Hazard Tree Removal Project

Biological Evaluation[1]

Brush Creek/Hayden and Laramie Ranger Districts, Medicine Bow-Routt National Forest

Version 01/31/2008

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Meets the standards for both a Biological Evaluation (FSM 2672.42) and Biological Assessment (50 CFR 402.12(f)).

I. INTRODUCTION

The purpose of this biological evaluation is to analyze and determine the likely effects of the alternatives on Forest Service sensitive species (FSM 2670.31-2670.32).

Forest Service policy requires that a review of programs and activities, through a biological evaluation (BE), be conducted to determine their potential effect on sensitive species (FSM 2670.3). Preparation of a Biological Evaluation as part of the NEPA process ensures that TEPS species receive full consideration in the decision-making process.

The purpose of this biological evaluation is to determine the likely effects of the proposed action and no action on Forest Service sensitive species (FSM 2670.31-2670.32). The best available science was used in analysis, including references at the end of this document and in the recent revision of the Forest Plan.

This biological evaluation includes Forest Service Region 2 sensitive terrestrial wildlife species. Evaluation of aquatic and plant species is included in other specialists' reports.

II. DESCRIPTION OF THE PROPOSAL

Much of the following information was taken directly from the scoping statement that advised the public of this hazard tree project. The descriptions below are part of the environmental baseline for the analysis area.

The Hazard Tree Analysis Area (AA) includes all of the Medicine Bow-Routt National Forests. However, all Wilderness areas and the Medicine Bow's Laramie Peak area will not include any proposed activities. This report addresses USFS Region 2 Sensitive Species for the Medicine Bow Forest portion of the analysis area. The Routt National Forest portion of the analysis area is addressed in separate reports. The Medicine Bow Forest analysis area is dominated by lodgepole pine and spruce/fir, 44% and 18%, respectively, of the 1,084,614 acres on the Forest.

Table 1. Habitat structure stages by cover type.

	Acres in Habitat Structure Stage									
Cover Type	**0**	**1**	**2**	**3a**	**3b**	**3c**	**4a**	**4b**	**4c**	**5**
Aspen	0	3,168	1,896	15,809	17,245	8,003	14,822	13,427	5,009	4,307
Cottonwood	0	0	0	84	25	41	122	128	7	0
Douglas-fir	0	131	0	232	359	1,403	2,407	2,678	1,525	1,561
Gambel oak	0	0	0	0	43	0	0	0	0	0
Limber pine	0	54	270	5,870	759	200	2,896	1,160	177	246
Lodgepole pine	0	13,561	41,645	44,307	64,861	87,408	39,758	86,858	54,329	39,849
Ponderosa pine	0	4,284	446	2,685	2,985	976	43,250	32,197	7,046	2,080
Spruce/fir	0	4,766	8,899	15,260	6,270	3,854	30,579	41,537	28,037	52,493
Juniper	0	0	0	154	0	0	89	0	0	0
Total Forested	**0**	**25,964**	**53,157**	**84,401**	**92,546**	**101,885**	**133,924**	**177,985**	**96,132**	**100,53**

										7
HSS as % of Total Forested	**0**	**3.0%**	**6.1%**	**9.7%**	**10.7%**	**11.8%**	**15.5%**	**20.5%**	**11.1%**	**11.6%**
HSS as % MBNF for Forested		**2.4%**	**4.9%**	**7.8%**	**8.5%**	**9.4%**	**12.3%**	**16.4%**	**8.9%**	**9.3%**
Total Non-forested	**10,593**	**76,551**	**130,537**	**2**	**2**	**72**	**250**	**35**	**36**	**4**
HSS as %MBNF for Non-Forested	**1.0%**	**7.1%**	**12.0%**	**<0.1%**	**<0.1%**	**<0.1%**	**<0.1%**	**<0.1%**	**<0.1%**	**<0.1%**
Total	**10,593**	**102,515**	**183,693**	**84,403**	**92,549**	**101,958**	**134,174**	**178,020**	**96,168**	**100,541**
HSS as % of Total	**1.0%**	**9.4%**	**16.9%**	**7.8%**	**8.5%**	**9.4%**	**12.4%**	**16.4%**	**8.9%**	**9.3%**

0 –non-vegetated, 1-grass-forb, 2-shrub-seedling, 3a-low density sapling-pole, 3b medium density sapling-pole, 3c high density sapling-pole, 4a-low density mature, 4b-medium density mature, 4c high density mature, 5-old forest.

Past Timber Harvest

There has been harvest in some portions of the Medicine Bow National Forest in the past. Vegetation changes caused by these actions and the subsequent regeneration are reflected in the existing condition (Table 1). However, some harvest units from the Ryan Park-Tenmile, Box Canyon, Blackhall/McAnulty, Singer Peak, Cottonwood Rim, Soldier Summit, French Creek, Silver Run, White Rock Estates, and Devil's Gate projects and the proposed Spruce Gulch project have not yet been treated, so these habitat changes are not reflected in the existing condition (Table 1). Future habitat changes caused by these projects are included in the cumulative effects analysis for the appropriate sensitive species.

Livestock Grazing

There are numerous cattle allotments across the Forest and several bands of domestic sheep grazing on the Sierra Madre range.

Recreation

Details about recreation across the Forest are included in the Specialist's report for recreation.

PURPOSE & NEED:

The description of the purpose and need is provided directly from the public scoping letter. The HFRA recognizes healthy forests or forest health as an integral part of forest management. The Proposed Action responds directly to forest health objectives as described in the HFRA.

The purpose of this project is to manage forest vegetation affected by the mountain pine beetle epidemic while reducing threats to public safety by felling and/or removing trees that are dead and dying along roads and trails, within and adjacent to Forest Service developed recreation sites (campgrounds, trailheads, etc.), and within and adjacent to Forest Service administrative sites of the Medicine Bow-Routt National Forests.

The project is needed to:

- Ensure public and firefighter safety by keeping travel corridors open with adequate clearance for the combination of traditional firefighting equipment, such as heavy equipment transport trucks, crew

carriers, busses, fire engines, recreational vehicles, and automobiles. The combination of such is typical during an emerging fire emergency when fire resources are arriving and the general public is evacuating.

- Reduce the hazard to public safety due to the risk of dead and dying trees falling;
- Reduce the risk of high intensity/high severity wildfires within treatment areas by reducing hazardous fuel loadings associated with treatments and beetle killed trees;
- Maintain and/or reduce the effects of tree mortality on the overall health, scenic quality, and condition of forested areas along roads, developed recreation sites, and administrative sites; and
- Salvage forest products in a timely manner to partially offset the cost of treatments.

PROPOSED ACTION:

Under the Modified Proposed Action, standing dead and dying trees that are within 1 ½ tree heights (up to 150 feet) from the centerline of: 1) state and county roads that cross the Forest; and 2) Forest Service system roads open to public travel (Maintenance levels 2 – 5) would be felled and/or removed. Standing dead and dying trees in and adjacent to Forest Service campgrounds, administrative sites, and Forest Service trailheads would also be felled and/or removed; standing dead and dying trees would be felled, but not removed, along Forest Service trails. Healthy, stable, live trees and dead and dying trees leaning away from the roads and trails and other aforementioned sites would be retained unless the dead trees pose a safety hazard in the felling/removal operation. Standing dead and dying trees would not be felled and/or removed within Wilderness Area boundaries.

