 years. While elk hiding cover has been reduced in both herd units, hiding cover within the project area and National Forest System lands is more widespread. Future hiding cover is expected to decline as standing dead trees (due to MPB mortality) fall to the ground.

As described above, hiding cover is based on the MFWP definition and includes forested stands that have 40 percent or more canopy cover and are at least 40 acres in size. Using this definition, Forest Plan standard 3 requires that hiding cover be maintained on a minimum of 50 percent of each HU. The amount of hiding provided on each HU and whether they comply with Plan standard 3 is displayed in

Table 81. Forest Plan hiding cover on elk summer range

Elk Herd Unit	Summer Range Acres	Forest Plan Hiding Cover	Percent Plan Hiding Cover	Meets Plan Standard #3
Beaver Creek	32,406	17,701	55	Yes
Keep Cool Creek	44,325	15,725	35	No

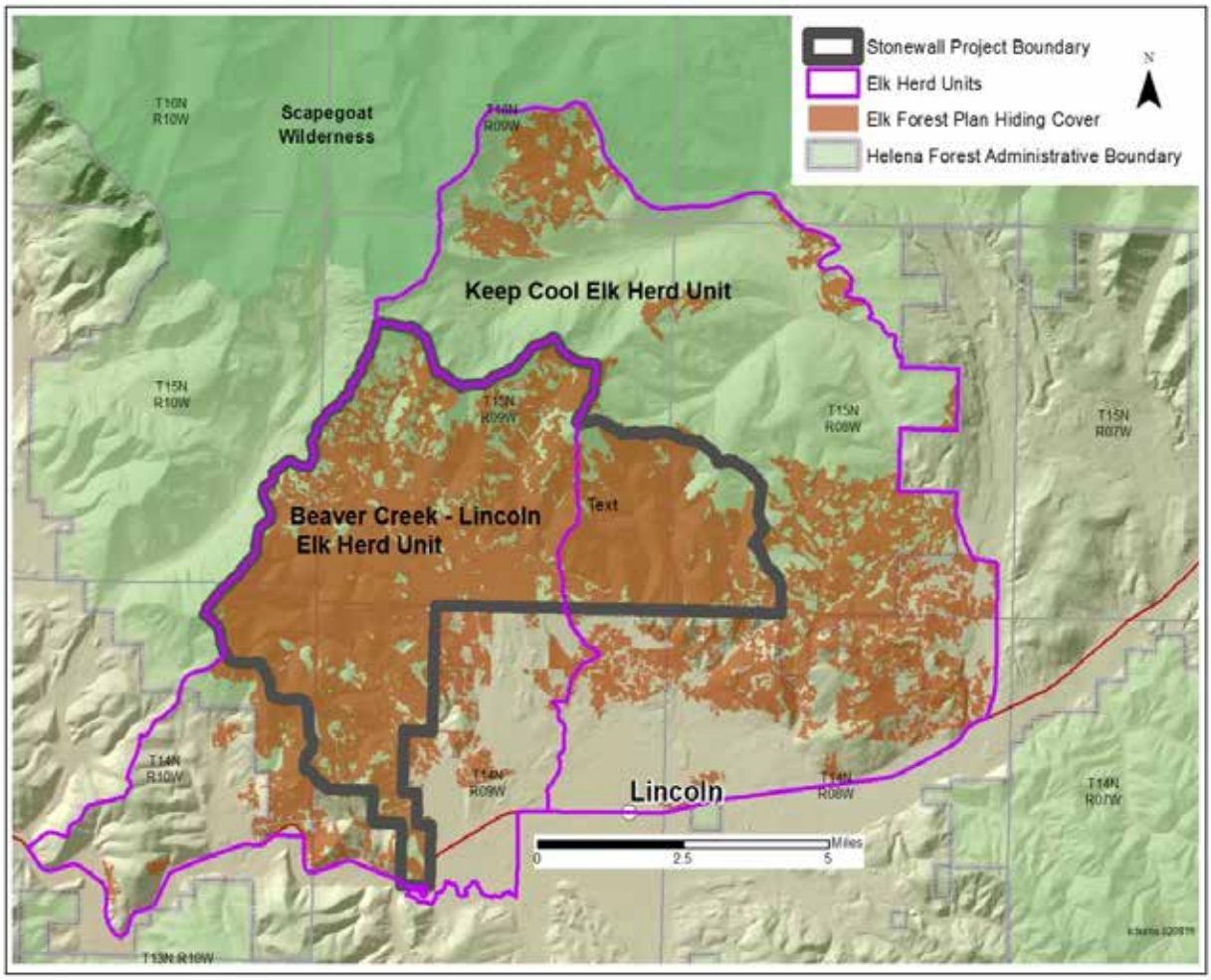


Figure 75. Existing hiding cover in Beaver Creek and Keep Cool herd unit

As can be seen from figure 75, the Stonewall Project area contains a disproportionate amount of hiding cover when compared to the herd units as a whole, and 86 percent of the existing hiding cover in the Beaver Creek HU and 67 percent in the Keep Cool Creek HU occur on National Forest System lands. Consequently elk hiding cover on NFS land is higher than is indicated in table 81, and is currently well distributed on NFS lands.

Summer Range Habitat Effectiveness

Elk generally avoid human disturbance and/or exhibit physiological stress when exposed to human activity (Cassirer et al. 1992). Habitat effectiveness refers to the percentage of available habitat that is useable by elk outside the hunting season (Lyon and Christiansen 1992). This analysis incorporates the habitat effectiveness model developed by Lyon (1983) based upon road densities. Christensen (et al. 1993) described Lyon's model for defining elk habitat effectiveness and comparing differences between alternatives.

Christensen (et al. 1993) recommended that habitat effectiveness should be 70 percent or greater (open road density less than 0.7 miles per square mile) for areas intended to benefit elk summer habitat and retain high use. Areas where elk are one of the primary resource consideration should have habitat effectiveness of 50 percent or greater (open road density of 1.9 miles per square mile or less). Areas with less than 50 percent habitat effectiveness (greater than 1.9 miles per square mile of open road density) are expected to make only minimal contributions to elk management goals.

Habitat effectiveness considers the open road density for roads open to motorized use between May 16 and October 14. Table 82 displays the existing open road density for EHUs. Road densities are determined across the entire herd unit including private lands and associated roads. Habitat effectiveness is currently below 50 percent in both the Beaver Creek and Keep Cool Creek HUs

Table 82. Elk herd unit summer open road density

Elk Herd Unit	Square Miles	Open Road Miles	Open Road Density	Percent Habitat Effectiveness
Beaver Creek	51	159.9	3.2	<50
Keep Cool Creek	69	189.6	2.7	<50

Winter Range Thermal Cover

Winter range is an important element of elk habitat. Areas with minimal human activities and adequate forage reduce the energetic costs associated with overwinter survival. During the winter, snow and cold temperatures push elk onto low elevation habitats, with predominantly southern or western aspects. Elk have a strong fidelity to a given winter range with most cows returning year after year to the same general area.

The Forest Plan requires that thermal cover be provided on 25 percent or more of each elk herd unit's winter range. Existing winter range thermal cover is displayed in table 83 and figure 76.