The majority of the treatments would impact lodgepole pine trees, although small amounts of Engelmann spruce, sub-alpine fir, and aspen could also be felled and/or removed. Depending on the severity of the infestation and the resultant mortality, harvest treatments could include clearcutting, patch clearcutting, overstory removal, thinning, and group selection. In these situations, forest products would be removed (where feasible) or fuels would be treated on site. Fuel treatments could include chipping, lopping and scattering slash to an 18 or 24 inch depth, roller chopping, machine trampling, and/or broadcast burning. Hand piling, pile burning or mulching may occur in select units to mitigate fuels or visual concerns. Small personal use sales, Forest Service Crews, Service contracts, timber sales, and Stewardship contracts could be used to remove the hazardous trees.

Design criteria would be applied to protect sensitive areas, such as streamside management zones (see Appendix A). Priority for scheduling treatment would be determined by the severity of bark beetle infestation, mortality of trees, and the severity of safety hazard posed.

ALTERNATIVE 1– NO ACTION

Under the No Action alternative, standing dead and dying trees along state and county roads within the Forest boundary and along NFSRs would not be felled and/or removed. Standing dead and dying trees in and adjacent to Forest Service campgrounds, trailheads, and administrative sites would also not be removed. No attempt would be made to respond to the purpose of and need for the proposal.

Expectations are that emerging pine beetles from the existing epicenters will continue to spread into, and attack green, standing lodgepole pine. The outbreak has the potential to affect thousands of acres of lodgepole-dominated forests across the Forest.

Figure 1. Proposed Treatment on the Sierra Madre Range

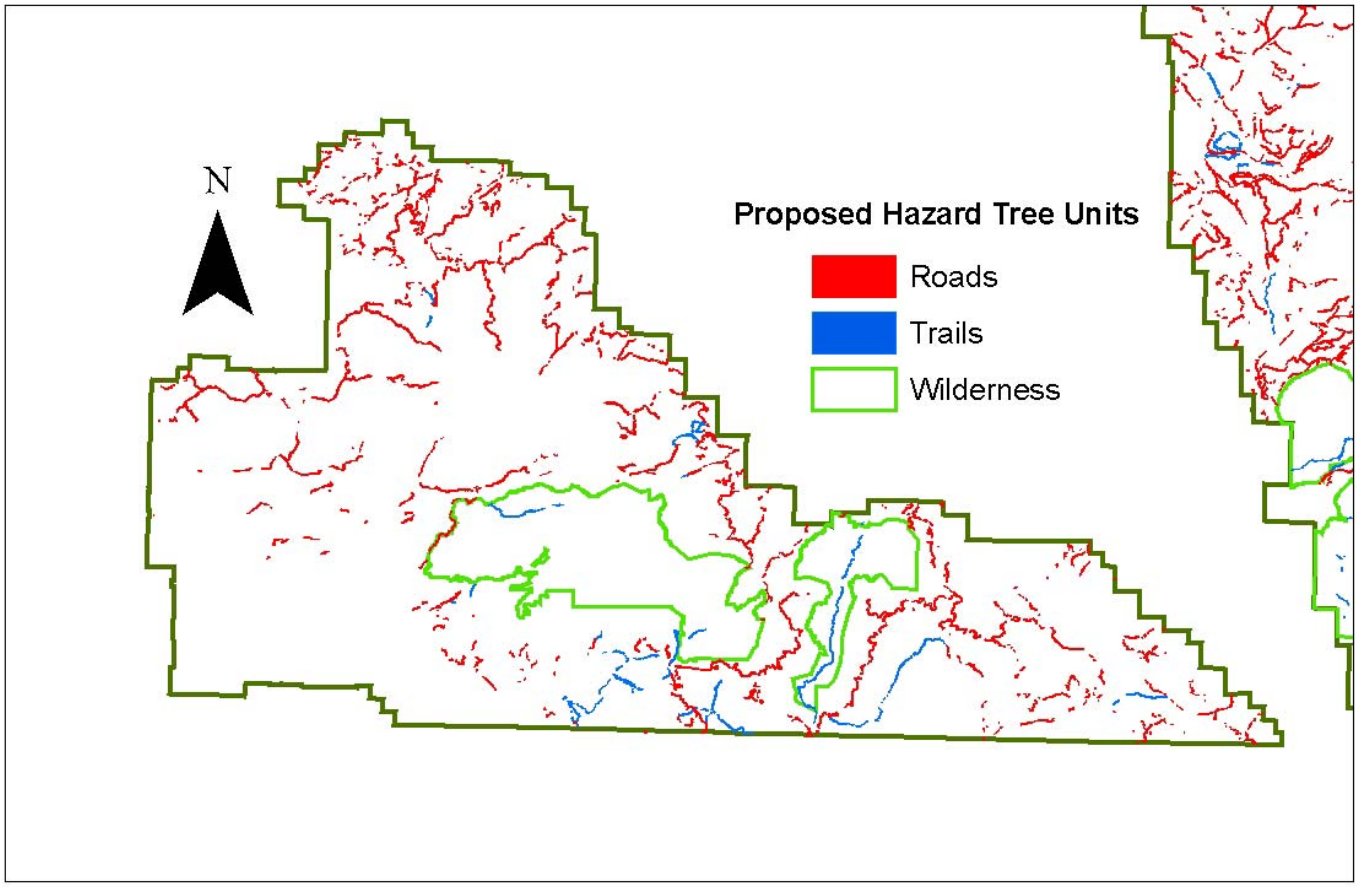
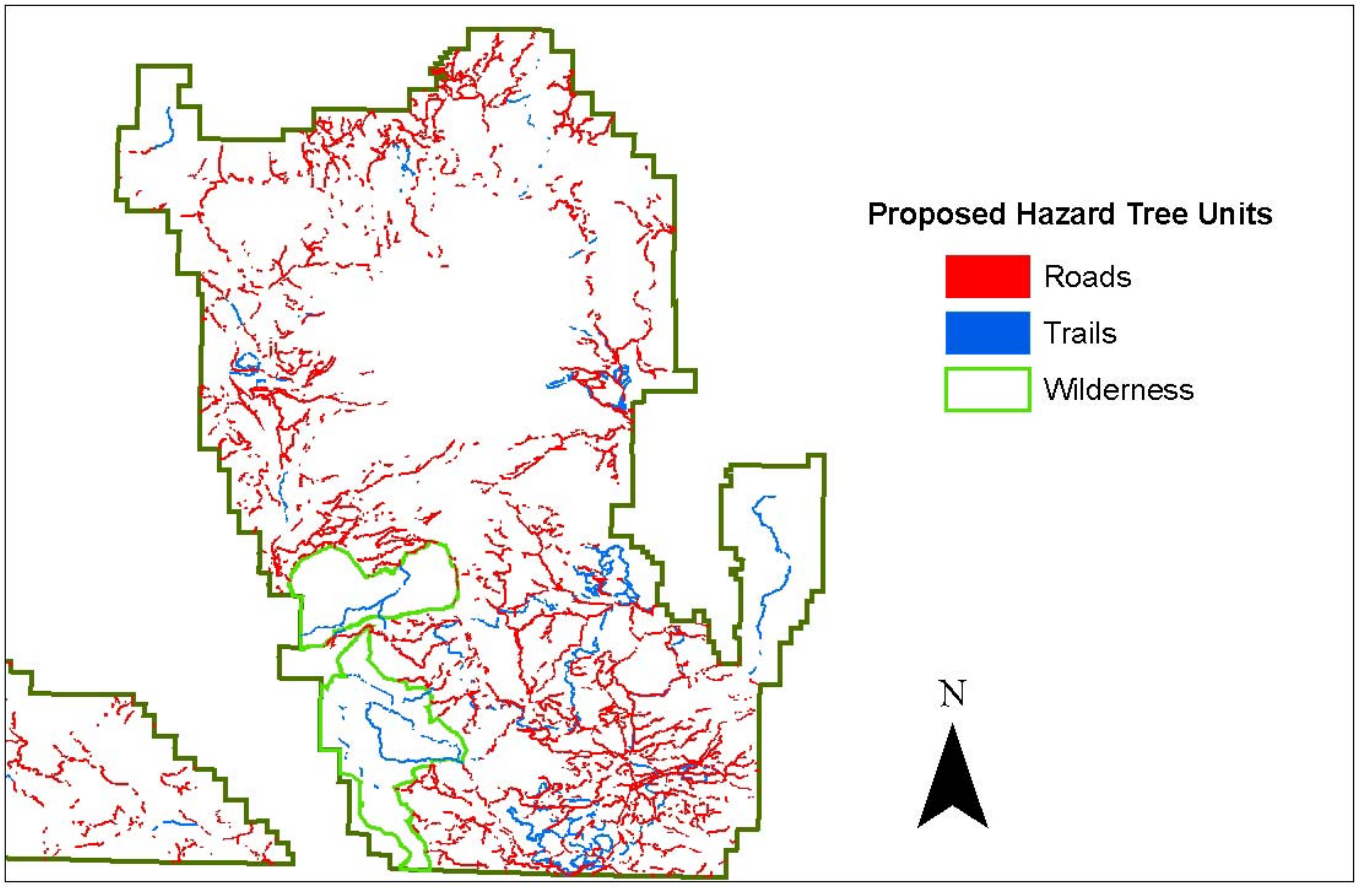


Figure 2. Proposed Treatment on the Snowy Range



III. SPECIES CONSIDERED AND THEIR STATUS

BIOLOGICAL EVALUATION

ANALYSIS OF EFFECTS – SENSITIVE SPECIES

District records including the FAUNA database, Wyoming Natural Diversity Database records (WyNDD 2007), the Atlas of Birds, Mammals, Amphibians and Reptiles in Wyoming (Cerovski et al. 2004), A conservation plan for bats in Wyoming (Hester and Grenier 2005), Partners in Flight (Nicholoff 2003), the Biological Evaluation and FEIS for the Forest Plan revision (USDA 2003), the USFS Region 2 websites for Species Evaluations and Rationale and Species Assessments Reports (USDA 2003-2007) were examined. The Region 2 website also includes a table of sensitive species by the Forest where these species occur. This table (USDA 2007) was also used to examine sensitive species for further evaluation.

All Region 2 terrestrial wildlife sensitive species were considered for inclusion in analysis (Table 2). Those sensitive species that may be affected directly, indirectly, or cumulatively by proposed actions were selected for further analysis. Other species were not selected for further analysis because: 1) suitable habitat, elevation, or range/distribution does not exist for the species in the project area, including those identified in USDA (2007) or 2) the type or intensity of the activity in the proposed actions is expected to have no impact to the species or its habitat. **Note: Amphibian, fish, and plant species are considered in separate biological evaluations prepared by the Fisheries Biologist and Botanist, respectively.**

Existing condition and limiting factors information for each sensitive species were extracted from the FEIS Biological Evaluation (Appendix I) for the revision of the Medicine Bow Land and Resource Management Plan. This Biological Evaluation is identified as USDA (2003) throughout this analysis.

Table 2. Rocky Mountain Region Sensitive Species (**Terrestrial Wildlife**).

Common Name	Habitat*	Selected
BIRDS		
American bittern *Botaurus lentiginosus*	Marshes. Does not exist on Forest (USDA 2007).	No-1
Trumpeter swan *Cygnus buccinator*	Marshes, lakes, rivers. Does not exist on Forest (USDA 2007).	No-1
Harlequin duck *Histrionicus histrionicus*	Rivers, lakes in mountainous areas. Does not exist on Forest (USDA 2007).	No-1
Bald eagle (*Haliaeetus leucocephalus)*	Lakes, Rivers.	No-2, habitat not affected by proposed activity. No proposed action sites overlooking lakes or rivers.
Northern goshawk *Accipiter gentiles*	SF,AS,LPP,RIP	**Yes**
Ferruginous hawk *Buteo regalis*	MS,FM,SS, 4500 – 7500 ft elevation (Nicholoff 2003)	No-1, beyond elevation range
American peregrine falcon *Falco peregrinus anatum*	RO 50-200ft high, SS near RO, 4500-9000 ft elevation (Nicholoff 2003)	No-2, habitat not affected by proposed activity
Northern harrier *Circus cyaneus*	Grassland, Marsh, SS near water, <2400m (MacWhirter et al. 1996)	No-2, habitat not affected by proposed activity

Common Name	Habitat*	Selected
Columbian sharp-tailed grouse *Tympanuches phasianellus columbianus*	MS west of Continental Divide	No-2, habitat not affected by proposed activity
Greater prairie-chicken *Tympanuchus cupido*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
Lesser prairie-chicken *Tympanuchus pallidicinctus* (Candidate)	Dry grasslands. Does not exist on Forest (USDA 2007).	No-1
Gunnison sage-grouse *Centrocercus minimus* (Candidate)	SS. Does not exist on Forest (USDA 2007).	No-1
Greater sage-grouse *Centrocercus urophasianus*	SS	No-2, habitat not affected by proposed activity
White-tailed ptarmigan *Lagopus leucurus*	Alpine willow, grasses, krummholtz. Currently considered extirpated on the Medicine Bow (USDA 2003, Hoffman 2006 p. 15).	No-1
Mountain plover *Charadrius montanus*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
Long-billed curlew *Numenius americanus*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
Black tern *Chlidonias niger*	WET. Does not exist on Forest (USDA 2007).	No-1
Yellow-billed cuckoo *Coccyzus americanus* (Candidate)	Cottonwood riparian. Does not exist on Forest (USDA 2007).	No-1
Burrowing owl *Athene cunicularia*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
Boreal Owl *Aegolius funereus*	SF,LPP	**Yes**
Flammulated owl *Otus flammeolus*	AS, PP stands	No-2, Habitat not affected by proposed activity. Actions only remove individual dead/dying aspen from within lodgepole stands
Short-eared owl Asio flammeus	SS, grasslands, marshes. Might occur only on the Laramie Peak unit.	No-1
Black swift *Cypseloides niger*	Wet cliff faces. Does not occur on Forest (Wiggins 2004)	No-1
Lewis' woodpecker *Melanerpes lewis*	PP. Occurs on the Laramie Peak unit	No-1
Black-backed woodpecker *Picoides arcticus*	SF,PP and recently burned conifer forest	**Yes**
American three-toed woodpecker *Picoides tridactylus dorsalis*	SF,LPP,AS	**Yes**
Olive-sided flycatcher *Contopus borealis*	SF,LP,WET,FM	**Yes**
Purple martin *Progne subis*	AS in specific area on west side of Continental Divide.	No-2, habitat not affected by proposed activity
Loggerhead shrike *Lanius ludovicianus*	Grassland w/shrubs <8000 ft. (Wiggins 2005)	No-2, habitat not affected by proposed activity
Brewer's sparrow *Spizella breweri*	SS	No-2, habitat not affected by proposed activity
Cassin's sparrow Aimophila cassini	Grasslands. Does not exist on Forest (USDA 2007).	No-1
Grasshopper sparrow *Ammodramus savannarum*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
Sage sparrow *Amphispiza bellii*	SS below 6500 ft. (Nicholoff 2003)	No-2, habitat not affected by proposed activity
McCown's longspur	Grasslands. Does not exist on Forest	No-1