Table 83. Forest Plan thermal cover on elk winter ranges[1]

Elk Herd Unit	Total EHU Acres	Winter Range Acres	Plan Thermal Cover Acres	Percent Plan Thermal Cover
Beaver Creek	32,406	17,787	938	5.3
Keep Cool Creek	44,325	13,754	527	3.8

[1] Winter range thermal cover

Most of summering elk winter on private/state lands outside the project area and utilize adjacent lower elevation National Forest System Lands. Elk winter range occurs on 55 and 31 percent of the Beaver Creek and Keep Cool Creek HUs, respectively. Because these lower elevation lands contain dry site coniferous forest and non-forest or open canopy forest on private land, currently thermal cover within both herd units is low, and neither herd unit complies with Forest Plan direction of maintaining of 25 percent of the winter range in thermal cover.

Thermal cover, as defined by the Forest Plan, is very limited in both abundance and distribution (see figure 76). Recent research indicates that classic thermal cover (conifer stands more than 40 feet tall with canopy closure of at least 70 %) is probably of little value to wintering elk except in extreme conditions (Cook et al. 1998, p. 41-48). This is due to the fact that elk are better able to maintain body condition by taking advantage of solar radiation in open habitats. In addition, recent studies on Montana winter range

indicate that, when in forest habitats, elk often prefer stands with more open or patchy canopies capable of supporting suitable forage (Thompson et al. 2005, MFWP 2011b.

Definitions for elk thermal cover (Thomas 1979) are based upon what elk were assumed to prefer in the mid-1970s in northeast Oregon. Also preferred winter range cover conditions vary geographically (e.g., wintering deer and elk selected for dense mature forest on the Flathead National Forest which receives greater snow depths, whereas elk selected for open forests and shrublands on the Lolo National Forest which were found to have lower snow depths). Forage availability also varied. Forage productivity was substantially below the range of historic conditions on the Lolo due to the lack of disturbance (i.e. had missed several fire return intervals), whereas forage production was within the range of historic conditions on the Flathead, because it contained moist sites with long fire return intervals (MFWP 2011b).

Big game winter range conditions within the project area are characterized by dryer site conditions that have missed several fire return intervals (Amell and Klug 2015, Buhl 2015) and are less likely to support dense stands of thermal cover. Also winter range snow depths are lower than many other winter ranges found in the State (e.g. Flathead NF) with an average winter precipitation of 2.7 inches, and range of 1.9 to 3.9 inches (NRCS 2013). As a result, project area winter range conditions more closely resemble those found on the Lolo NF, where elk utilized both open canopy (25 to 40 percent canopy closure) and closed canopy (i.e. greater than 40 percent canopy closure) forest (MFWP 2011b). So while the Forest Plan thermal cover is not being met, winter range conditions are considered adequate to support local populations of elk, as is indicated by the fact elk numbers have increased over time (MFWP 2005) and population numbers are at objective in Hunting District 281(MFWP - Elk Objective Status 2014, accessed online at http://fwp.mt.gov/fishAndWildlife/management/elk/).

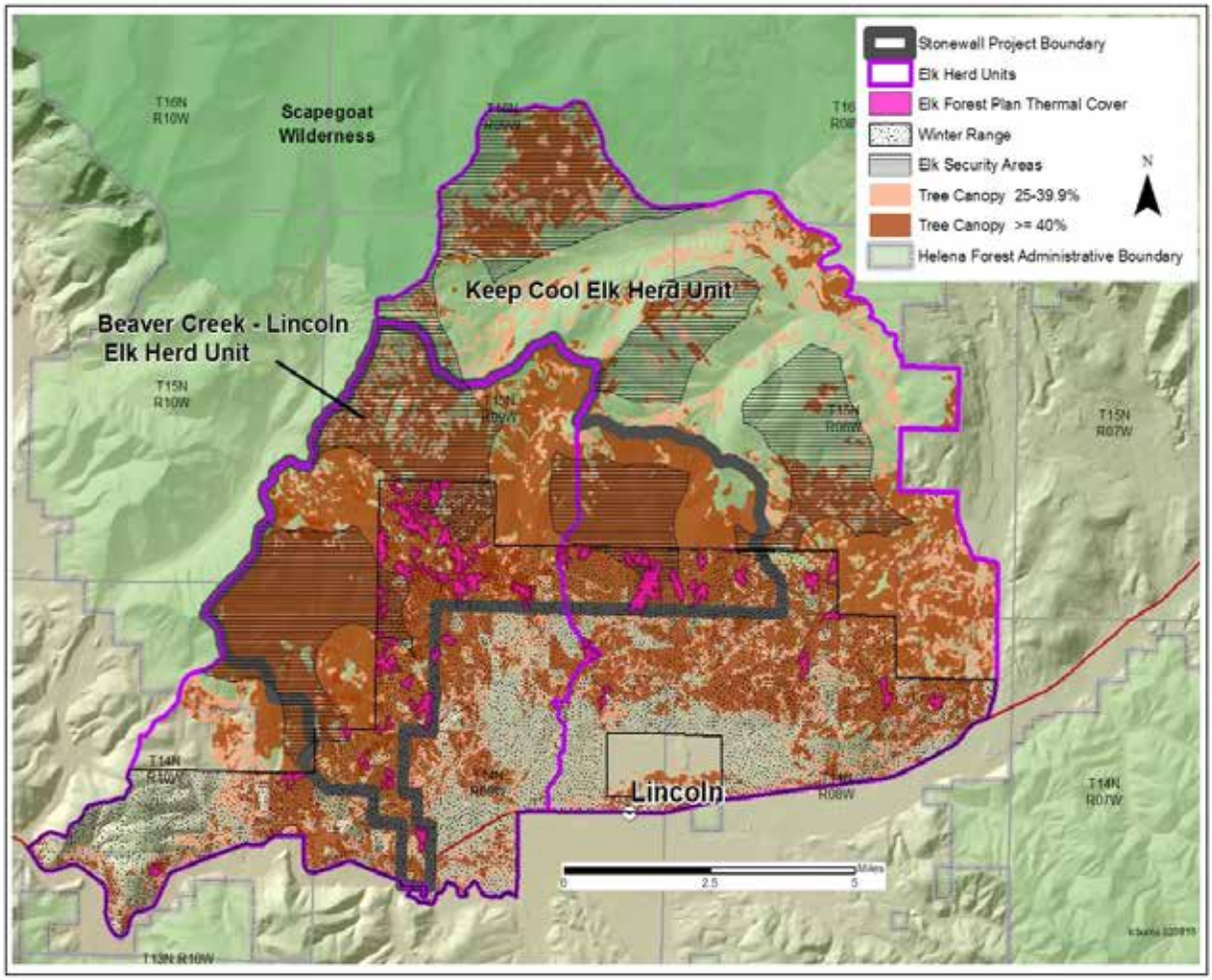


Figure 76. Elk winter range, thermal cover and security habitat

Open Road Density (Hunting Season)

The following addresses Forest Plan Standard 4a. For purposes of this analysis, Standard 4a is addressed as Open Road Density to avoid confusion with the Hillis et al. (1991) habitat security model which is also used in this analysis and addressed as elk security.