Common Name	Habitat*	Selected
Calcarius mccownii	(USDA 2007).	
Chestnut-collared longspur *Calcarius ornatus*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
MAMMALS		
Grizzly bear *Ursus arctos horribilis*	Various habitats in Greater Yellowstone Area	No-1
Rocky Mountain Bighorn Sheep *Ovis Canadensis canadensis*	Shrublands, Rock outcrops, Alpine. 3 herds on Forest.	No-2. Habitat not affected by proposed action.
Desert bighorn sheep *Ovis canadensis nelsoni*	Shrublands, Rock outcrops, Alpine. Does not exist on Forest (USDA 2007)	No-1
Pygmy shrew *Sorex hoyi*	Wetland edges in SF above 9000 ft.	**Yes**
Fringed myotis *Myotis thysanodes*	Roosts in RO, Mines, Caves, snags at 1200-2100 m; up to 2850m in spruce-fir in New Mex. (Keinath 2004). Forages in PP, oak, shrublands, pinyon/juniper (Keinath 2004).	No-2. Habitat not affected by proposed action
Spotted bat *Euderma maculatum*	Juniper shrub,desert sagebrush grasslands. Does not exist on Forest.	No-1
Townsend's big-eared bat *Corynorhinus townsendii*	Caves, mines, buildings, bridges. Forage over live canopy, shrublands	No-2. Habitat not affected by proposed action
Black-tailed prairie dog *Cynomys ludovicianus*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
White-tailed prairie dog *Cynomys leucurus*	Colony at Six-Mile/Platte River.	No-1
Gunnison's prairie dog *Cynomys gunnisoni*	Dry grasslands at high altitudes. Does not exist on Forest (USDA 2007).	No-1
Wyoming pocket gopher *Thomomys clusius*	SS, Grassland. Does not exist on Forest (USDA 2007).	No-1
Water vole *Microtus richardsoni*	Alpine, subalpine, and foothills riparian. Does not exist on Forest (USDA 2007).	No-1
Swift fox *Vulpes velox*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
Kit fox Vulpes macrotis	Grasslands. Does not exist on Forest (USDA 2007).	No-1
River otter *Lontra canadensis*	Rivers	No-2, habitat not affected by proposed activity
American marten *Martes americana*	SF,LPP	**Yes**
Wolverine *Gulo gulo*	SF,AL,LPP,RO	**Yes**
Common hognosed skunk *Conepatus leuconotus*	Sparsely timbered or brushy areas. Does not exist on Forest (USDA 2007).	No-1
REPTILES		
Massassauga rattlesnake *Sistrurus catenatus (Candidate)*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
Black Hills redbelly snake *Storeria occipitomaculata pahasapae*	FM in Black Hills. Does not exist on Forest (USDA 2007).	No-1
MOLLUSCS		
Rocky Mountain capshell snail *Acroloxus coloradensis*	Littoral zones of rocky oligotrophic to mesotrophic lakes <9400 ft. Known only from CO, MT (Anderson 2005)	No-1.
Cooper's mountain snail *Oreohelix strigosa cooperi*	Known only to Black Hills National Forest (Anderson 2005a)	No-1
INSECTS		
Caddisfly *Ochrotrichia susanae*	WET. Does not exist on Forest (USDA 2007).	No-1

Common Name	Habitat*	Selected
Ottoe skipper *Hesperia ottoe*	Tall-grass prairie. Does not exist on Forest (USDA 2007).	No-1
Hudsonian emerald *Somatochlora hudsonica*	Boggy ponds	No-1
regal fritillary butterfly *Speyeria idalia*	Tall-grass prairie. Does not exist on Forest (USDA 2007).	No-1
Nokomis fritillary butterfly *Speyeria nokomis nokomis*	WET. Known range south and west of Wyoming	No-1

**AL-alpine, AS-aspen, FM-forest meadow, LPP-lodgepole pine, SS-sagebrush shrub, MS-mountain shrub, PP-ponderosa pine, RIP-riparian, RO-rock/cliff/cave, SF-spruce-fir, WET-wetland*

A subgoal of the revised Medicine Bow Forest Plan (USDA 2003a) is to "Provide ecological conditions to sustain viable populations of native and desired non-native species.

In order to ensure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area.

As a consequence, this analysis is an assessment of the existing condition, projected impacts, and future condition of the habitats favored by Forest Service Sensitive species. Because sensitive species cannot exist without supporting habitats, these habitats can be readily predicted, and unoccupied habitats provide potential for future populations. This approach provides a reliable assessment of impacts on individuals and populations.

ENVIRONMENTAL CONSEQUENCES

All Alternatives

Impacts common for all species

It is expected that the spread of pine beetles will cause changes to some existing habitat. Generally, pine beetles on the Forest have been causing tree mortality that results in the loss of most or all pine trees >6 inches dbh in affected areas. On the Medicine Bow National Forest in southern Wyoming, aerial survey data from 1996 showed only 10 acres impacted by mountain pine beetles. By 2006, that number had increased to 75,000. Data from ground surveys conducted between 2002 and 2006 were also summarized to augment the analysis of aerial survey data. In all cases, mountain pine beetle populations exceeded endemic levels (<0.5 infested trees per acre), and ranged from 2.8 to 89.4 newly infested trees per acre, with an average of 24.5 newly infested trees per acre. The final extent of beetle-killed lodgepole across the Forest over time cannot be predicted but it is known that mature forest habitat has been rapidly changed will continue to be rapidly changed until the beetle outbreak returns to endemic levels.

These changes could create an immediate substantial (1-10 years) loss of mature and older aged forest important to many Region 2 sensitive species such as goshawk, three-toed woodpecker, and American marten. These and other sensitive species are addressed individually in the following pages.

Over time, perhaps 2 decades, these stands will have a high density of large snags and later coarse woody debris from beetle-killed trees. This is not a common characteristic across the Forest and could provide unique habitat opportunities for cavity-nesting, denning, many small mammals, and several furbearing wildlife.