During hunting season, management of elk includes balancing the need to provide for and protect certain sex and age classes of elk and to provide hunting opportunities. While these parameters are a management function of the Montana Fish, Wildlife and Parks, the Helena National Forest strives to compliment these objectives through management of open road densities. Table 84 summarizes the Forest Plan standards based on the MFWP definitions and thresholds discussed above which are used in this analysis. Table 85 summarizes the amount of Forest Plan hiding cover by elk HU, associated road densities during the hunting season, and whether the current conditions meet the Forest Plan standards for hiding cover/open road densities (Plan Standard 4a).

Table 84. Forest Plan hiding cover/open road densities (Forest Plan Standard 4a)

Existing Percent Hiding cover[1](according to MFWP definition of hiding cover)	Max Open Road Density
80	2.4 mi/mi^2
70	1.9 mi/mi^2
60	1.2 mi/mi^2
50	0.1 mi/mi^2

Table 85. Elk herd unit data comparing hiding cover and open road density

Elk Herd Unit	Percent Plan Hiding Cover[1]	Total Square Miles	Open Road Miles[2]	Open Road Density
Beaver Creek	56	51	72.3	1.4
Keep Cool Creek	36	69	90.7	1.3

1 – From Table Elk 1

2 – Open roads during the hunting season

As shown in table 85, neither project area herd unit meets Forest Plan Standard 4(a), although it should be noted that even if all the roads in the Beaver Creek HU and over 50 percent of the roads in the Keep Cool Creek HU were closed, the low hiding cover values (described under summer range) would preclude the HU's from meeting Plan standard 4(a).

Hunting Season Elk Security

The relationship between open road densities and hiding cover serves as the basis for the Forest Plan standard 4(a), and while this relationship is important, it does not take into account the spatial arrangement and size of unroaded patches, weather driven road access, or foraging condition during any given autumn. Additionally it is not necessarily an accurate predictor of elk security during the hunting season. Conversely, stands that may not meet the definition of hiding cover may well prove to be secure areas for elk, given local conditions of topography, remoteness and vegetation structure (i.e. a heavy downfall) that make hunter access more difficult. Therefore hiding cover alone is not synonymous with security (Lyon and Canfield 1991, Unsworth and Kuck 1991, Lyon and Christenson 1992 and Christenson et al. 1993).

Security and vulnerability are often used interchangeably but actually reflect a causal relationship: when security is high vulnerability tends to be low, and vice-versa. Elk vulnerability to hunting results from an extremely complex relationship involving access, cover, topography, hunter density and weather (Christensen 1993). Security is the result of a combination of factors that allow elk to remain in the specific area while under stress from hunting. More specifically these are areas of coniferous cover large enough and far enough away from open roads to provide security. The "Hillis (1991) paradigm" provides these and can be used as a general guide (Christensen 1993). Hillis et al. (1991) concluded that maintaining greater than 30 percent of each herd unit as security areas with a minimum patch size of 250 acres and at least 0.5 miles from open roads (areas where elk can evade hunters), would slow the elk harvest rate and increase the probability that some bulls would be available for harvest even late in the season. Hillis et al. (1991) acknowledged that their model was most applicable on densely forested areas with steep topography and might be less applicable on more open forests. Christensen et al. (1993) suggests that roads more than any other factor affect hunting opportunity, suggesting the Hillis et al. (1991) model might be conservative. Also Burcham et al. (1999) concluded that where posted private

lands occur within a herd unit, many elk may move to private land during the hunting season in spite of there being large blocks of security on public lands.

Elk vulnerability during the hunting season is in part based on Hillis et al. (1991) (described above), and table 86 displays security habitat on lands greater than 250 acres that are further than 0.50 mile from an open road for the two project area herd units. Existing security habitat is displayed in figure 76. Currently, elk security is below the 30 percent value recommended by the Hillis Paradigm (Hillis et al. 1991).

Table 86. Existing elk security by herd unit

Elk Herd Unit	Total Acres	Security Habitat	
Beaver Creek	32,406	8,493 acres	26%
Keep Cool	44,325	11,828 acres	27%

Forage

As described in the habitat section (section 3.1), decades of fire suppression and conifer encroachment has reduced shrub and herbaceous vegetation, as well as mountain meadow habitat and aspen. Collectively this has resulted in a reduction in elk forage within both herd units. While lands burned in the Snow Talon and more recent wildfires have increased available forage, elk use in these areas is reduced due to the large reduction in cover. While available forage in these areas would continue to increase, very little transition habitat and winter range has been affected by recent fires. As a result, forage availability in these areas remains low and is expected to continue to decline.

Calving Areas/Transition Range

Although elk calving is known to occur within the project area there are no specific calving grounds or nursery areas identified within the project area (Shanley pers. comm. 2015). Suitable birthing areas are broadly distributed primarily at upper elevations within the project area. Although elk calving usually occurs on spring/autumn transitional ranges, it also occurs on upper reaches of winter range or on lower summer range (Toweill and Thomas 2002). In general, calving habitat depends largely on the availability of succulent and nutritious vegetation during the month long calving season (mid-May through mid-June). This in turn is related directly to the receding snowline and plant phenology as well cover and predator avoidance.

While different studies have shown variability in what constitutes elk calving habitat, other factors such as predation can influence behavioral patterns by elk including annual variability in calving sites. In recent years the return of wolves to the ecosystem has forced elk to change how they utilize the habitats available to them (Shanley pers. comm. 2015). Between 2007 and 2012 the wolf population in the area, and throughout much of western Montana (Bradley et al. 2013), expanded rapidly due to the abundance of prey and the prey's unfamiliarity with the predator. In response elk have changed their behavior patterns and habitat selection to reduce the risk of predation by wolves which has also likely influenced variability in calving site selection. For the past several years there have been two known wolf packs with territories overlapping the project area. Due to the continued presence of wolves in the project area it is anticipated that elk calving site selection within the project area will vary over time in response to wolf predation.

Transition range is used by elk when migrating between summer and winter range, and is commonly made up of habitats such as Douglas-fir, aspen/pine, and other communities intermixed with grassland or shrub communities. These transitional range habitats provide forage needed by elk to build fat reserves in the fall and to support calving in the spring. If winter range forage quality is typically poor, transitional

range can be extremely important in sustaining elk populations (NRCS 1999). Project area transition range occurs largely on mid-elevations habitats or generally mid- to upper-elevation elk winter range.