Generally, there is a large increase in understory production by existing grasses, forbs, and shrubs but little change in understory plant diversity where pine beetles have killed a large portion of lodgepole within a stand (Stone and Wolfe 1996). Time since death of beetle-killed trees is an important factor determining usefulness of these trees for wildlife (Chan-McCleod 2006): wildlife species that require mature forest cover are less affected in 3 to 5 years; as the stand continues to break up over time it becomes less favorable to mature forest species; wildlife species that thrive in open, edge, or coarse woody debris habitat benefit in the mid and long term; and salvage harvesting of beetle-killed stands might rejuvenate stands more quickly.

As pine beetles create more stands of dead and dying lodgepole pine, there is also an increased risk for more catastrophic fire events due to increased fuel loads. The extent or frequency of future catastrophic fires is unknown but it is known that these events would rapidly reduce the amount of forested habitat for years. Catastrophic fires after a beetle epidemic would typically result in a more continuous fire affected habitat across the landscape, cause higher live tree loss, greater understory vegetation loss, reduced coarse woody debris, and longer recovery time for revegetation. These characteristics delay or reduce habitat quantity and quality for Forest wildlife compared to less catastrophic fires.

The habitat of particular interest to this project is beetle-killed or dying lodgepole along existing open roads and surrounding administrative sites. Abundant research indicates that habitat quality for many of the Forest's wildlife is already reduced along roads. Effects are usually identified as direct loss of habitat, changing landscape pattern of habitat, increased predation, parasitism, reduced fitness from disturbance, collision with vehicles, harassment or other disturbance. Following is a summary of some research on the effects of roads to wildlife that is applicable to this analysis.

Road use can cause disturbance to wildlife and there is a potential for wildlife/vehicle collisions (USDA 2003c). Vehicle collisions with wildlife are uncommon on the Forest, however.

Tinker et al. (1998) found roads were a more significant agent of change to the landscape than clearcuts in the Bighorn National Forest by decreasing patch size, increasing patch density, increasing edge, and simplifying patch shape. The effect of road edges may extend more than 50 meters into the adjacent forest. Edges created by roads and clearcuts are different from edges created by natural events such as fire because road created edges are abrupt.

Reed et al. (1996a) studied the Tie Camp area immediately west of the Blackhall/McAnulty analysis area. They found that roads added to forest fragmentation more than clearcuts by creating smaller patches, more patches, and converting interior habitat to edge habitat. Roads increased the number of patches by 179% and decreased patch size by 65% since 1950. Roads increased the distance between patches of interior habitat. Whereas natural and clearcut patches become progressively less defined, road edges exist long term and are more frequently disturbed.

Ward (undated) stated that foraging areas such as parks, meadows, and clearcuts must be protected from human disturbances such as vehicles and pedestrians. Elk prefer a buffer zone of 800m from pedestrians and 400m from moving traffic; mule deer prefer 180m from pedestrians and 90m from moving traffic. These distances may increase on winter ranges where timber is not accessible for cover. Most disturbing is traffic that is slow moving and where people are more apt to stop and get out of vehicles when they see animals.

Ward (1984) found elk and mule deer on the Medicine Bow National Forest were more disturbed by people in activities outside of their vehicles than traffic or equipment. Elk preferred to be at least ½ mile from people engaged in out-of-vehicle activities such as camping, picnicking, fishing, and harvesting timber.

Ward (1985) stated elk on the Medicine Bow National Forest stay about ½ mile from people walking on summer and winter ranges where there is an adequate supply of trees for security cover. Elk may be disturbed at greater distances, possibly 2 to 3 miles, on winter ranges where there are no trees.

Ward (1985a) studied elk in the Sierra Madre Mountains of southcentral Wyoming. He found that elk had a preference for timbered areas with lower road density or impossible roads due to snow depths or mud. The road itself was not a problem but the human activities associated with the road were the major concern for the welfare of the elk. Ward found 89% of radio-collar elk locations were ≥ ¼ mile from a road and 73% of locations were > ½ mile from roads in the Sierra Madres during hunting season.

Leptich and Zager (1991) found a strong inverse relationship between mature bull elk and road density. They found bull mortality rates were higher (62%) in highly roaded areas versus mortality (31.3%) in areas with few roads.

Hillis et al. (1991) indicated that elk vulnerability can be reduced and hunter opportunity can be increased by providing security areas for elk during the hunting season. To provide a reasonable level of bull survival, security areas were defined as nonlinear blocks of hiding cover > 250 acres in size and > ½ mile from any open road.

Geist (1971) found bighorn sheep to retreat from loud noises caused by recreationists, assuming this behavior to be an innate response to rockfalls and avalanches.

Canfield et al. (1999) reviewed many studies of human caused disturbance to ungulates. The summary of this review could be stated as human disturbance, particularly motorized vehicles, cause disturbance to bighorn sheep, elk, pronghorn, moose, and mule deer throughout the year, but especially during winter.

Hutto (1995) found that brown creepers and golden-crowned kinglets were more than twice as likely to occur more than 100m from roads than adjacent to roads.

Ortega and Capen (2002) found 4 of 18 forest interior bird species had lower relative abundance or territory density adjacent to unpaved roads while 4 of 6 edge nesters had higher relative abundance near unpaved roads. Their results suggested that narrow openings within forested landscapes may affect habitat use.

Wiedenmann (1991) found that singing behavior by breeding birds in the Brush Creek-Hayden District could be affected by human intrusion as infrequent as twice a week. Of course, Forest access is greatly influenced by the extent of the road network.

Greater human dispersal provided by roads may also reduce the amount of snags and down and dead material since motorized access facilitates firewood collection and cutting (Hamann et al. 1999). These researchers suggested that firewood cutting was in direct conflict with woodpecker nest success because woodcutters harvested the material most valuable to woodpeckers for nesting (large standing snags…).

Proposed Action

Effects common to all species

Proposed actions can temporarily eliminate habitat for a particular sensitive species. Individuals of that specie are not expected to use that habitat until sufficient vegetation regeneration occurs. Proposed actions can also reduce the quality of habitat for a particular sensitive species. In these cases, individuals are expected to require larger territories or home ranges in order to meet all their survival needs. As a result, the density of individuals will decline in that reduced quality habitat.

Additionally, noise and other activities of the proposed actions can disturb some individuals of Sensitive Species for a short time in untreated areas that are adjacent to hazard tree removal units. Individuals of Sensitive Species could leave the immediate area during the brief period of harvest but can return to the adjacent untreated areas immediately after harvest is completed. Habitat, prey density, and prey habitat will not be changed in the untreated adjacent areas. Individual sensitive species or their prey could forage in nearby undisturbed areas while harvest occurs. The temporary disturbance in adjacent untreated areas caused by this project is not expected to cause decreased reproductive success, decreased survival, or increased territory size for any individual sensitive species.

There has been harvest in some portions of the Medicine Bow National Forest in the past. Vegetation changes caused by these actions and the subsequent regeneration are reflected in the existing condition (Table 1).

All harvest units from the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project have not yet been treated, so habitat changes are not reflected in the existing condition (Table 1). However, future habitat changes caused by these projects are included in the cumulative effects analysis for the appropriate sensitive species.