Management Areas

There are six Management Areas within the project area; of those, the Stonewall project contains three that have direction and standards relevant to elk habitat:

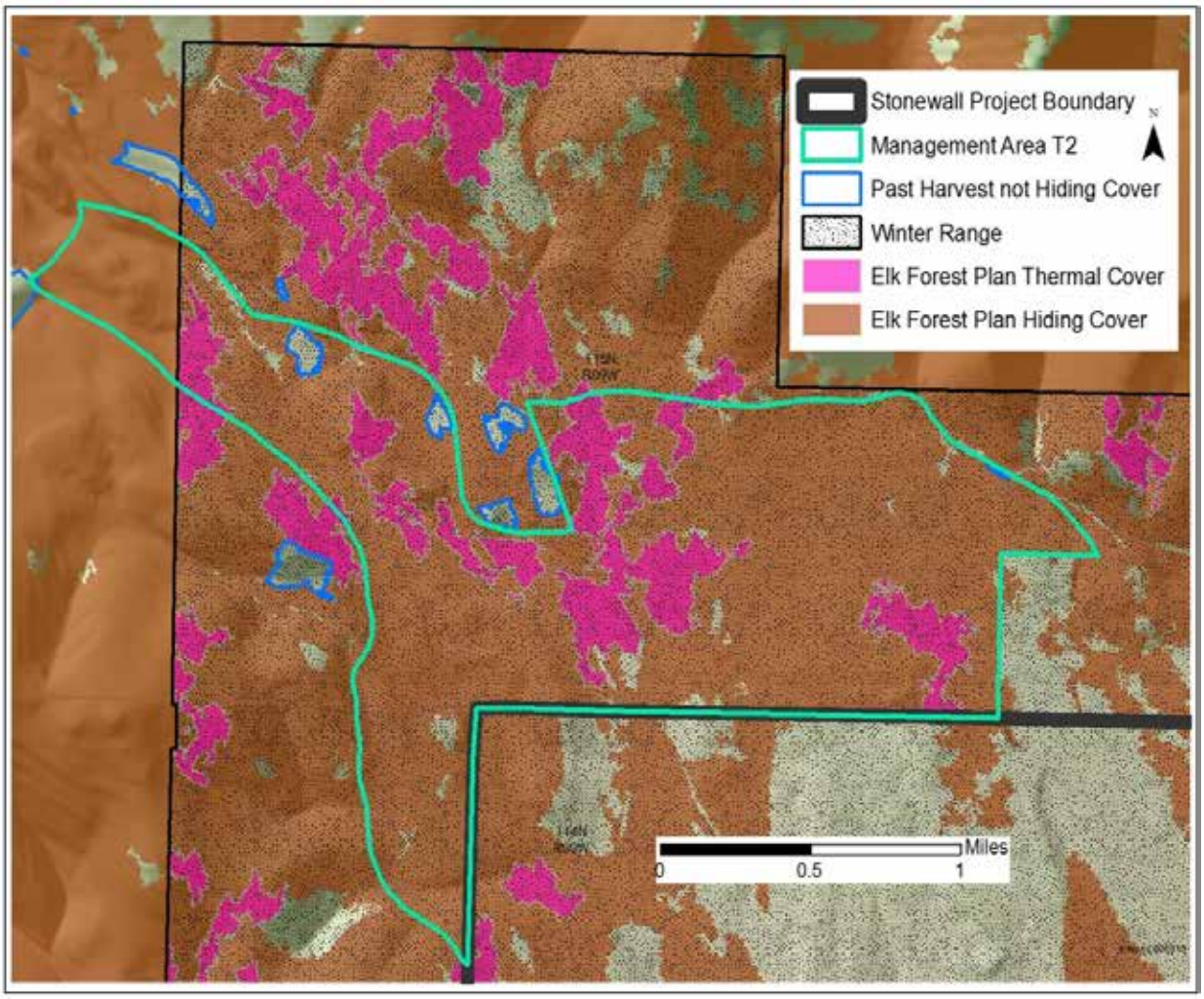


Figure 77. Management Area T-2: hiding cover, thermal cover on winter range; past harvest units not currently meeting hiding cover requirements

Management Area T-2

There are 2,184 acres of management area (MA) T-2 in the Beaver Creek herd unit (figure 77). Forest plan standards for wildlife in this MA include:

- Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game winter habitat.
- Maintain adequate thermal cover and hiding cover adjacent to forage areas. Generally this means providing 25 percent thermal cover on identified winter range.

- Openings created by timber harvest should meet hiding cover requirements of big game before adjacent areas can be harvested.
- Schedule sale activities outside winter periods (December 1 to May 15).
- No more than 25 percent of the timber-perimeter around natural or artificial parks should be nonthermal cover at one time.

Elk hiding cover is provided on 2,029 acres or 93 percent of MA T-2. There are 2,083 acres of elk winter range in MA T-2, with 276 acres or 13 percent in thermal cover. The MA is currently below the thermal cover standard on winter range. There are several openings created by timber harvest within this MA that do not meet the hiding cover requirements of big game. These are displayed in figure 77. There are no natural or artificial parks within the MA T-2 area.

Management Area T-3

There are 12,167 acres of MA T-3 in the Stonewall project area, in both the Beaver Creek and Keep Cool Creek HUs (figure 78). Forest plan standards for wildlife in this MA include:

- Wildlife habitat improvement practices, including road management, prescribed fire, and timber harvest, may be used to maintain and/or enhance the quality of big game summer habitat.
- Maintain a minimum of 50 percent hiding cover for big game, as determined by MFWP definition of hiding cover.
- Maintain thermal cover adjacent to forage areas. Appendix C provides guidance for thermal cover.
- Opeings created by timber harvest will be reforested to the extent necessary to meet the hiding cover requirements of big game before harvesting adjacent areas.

Hiding cover is found on 5,931 acres, or 49 percent, of MA T-3. This is below the standard. There are several openings created by timber harvest within this MA that do not meet the hiding cover requirements of big game displayed in figure 78.

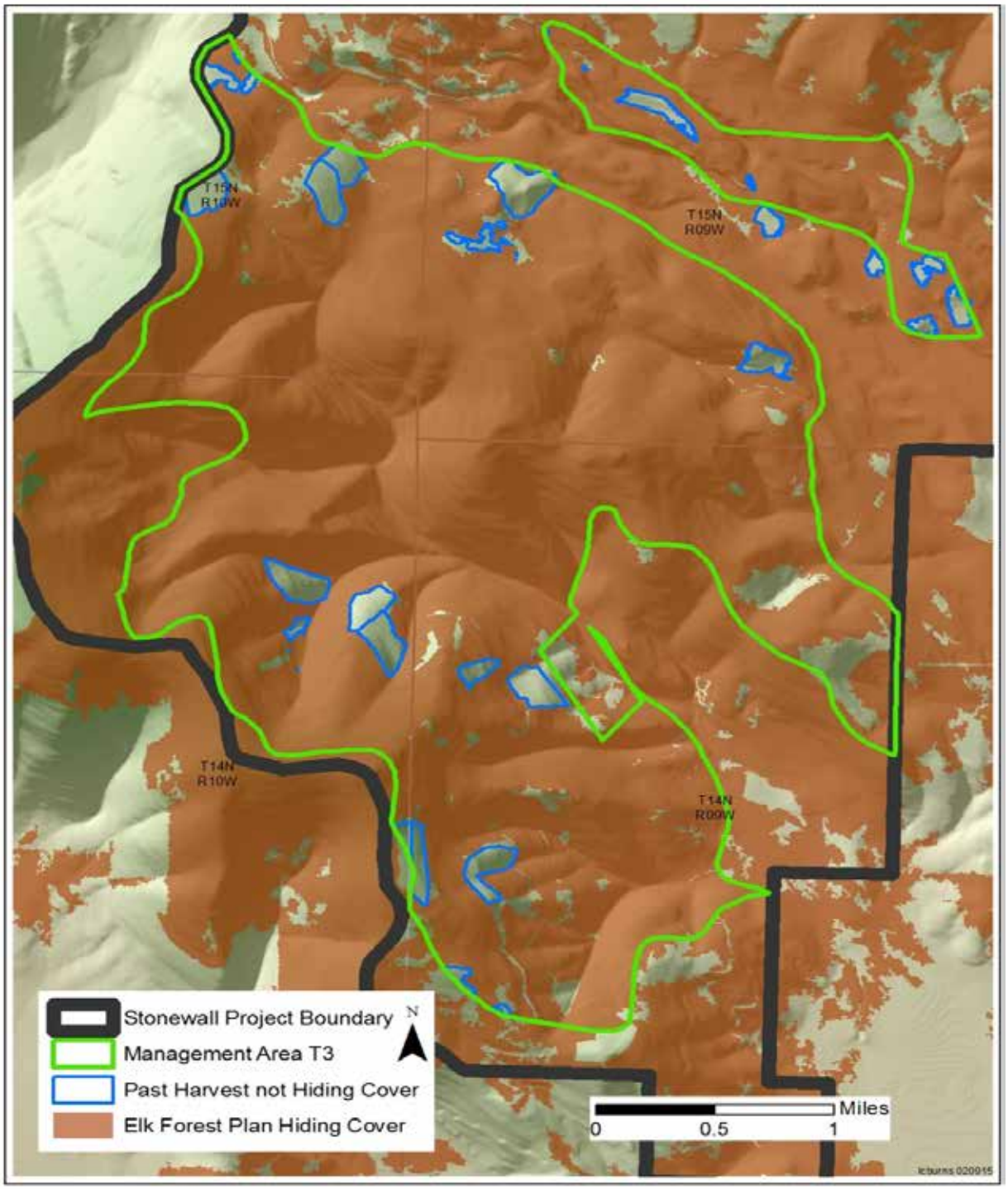


Figure 78. Management Area T-3: hiding cover and past harves units not currently meeting hiding cover requirements

Management Area W-1

Management area W-1 is found on 9,373 acres of the Stonewall project area (Figure 5). Forest plan standards for wildlife in this MA include:

- Wildlife habitat improvement practices, including road management, prescribed fire and other techniques, may be used to maintain and/or enhance the quality of big game and nongame habitat.
- Maintain adequate thermal and hiding cover adjacent to forage areas. Generally this means providing 25 percent cover, where available, on identified winter range.

There are a total of 4,163 acres (44 percent) of hiding cover in MA W-1. Winter range accounts for 198 acres of the MA, with 43 acres (22 percent) providing thermal cover; therefore the thermal cover standard is not met in the MA.

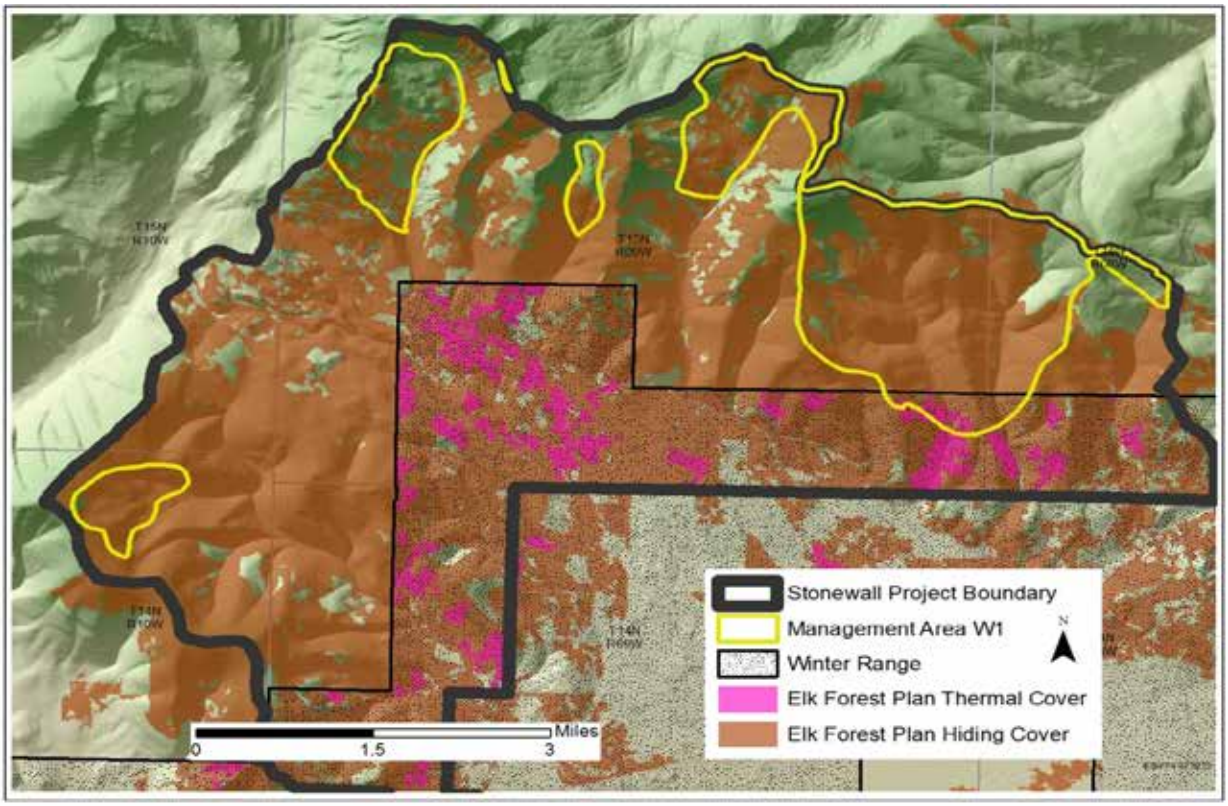


Figure 79. Management Area W-1: hiding cover and thermal cover on winter range

Mule Deer

Methodology and Analysis Area

Due to the variety of forest and nonforest communities utilized, virtually all of the Stonewall Project area provides suitable deer habitat. Like elk, effects are analyzed by looking at changes in cover and forage conditions on summer, winter and transition range and available mule deer cover is expected to be similar to that described for elk. Mule deer winter range and season-long use areas is based on MFWP range maps. Hiding and thermal cover models are based on R1-VMap data, whereas hiding and thermal cover models are described in the Criteria for Wildlife Models Helena National Forest Version June 2009 (USDA Forest Service 2009b).

Suitable habitat and use by deer is widespread. In Montana the average deer home range is less than 500 acres (Riley and Dodd 1984). As a result, and considering the project area contains year-round, winter and transition range, direct, indirect and cumulative effects are evaluated across the project area.

Species Status and Biology

Mule deer have a global ranking of G5 and a Statewide ranking of S5, indicating they are common, widespread and abundant. Although they may be rare in parts of their range, mule deer are not considered vulnerable (MNHP 2011).

Mule deer are habitat generalists, mobile, adaptive and wide ranging. As a result they use a wide variety of habitats from open to dense montane and subalpine coniferous forests, aspen, shrub communities and brushy areas. In summer they are widely distributed in forest and subalpine habitats, and in winter use lower-elevation, open, shrub-dominated areas (MNHP 2011). Within woody vegetation types, mule deer use all seral stages and do best in areas where there is a mix of seral communities.