INDIVIDUAL SPECIES

Northern Goshawk

Existing Conditions

Northern goshawks appear to be relatively abundant on the MBNF. Goshawks are found well distributed across the forest and are regular breeding birds. There are more than 300 recorded nests on the MBNF (records in the Wyoming Natural Diversity Database, District survey records, and FAUNA database). Forest-wide, goshawk population trend is stable. Annual fluctuations exhibited in Table 3 are typical for this species and believed related to natural fluctuations in climate and prey.

Table 3. Territory Occupancy across the Medicine Bow National Forest

YEAR	# Territories Surveyed	# Territories Active	% Territories Active
1992	46	32	70
1993	21	4	19
1994	17	5	29
1995	5	2	40
1996	33	10	30
1997	42	13	31
1998	13	9	69

1999	26	4	15
2000	4	2	50
2001	9	4	44
2002	7	4	57
2003	11	6	54
2004	43	10	23
2005	31	8	26
2006	24	12	50
2007	24	11	46

Goshawks breed in coniferous, deciduous, and mixed forests throughout much of North America (Reynolds et al. 1992). The goshawk is a forest habitat generalist, occurring in all major forest types. Preferred habitat during the breeding season is older, tall forests where goshawks can maneuver in and below the canopy while foraging and where they can find large trees in which to nest (Squires and Ruggiero 1996). In the Rocky Mountains, goshawks frequently nest in dense stands of mature lodgepole pine or quaking aspen below 9200 ft. elevation (Squires and Ruggiero 1996). Because of its relatively large body size and wing span, the goshawk does not often use dense, young forest stands.

Management recommendations for goshawks have been developed for the Southwest Region (R3) of the Forest Service (Reynolds 1983, Reynolds et al. 1992). Since many of the forested habitat types in the Southwest (primarily ponderosa pine) differ from those in the central Rocky Mountains, Region 2 of the Forest Service has <u>not</u> formally adopted the R3 management recommendations. However, some interpretations may be made which are loosely based on some of the Southwestern management criteria.

A goshawk's nesting home range may be up to 6,000 acres, and Reynolds et al. (1992) identified three main components needed within this home range for southwestern forests. The nest area is 30 acres or more in size, and may include more than one nest. Nest areas contain one or more stands of large, old trees with a dense canopy cover. Most goshawks have alternate nest areas within their home range that may be used in different years. The post fledging-family area (PFA) is approximately 420 acres and surrounds the nest area. Because of its size, the PFA typically includes a variety of forest types and conditions. It represents an area of concentrated use by the family from the time the young leave the nest until they are no longer dependent on the adults for food (up to two months). These areas are important for fledglings since they provide hiding cover and prey on which to develop hunting skills. PFA's have patches of dense trees, developed herbaceous and/or shrubby understories, and habitat attributes such as snags, downed logs, and small openings that provide necessary habitat for many goshawk prey species. The foraging area is approximately 5,400 acres in size, and surrounds the PFA. Hunting goshawks use available habitats opportunistically. This suggests that the choice of foraging habitat may be as closely tied to prey availability as to habitat structure and composition.

Limiting Factors (from USDA (2003))

Goshawks are sensitive to disturbance at nest sites. Loss of stands of mature/old trees with interlocking crowns reduces nesting habitat. Loss of old aspen also reduces nesting habitat.

Alternative 1 – No Action

<u>Direct Effects and Indirect Effects</u>

There are 16 known goshawk nests within 13 territories near (within 150 ft) open roads/trails and administrative sites (collectively admin features) across the Forest. Most known goshawk nests across the Forest, more than 280, are not near these admin features. This coincides with research mentioned earlier (p. 11-12) that indicates habitat quality is reduced for many wildlife near roads.

Natural fire regimes, endemic levels of insects and pathogens play significant ecological roles including tree mortality, defoliation, decay, and deformity. These processes are important attributes in goshawk foraging and nesting habitat. No action will result in variable effects to northern goshawks.

Habitat selected for nesting by Northern goshawks (Squires and Ruggiero 1996) consists of closed-canopied, single-layered lodgepole and lodgepole/aspen stands with large trees and open understories (aspen and lodgepole 4B, 4C and 5, below 9200 ft.). Squires and Ruggiero (1996) found that nesting habitat had a mean canopy closure of 65%. Limited research has also found, however, that some goshawks continue to nest successfully in lodgepole pine forests where up to 80% of the overstory trees were killed (Graham et al. 1999, Dalton 2005) until the beetle-killed trees fall.

Under No Action, some goshawks could continue to nest in beetle-killed stands near these administrative features (roads/trails, administrative sites) until the nest trees and the stands deteriorate over 10 to 20 years. There will still be some of the canopy cover and interlocking limbs of nesting habitat but created by dead limbs. After 1 or 2 decades, goshawks would have to move to suitable aspen or nonbeetle-killed lodgepole to continue nesting. Natural regeneration of lodgepole after beetle-kill could reproduce nesting habitat as soon as 80 years after these events.

Goshawks could also continue to use these administrative feature areas for foraging for years, if not for nesting. Goshawks are opportunistic foragers and adapt their diet to take advantage of prey abundance. They have been found to prey on more than 30 species (Squires 2000) and forage in a variety of forest types and successional stages (Reynolds et al. 1992). For example, natural tree mortality from beetles would attract woodpecker prey species while there would be a concurrent decline in red squirrel prey as cone resources are lost. Lodgepole regenerating after natural disturbances and increased understory productivity would create habitat for snowshoe hare prey species for some time. There could be a general reduction in goshawk foraging habitat quality as forest structure is lost since many prey species are the mature forest species that will no longer occur in these stands (Chan-McCleod 2006, Martin et al. 2006). Overall, it is expected that foraging habitat will remain abundant, quality will be reduced, prey species composition will change, and there will be a small reduction in total prey abundance due to the extensive loss of forest structure. There should still be enough prey animals to support adults in the territories but, perhaps, not enough prey for successful nesting.

Cumulative Effects

Habitat for many prey species and, therefore, prey abundance is expected to decline somewhat across the Forest under no action. Beetle-killed stands will still provide some habitat for a variety of prey species that exist across the Forest. However, the quality of this foraging habitat will be reduced in many areas where there is a dramatic loss of live vegetation structure in beetle-killed trees across thousands of acres.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also change goshawk habitat. Stands would not be suitable for nesting after a catastrophic wildfire. There would not be sufficient standing trees, canopy cover, interlocking limbs, and snags to be suitable for nesting.

This burned habitat would still provide some foraging habitat. Insects within dead trees and coarse woody debris would attract woodpecker prey animals. Some snowshoe hare habitat would be created over time where understory vegetation was restored in abundance and when later lodgepole regeneration occurred.

The final extent of loss of nesting habitat to pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Some of this is comprised of the closed-canopied, single-layered lodgepole with large trees used for nesting by goshawks. Some nesting habitat will always be available across the Forest since goshawks also nest in mature aspen, not every stand of mature lodgepole across the Forest is likely to be lost, suitable nesting stands that are lost won't all die at the same time, and some existing younger stands will mature to suitable nesting habitat over the next few decades.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 2648 acres of nesting habitat across the Forest. This is only 1.3% of the more than 200,000 acres of potential nesting habitat available across the Forest. These will regenerate to nesting habitat in approximately 80 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All these areas are suitable habitat for goshawks but the Damfino section occurs above the elevation found to be suitable for nesting on the Forest (Squires and Ruggiero 1996). Harvested areas will be available for foraging but quality will be very low since state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost on 215 acres from approximately 800 acres of nesting habitat available within these state lands. These areas will regenerate to nesting habitat in no less than 80 years.

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Far fewer goshawk nests are located adjacent to roads across the Forest and prey animal habitat quality is expected to be reduced (see p. 11-12). There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

In total, there will be a reduced amount of nesting habitat acres and some reduced quality of foraging habitat across the Forest. Goshawks might occupy some territories for years without nesting or nesting unsuccessfully. Even without beetle-killed stands, the Forest has occupied goshawk territories where successful nesting does not occur. Some territories with lodgepole nesting habitat probably won't be affected by beetles; some territories also have aspen nesting habitat. A few territories might be abandoned if sufficient prey can't be found or adults die and are not replaced or time. The goshawk population across the Forest probably won't decline noticeably since adults will still occupy territories where beetles have killed the lodgepole nesting habitat. The population is not expected to increase either since Forestwide goshawk recruitment will probably be reduced.

Proposed Action

Direct Effects and Indirect Effects

There are 16 known goshawk nests from 13 territories within proposed actions. Several of these areas contained an active nest in the last 5 years. Beetles could kill enough trees to reduce overstory cover to a point that goshawks will no longer use these stands for nesting. However, some goshawks have continued to use nests in lodgepole pine where up to 80% of the overstory trees were killed by pine beetle outbreaks (Graham et al. 1999) until these snags

fell over. If goshawks abandon nesting in these beetle-killed stands, treatment can proceed. If goshawks continue to use the nesting areas in these treatment sites despite beetle-killed trees, Forest Plan standards for nesting goshawks will be applied (p. 1-42) and treatment should not occur or should be appropriately adjusted. Surveys (Joy et al. 1994) for an active goshawk nest or occupied territory should be completed before treatment proceeds in order to ensure that Forest Plan standards for goshawks (p. 1-42) are met. This process is generally identified in proposed action design criteria 13 and 14 but will be more thoroughly explained in the design feature at the end of this report.

There are also 72 nests from 42 known territories within ¼ mile of proposed actions. If goshawks use the nesting areas within ¼ mile of these treatment sites despite beetle-killed trees, Forest Plan standards for nesting goshawks should be applied (p. 1-42) and treatment should be appropriately adjusted. Surveys (Joy et al. 1994) for an active goshawk nest or occupied territory should be completed within ¼ mile of these proposed action sites within suitable habitat before treatment proceeds in order to ensure that Forest Plan standards for goshawks (p. 1-42) are met.

There are an additional 46 other known goshawk territories that include approximately 212 nests across the Forest. None of these nests are within or near proposed action sites.

There are currently about 200,000 acres of nesting habitat (aspen and lodgepole stages 4B, 4C, and 5 below 9200 ft. elevation) across the Forest. Proposed harvest in lodgepole stands would eliminate 9523 acres of potential nesting habitat across the Forest over 10 years. Some goshawks might have used these beetle-killed stands for nesting (see Graham et al. 1999) while others would use the stands only for foraging. Surveys for active goshawk nests (Joy et al. 1994), as identified in design features, will ensure that Forest Plan standards are followed (p. 1-42) and active nesting is protected. Harvested areas could return to nesting habitat in approximately 80 years as the regenerating forest matures and canopy cover increases.

All proposed action sites would retain some foraging habitat but habitat quality would be affected by reducing forest structure, reducing snags, dead topped trees and coarse woody debris. Forest Plan standards for snags, recruitment trees, and coarse woody debris will retain required amounts of these features. Of course, there will also be a concurrent habitat change resulting from beetle-killed trees. Primary prey species such as three-toed woodpeckers would initially increase while red squirrels would decline from these habitat changes (Martin et al. 2006). The subsequent grass/forb stages would benefit alternate prey species such as golden-mantled ground squirrels, deer mice, and montane voles. Later regeneration to a shrub-like understory would benefit alternate prey species such as snowshoe hare and blue grouse. Reynolds et al. (1992) indicated that consistent abundance and wide variety of prey might determine population stability. Secondly, Graham et al. (1999) indicated that managing for a variety of habitats will manage for goshawks over time.

Foraging goshawks would be expected to leave the immediate area surrounding treatment units due to the noise disturbance caused by mechanical equipment. Forest Plan standards (p. 1-42) would protect a ¼ mile area around any active nests, so these should not be disturbed. One study in Arizona concluded that audible noise from loaded log trucks passing ¼ mile or more away from a goshawk nest was barely louder than ambient noise levels and produced no "discernable behavioral response" in observed goshawk adults or young (Grubb *et al.* 1998). Immediately after harvest, goshawks could return to those treated areas for foraging.

<u>Cumulative effects</u>

Habitat for many prey species and, therefore, prey abundance is expected to decline somewhat across the Forest under proposed action. Harvested stands and beetle-killed stands will still provide some habitat for a variety of prey species that exist across the Forest. However, the quality of this foraging habitat will be reduced in many

areas where there is a dramatic loss of live vegetation structure from harvested stands and from extensive acres of beetle-killed trees across thousands of acres.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also change goshawk habitat. Stands would not be suitable for nesting after a catastrophic wildfire. There would not be sufficient standing trees and snags to be suitable for nesting.

This burned habitat would still provide some foraging habitat. Insects within dead trees and coarse woody debris would attract woodpecker prey animals for several years. Some snowshoe hare habitat would be created over time where understory vegetation was restored in abundance and when later lodgepole regeneration occurred.

The final extent of loss of nesting habitat to pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Some of this is comprised of the closed-canopied, single-layered lodgepole with large trees used for nesting by goshawks. Some nesting habitat will always be available across the Forest since goshawks also nest in mature aspen, not every stand of mature lodgepole across the Forest is likely to be lost, suitable nesting stands that are lost won't all die at the same time, and some existing younger stands will mature to suitable nesting habitat over the next few decades.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch projects will remove approximately 2648 acres of nesting habitat across the Forest. The proposed action will also remove up to 9523 acres of nesting habitat over 10 years. These are 6% of the more than 200,000 acres of potential nesting habitat available across the Forest. Some of these acres would probably be lost to nesting without harvest. Stands will regenerate to nesting habitat in approximately 80 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All these areas are suitable habitat for goshawks but the Damfino section occurs above the elevation found to be suitable for nesting on the Forest (Squires and Ruggiero 1996). Harvested areas will be available for foraging but quality will be very low since state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost on 215 acres from approximately 800 acres of nesting habitat available within these state lands. These areas will regenerate to nesting habitat in no less than 80 years.

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Far fewer goshawk nests on the Forest are located adjacent to roads and prey animal habitat quality is expected to be reduced (see p. 11-12). There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

In total, there will be a reduced amount of nesting habitat acres and some reduced quality of foraging habitat across the Forest. Goshawks might occupy some territories for years without nesting or nesting unsuccessfully. Even without beetle-killed stands, the Forest has occupied goshawk territories where successful nesting does not occur. Some territories with lodgepole nesting habitat probably won't be affected by beetles; some territories also have aspen nesting habitat. A few territories might be abandoned if sufficient prey can't be found or adults die and are not replaced or time. The goshawk population across the Forest probably won't decline noticeably since adults will

still occupy territories where beetles have killed the lodgepole nesting habitat. The population is not expected to increase either since Forestwide goshawk recruitment will probably be reduced.