Food habitats vary seasonally and by year. Preferred forage species include bitterbrush, mountain mahogany, chokecherry, serviceberry, grasses and forbs. Forbs are most important in summer, whereas shrubs are used year-round but are important in fall, winter and spring (MNHP 2011). Competition with elk can be significant because elk have a more varied diet and on shared range, mule deer are most often negatively impacted (MNHP 2011; Frisina et al. 2006).

Optimum deer habitat contains a mixture of forage and cover habitat that is well interspersed and generally, a mixture of 40 percent cover and 60 percent forage is considered optimum (Thomas 1979; Knight 2011). Available cover should include a combination of hiding, thermal and fawn rearing cover. Because deer cover and forage requirements are very similar to elk, the discussion of preferred hiding cover and forage for elk, would also apply to mule deer. Since deer are smaller, the height and density of vegetation suitable for cover (hiding and thermal) would be less than that required by elk (Thomas 1979). Also like elk, deer require water (particularly on summer range) (Julander 1966 *in* Thomas 1979) and optimum habitat occurs within approximately 0.5 mile of water (Mackie 1970 *in* Thomas 1979). Consequently riparian areas can be particularly important.

Fawning habitat for mule deer consists of foraging areas with hiding and thermal cover, and is typically on spring transition range with gentle slopes with abundant succulent vegetation within 600 feet of water. While many habitats are used for fawning and rearing fawns, those providing relatively large quantities of herbaceous vegetation are most important.

While deer numbers and herd health are affected by a number of factors, forage is often most limiting on carrying capacity (Knight 2011), particularly on winter range. Equally important to forage quantity is forage quality and reproduction and animal condition is best maintained if high quality (i.e., nutritious and palatable) forage is available. As a result, a combination of herbaceous and woody vegetation needs to be available.

Mule deer occupy nearly all habitats of the Lincoln Ranger District at nearly all elevations during summer and fall, although they are most abundant where large quantities of nutritious forage is available. Transition range is found at the lower elevations of the summer range and contains abundant grass and forbs, intermixed with the shrub and aspen communities.

Major impacts to mule deer habitat in northern forests include: (1) modification of vegetative structure, (2) decrease in nutritional quality of woody shrubs as they age, (3) modification of vegetation species composition, and (4) loss of usable habitat due to human encroachment and associated activities (Hayden et al. 2008).

Mule deer in Montana have a history of population fluctuations (see figure 80). These fluctuations vary among populations in response to environmental conditions and may reflect general, long-term changes in

distribution and demographics, periodic fluctuations, year to year fluctuations, and season to season changes within years (Mackie et. al. 1998 p. 110).

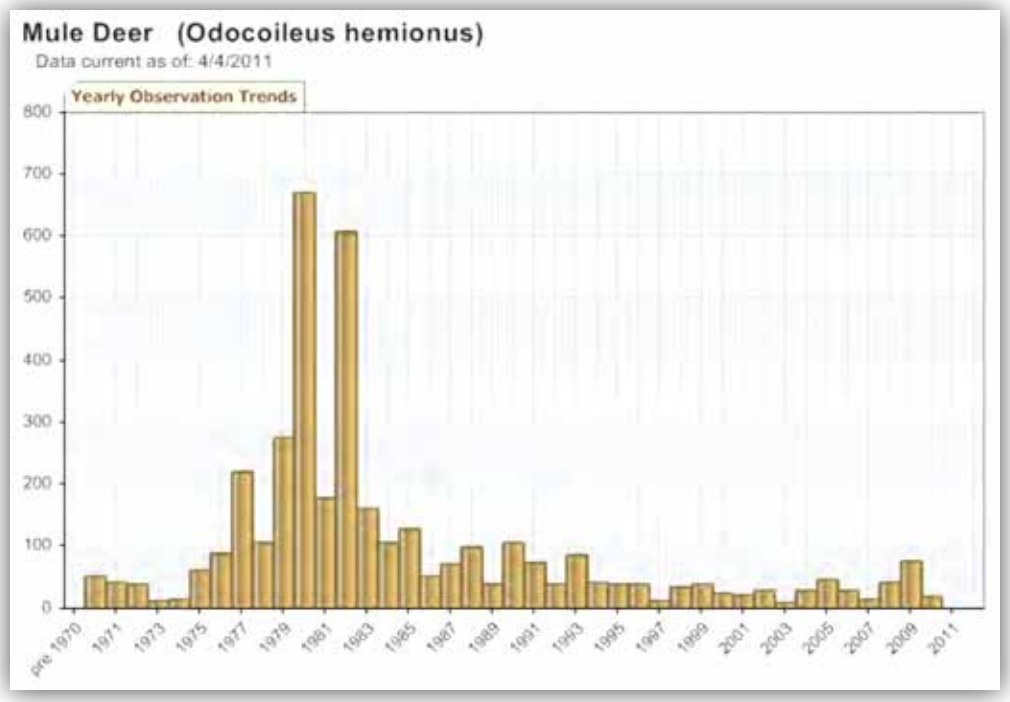


Figure 80. Mule Deer Fluctuations in Montana from 1970 to 2011 (Montana Field Guide)

Mule Deer Project Area Habitat

The project area includes a mixture of mature and regenerating forest interspersed with nonforest (on NFS and adjacent private lands), therefore, all of the project area provides deer habitat. Spring, summer and fall range occur on approximately 85 percent of the project area, although some of this is also utilized in the winter, whereas winter/yearlong range occurs on approximately 15 percent (MDFWP 2005-GIS distribution layer). While canopy cover has been reduced due to recent MPB mortality, like elk, standing dead trees continue to provide hiding cover. As a result cover is widespread and approximately 80 percent of the project area contains hiding cover (See figure 81). Of this over 99 percent is on NFS lands. The availability of thermal cover is reduced due to the more open ponderosa pine stands occurring at lower elevations. Also, while pre-kill data is used to identify existing thermal cover, cover in areas with concentrated mortality would be expected to decline in the next 10 years as mortality continues and trees fall to the ground. Currently, thermal cover exists on 492 acres or 14 percent of the project area mule deer winter range (See figure 81).

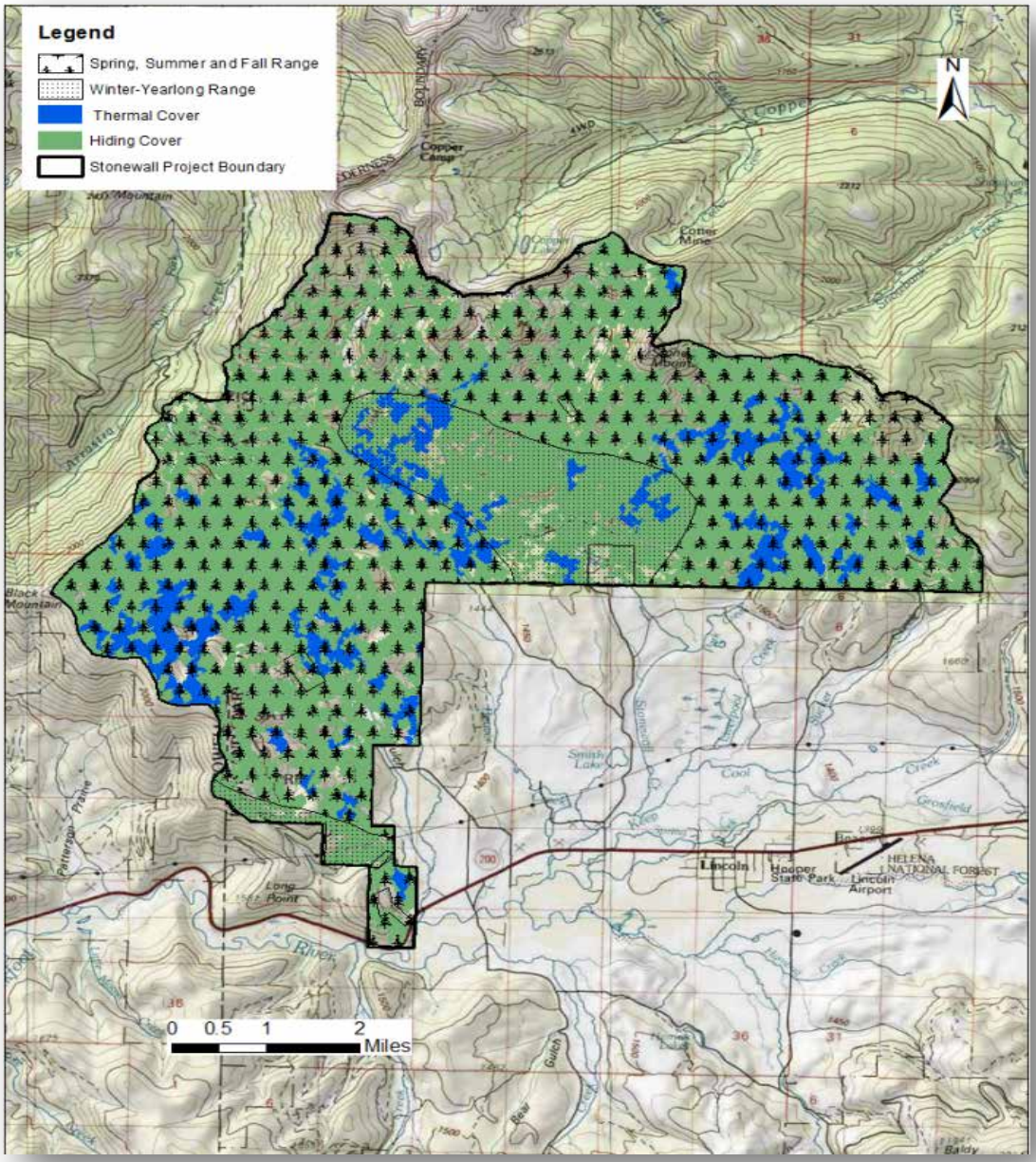


Figure 81. Mule deer range and cover within the project area

While there has been very little regeneration harvest in the last 15 years, some regenerated stands, particularly at lower elevations still contain higher quantities of deer forage, although early successional forage would continue to decline. Overall, due to fire suppression increasing stand density and conifer encroachment, aspen as well as understory diversity (grasses, forbs and shrubs) have been declining within forested stands. Conifer encroachment has also reduced shrub and herbaceous diversity in nonforest habitats. Finally in the absence of fire, there is little shrub regeneration and many existing shrubs, particularly on transition and winter ranges are becoming decadent. Collectively these conditions have contributed to a reduction in forage across much of the project area. Conversely, forage has increased on approximately 365 acres that recently (since 2003) burned by wildfire. Forage would also

increase over time in areas where MPB have opened up the forest canopy, although conifer encroachment and elevated levels of downed woody debris may reduce the availability of forage for deer (Hayden et al. 2008).

In summary, while deer hiding cover is widespread due to the more open stand conditions that exist and MPB mortality, thermal cover within deer winter ranges is presently low and would continue to decline. While forage availability has been improved on summer range affected by wildfire, forage on winter and transition range, as well as most of the summer range has been reduced due to increased conifer encroachment and the absence of fire.

Migratory Birds

Methodology and Analysis Area

Migratory birds use diverse habitat conditions; therefore, existing habitat and environmental effects are primarily addressed in the assessment of the habitat conditions under the biophysical settings discussed in section 3.1. Additionally the bald eagle, black-backed woodpecker, flammulated owl, northern goshawk, and pileated woodpecker are priority I and II species in Montana; and the needs of migratory birds are also addressed in the analysis provided for these species. As a result, migratory birds are collectively addressed through the habitat and species-specific sections of this document.

While the analysis areas vary somewhat by species, generally, because bird use is determined by both site-specific and landscape considerations, direct and indirect effects to migratory birds are evaluated across the project area, whereas cumulative effects are evaluated across the combined boundary.

Migratory Bird Treaty Act

In December 2008, the Forest Service entered into a memorandum of understanding (MOU) with the United States Department of Interior (USDI) Fish and Wildlife Service on the Migratory Bird Treaty Act to further clarify agency responsibilities (USDA Forest Service and USDI Fish and Wildlife Service 2008). Four key principles embodied in the MOU direct the Forest Service to (1) focus on bird populations; (2) focus on habitat restoration and enhancement where actions can benefit specific ecosystems and migratory birds dependent on them; (3) recognize that actions taken to benefit some migratory bird populations may adversely affect other migratory bird populations; and (4) recognize that actions that may provide long-term benefits to migratory birds may have short-term impacts on individual birds. The parties agreed that through the NEPA process, the Forest Service would evaluate the effects of agency actions on migratory birds, focusing first on species of management concern along with their priority habitats and key risk factors.

Migratory birds are included under the Migratory Bird Treaty Act (MBTA) and incorporate most species of birds present in the project area. Executive Order 13186 directs departments and agencies to take certain actions to further implement the MBTA. Specifically, the Order directs federal agencies, whose direct activities will likely result in the “take” of migratory birds, to develop and implement a memorandum of understanding with the U.S. Fish and Wildlife Service that shall promote the conservation of bird populations. Under Executive Order 13186, the U.S. Fish and Wildlife Service is responsible to ensure that environmental analyses of federal actions evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.

In general, most birds migrate to some degree, including seasonal movements from higher to lower elevations within the same geographic region. The three most referenced groups of migratory birds are waterfowl, raptors, and neo-tropical migrants. Birds protected under the act include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts,

martins, swallows and others, including their body parts (feathers, plumes etc.), nests, and eggs. A complete list of protected species is found at 50 CFR 10.13.

Project Level Migratory Birds

The Helena National Forest has participated in the Region One Landbird Monitoring Program in partnership with the Avian Science Center (ASC) at the University of Montana. Habitat and distribution surveys have been conducted for landbirds from 1994- 2008. The USFS Northern Region Songbird Monitoring Program (Hutto and Young 2002) has provided data on population trends, habitat relationships, and effects from past management activities for birds breeding in western Montana. According to Hutto, "There are not nearly enough years of data to make meaningful use of our population trend data yet, but the preliminary data suggest that most populations have remained fairly stable during the 12-year period from 1994-2006" (See http://avianscience.dbs.umt.edu/projects/trends.php).

The project area contains three bird point count transects that were monitored from 1994-2004. Over 1,000 bird observations were made during this period. Table 87 identifies those birds identified as part of the Landbird Monitoring Program, the number of observations and preferred habitat. As described previously, migratory birds are also addressed through the habitat analysis presented.

Table 87. Project area migratory birds

Bird Species[1]	Habitat	Bird Species[1]	Habitat
American Crow (4)	Open Lands	Mountain Bluebird (3)	Grassland/Shrub
American Dipper(4)	Riparian	Mountain Chickadee (56)	Dry Forest
American Goldfinch (1)	Grassland/Shrub	Northern Flicker (22)	Snags
American Robin (54)	Generalist	Olive-sided Flycatcher (1)	Cool Moist Forest
Bank Swallow (1)	Riparian	Orange crowned Warbler (1)	Riparian
Barred Owl (1)	Cool Moist Forest	Osprey (1)	Riparian/Open Water
Black-capped Chickadee (1)	Dry Forest	Pileated Woodpecker (3)	Snags
Brown headed cowbird (12)	Forest Edge	Pine Siskin (94)	Dry Forest
Brown Creeper (1)	Dry Forest	Red-breasted Nuthatch (49)	Snags/Forest
Canada Goose (1)	Riparian/Open Water	Red-winged Blackbird (9)	Riparian
Cassin's Vireo (5)	Dry Forest	Red-naped Sapsucker (3)	Snags/Riparian Forest
Chipping Sparrow (27)	Dry Forest	Ruby Crowned Kinglet (130)	Dry Forest
Clark's Nutcracker (7)	Dry Forest	Ruffed Grouse (14)	Young Forest
Common Nighthawk (1)	Dry Forest	Song Sparrow (17)	Riparian
Common Raven (42)	Generalist	Swainson's Thrush (24)	Dry and Cool Forest
Common Yellowthroat (22)	Riparian	Towensend's Warbler (52)	Dry and Cool Forest
Dark-eyed Junco (103)	Generalist	Tree Swallow (7)	Grassland/Edge
Dusky Flycatcher (15)	Dry Forest	Varied Thrush (18)	Dry and Cool Forest
Fox Sparrow (4)	Forest Edges	Warbling Vireo (25)	Riparian
Golden-crowned Kinglet (10)	Spruce Fir Forest	Western Tanager (9)	Dry Forest
Gray Jay (3)	Cool moist/subalpine Forest	Williamson's Sapsucker (3)	Snags, Dry Forest
Great Blue Heron (3)	Riparian/Open Water	Willow Flycatcher (5)	Riparian
Hairy Woodpecker (5)	Snags/Aspen	Wilson's Snipe (8)	Riparian
Hammond's Flycatcher (3)	Cool moist forest	Wilson's Warbler (5)	Riparian/Shrub

Bird Species[1]	Habitat	Bird Species[1]	Habitat
Hermit Thrush (8)	Cool Moist Forest	Winter Wren (2)	Forest Riparian
Lincoln's Sparrow (6)	Grassland/Shrub	Yellow-rumped Warbler (46)	Forest Generalist
MacGillivray's Warbler (13)	Shrubland	Yellow Warbler (64)	Riparian Forest
Mallard (1)	Riparian/Open Water		

1 – number in parenthesis is the number of observations for that species.

The project area provides diverse, well-distributed habitats for a variety of bird species. Some species are positively affected by land management while others are negatively affected. Hejl and others (1995) recommend a bird conservation strategy composed of three parts: (1) maintain, mimic, and restore natural vegetation patterns and processes; (2) ensure that the specific habitat components required by focus species are created and/or maintained; and (3) monitor the habitats and individual species.

The U. S. Fish and Wildlife Service is responsible for identifying migratory non-game birds that, without conservation actions, are likely to become candidates for listing under ESA. To that end, the Service identifies birds of conservation concern by region (USDI Fish and Wildlife Service 2008). The Stonewall Project area falls within Bird Conservation Region (BCR) 10, which includes 22 species. Of these, nine species have been documented in or near the project area or the project area provides suitable habitat. Table 88 identifies these species, their preferred habitat conditions and where environmental effects are assessed.

Table 88. Project area birds of conservation concern

Species	General Habitat Summary[1]	Environmental Consequences Assessed
Bald Eagle	Prefer late successional forests and shorelines adjacent to open water lakes and rivers.	Sensitive Species – Bald Eagle
Flammulated Owl	Mature forest with open canopy. Avoids dense young stands. Usually open conifer forests containing pine, with some brush or saplings. Shows strong preference for ponderosa pine.	Sensitive Species – Flammulated owl
Calliope Hummingbird	Seral shrublands and forest openings to moderate elevation in the mountains. Use re-growth from 8 to 15 years after logging or fire.	Habitats – Meadows and Shrubland
Williamson's Sapsucker	Middle to high elevations in montane spruce-fir, Douglas fir, lodgepole and ponderosa pine forests. Also in mixed deciduous/coniferous forest with aspen. Favors nest sites adjacent to open ponderosa pine forests. Restricted to large diameter trees and snags for nesting, except in aspen.	Habitats – Snag and downed wood; MIS-Pileated Woodpecker
Lewis's Woodpecker	Primarily breeds in open ponderosa pine forest, burned coniferous forest and open riparian woodlands. Occupy burned habitats after a shrub understory is established	Habitats – Dry Forest
Olive-sided Flycatcher	While they may occur in forested openings (e.g., disturbed areas), or open forests with low canopy cover. They are adapted to fire dependent landscapes and most often associated with post-fire habitat. Common in spruce and aspen but uncommon in mixed conifer or ponderosa pine.	Habitats – Cool, Moist Forest and Aspen
Willow Flycatcher	Breed in riparian habitat that has a mid-story of willows or alders and an intact shrub layer. Shrubs are often	Habitat - Riparian

Species	General Habitat Summary[1]	Environmental Consequences Assessed
	interspersed with openings.	
Brewer's Sparrow	Associated with shrublands, primarily sagebrush. Prefer unburned to burned habitat.	Habitats – Meadows and Shrubland
Cassin's Finch	Prefers open dry coniferous forests with mature lodgepole and ponderosa pine but will utilize Douglas fir or mixed coniferous forest. Post-fire and heavily logged sites used extensively.	Habitats – Dry and Cool, Moist Forest

1 – Habitat information taken from Montana Partners in Flight (2000)

Environmental Consequences

Methodology

Information used in the effects analysis includes aerial photographs, stand exam data, Northern Region Vegetation Mapping Project (R1-VMAP) data, field surveys and photos, data collected from project field visits and research literature including species and regional conservation assessments. Because this assessment involves a multi-scale analysis, Geographical Information System (GIS) coverages and data sets for vegetation stand and landscape structural characteristics, past management activities, stream, riparian and aquatic data, wildfire activity, national and state wildlife documentation databases and district and Forestwide observation data and surveys were collectively used to assess wildlife habitat conditions and effects.

This section discusses effects of individual treatments, alternative effects and effects to species and habitats evaluated in detail (table 90). Because anticipated effects are based upon implementation of project design features, design features specific to wildlife are also presented.

Project Design Features

The Stonewall Vegetation Project has been designed with features that are intended to minimize or avoid potential adverse effects while meeting project objectives. Project design features apply to both action alternatives. A description of the project design features relating to wildlife and other resources is displayed table 9, chapter 2.

All anticipated effects are based on implementation of the following wildlife project design features. Table 89 identifies project-specific pdfs related to wildlife and the estimated effectiveness of each design feature.