Overall, proposed and on-going actions will retain more than 180,000 acres of suitable nesting habitat on the Forest. These acres will continue to provide suitable nesting habitat and post-fledging areas (Reynolds et. al 1992) for the more than 80 known territories on the Forest. Harvested areas will provide foraging habitat and may become nesting habitat in 80 years. Habitat changes from harvest, beetles, and forest regeneration over time will provide variety in prey available and will contribute toward the stability of the goshawk population on the Forest.

Determination of Effect and Rationale

Across the Forest, there are more than 200,000 acres of possible nesting habitat (USDA 2003, p. 3-123). Forest management activities are regenerating 6% of these. The analysis of habitat changes for the 2003 Forest Plan revision indicated that mature lodgepole habitat changed less than 5% between 1985 and 2003 and indicated that mature aspen increased by approximately 10% during the same period. Therefore, vegetation is being maintained to provide suitable nesting habitat for goshawks. This habitat is well distributed across the Forest.

A "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide" determination is made for Northern goshawk based on the following:

- Forest management actions will regenerate 6% of Forestwide nesting habitat.
- Forest Plan standards for snags, recruitment trees, and coarse woody debris are automatically included in timber harvest, providing prey habitat.
- Forest Plan standards to ensure the protection of nesting goshawks (p. 1-42) will be met with call-back surveys (Kennedy and Stahlecker 1993) in proposed action sites as described in Design Features for this report and Design Criteria 13 and 14 of the proposed action.
- Proposed actions will meet suggestions by Graham et al. (1997) to maintain mosaic forest conditions that would sustain the goshawk and its suite of prey species.
- Forest Plan guideline to consult Partners-in-Flight Conservation Plans (p. 1-40) for additional guidance was accomplished. Goshawk is a level I priority species.
- The proposed activities will be consistent with the revised Forest Plan (2003) when Design Features and Criteria are followed. The analysis for the Forest Plan revision determined that Forest activities may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide.

Boreal Owl

Existing Conditions (from USDA 2003)

Boreal owls are widespread at low density in boreal and subalpine forest across North America. A year-long resident, known to breed on the forest in the Laramie Range, Medicine Bow Range, and Sierra Madre. Nest boxes are occupied and reproduction has been confirmed. Garber et al. (1991, in USDA 2003, App. I) compiled a listing of 50 boreal owl observations that occurred in Wyoming from 1927-89 from records that included museum specimens, photographs, limited surveys, and incidental observations. Most observations were from Grand Teton National Park and southeastern Carbon County in the Snowy Range and Sierra Made Range.

Boreal owls forage in mature and older spruce-fir most of the year. Prey is more available in this habitat in winter because the snow is less compacted, and in summer because there is less herbaceous cover than in regenerating

openings. For this animal, so highly adapted to coping with winter cold, the limitation on the southern extent of its range may be availability of cool dense spruce for summer roosting.

The high association with old growth spruce-fir is due to their dependence on this forest type as a secondary cavity nester and for year-round foraging. Herren (1994, in USDA 2003, App. I) found 77% of mating habitat locations in spruce-fir and the remainder in lodgepole stands with adequate forest structure. Boreal owls nest in cavities excavated by large woodpeckers such as northern flickers or in naturally created cavities. Boreal owls are limited by these circumstances because the principal excavating species, pileated woodpecker, does not occur on the Forest and large cavities are not abundant in the southern Rockies. Nesting habitat structure consists of forests with a relatively high density of large trees ≥12 inches dbh, open understory, and a multilayered canopy. They avoid open areas, such as clear-cut and open meadows, except for occasional use of the edges and openings for foraging. Boreal owls prey primarily on small mammals, with redbacked voles making up the highest proportion of their diet. They will also take other small mammal species, birds, and some insects. Forest management that ensures mature and older forests will provide quality nesting, foraging, and roosting habitat.

Limiting Factors

Boreal owls are limited in the Forest by the abundance of large snags with cavities, by the amount of old forest with complex structures, and possibly by prey density. Snags are lost by firewood collection and in timber harvest. Lack of dead downed wood recruitment over time would reduce habitat suitability for the Boreal owl's prey.

Alternative 1 – No Action

Direct Effects and Indirect Effects

Natural fire regimes, endemic levels of insects and pathogens play significant ecological roles including tree mortality, defoliation, decay, and deformity. These processes are important attributes in boreal owl habitat. No action could result in variable effects to boreal owls.

Potential boreal owl habitat across the Forest corresponds to spruce-fir forest of structural stages 4A through 4C and 5 and lodgepole of stages 4B, 4C, and 5. There are currently more than 300,000 acres of habitat across the Forest. It is likely that boreal owls use habitat adjacent to the Forest's open roads, trails, and administrative sites (collectively admin features). However, owl use should be reduced since research mentioned earlier (p. 11-12) indicated wildlife habitat quality and, relatedly, prey are reduced near roads.

Where pine beetles move through stands near admin features at epidemic levels, boreal owl habitat quality will change through time. Important components of owl nesting, foraging and prey habitat, such as snags and coarse woody debris, would be increased by these insect outbreaks in several years. There would be an increased number of snags for nesting after natural cavities are created or are excavated by woodpeckers. However, at epidemic levels, there will not be enough overstory cover for nesting since the beetle-kill would be complete and widespread across many acres.

These areas could still be used for foraging since the snags, abundant coarse woody debris, and lodgepole regeneration will support small mammals. Forest regeneration could produce nesting habitat again in approximately 100 years.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey animal habitat quality is expected to be reduced (see p. 11-12), so fewer boreal owl nests and foraging sites should be located near roads. There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased nesting and foraging habitat quality. However, this would not occur where beetles restarted succession in lodgepole stands.

Habitat for prey species and, therefore, prey abundance could decline initially from widespread beetle-killed stands across the Forest in just a few years. This decline will be caused by the sharp decrease in canopy cover from mature beetle-killed trees losing foliage. Some ground cover will remain since beetles will not affect the smallest trees. Prey abundance, such as red-backed voles, will increase over the following years and decades as younger, unaffected trees grow to provide greater ground and overstory cover and as beetle-killed trees fall and increase the amount of coarse woody debris. Still, this lodgepole change would be a very small change to boreal owl foraging habitat across the Forest since these owls prefer mature and older spruce-fir.

Nesting habitat in lodgepole could decline initially across the Forest due to the rapid and widespread loss of mature and older lodgepole. Many snags would be created but a few years would be required for these to develop natural cavities or have cavities excavated by woodpeckers. There will still be a high density of beetle-killed trees available as potential nesting sites in 25 years (USDA 2003 p. D-80). However, some snags will be too soft or will have fallen in 25 years. Around 50 - 100 years would pass before understory trees, unaffected by beetles, could grow and mature to provide sufficient canopy cover for nesting use by boreal owls. Overall, nesting habitat quality in lodgepole could increase over several decades, then decline as snags fall. The quantity and quality of nesting habitat will be dictated by how widespread and complete the beetle outbreak becomes. Still, this would be a very small change to boreal owl nesting habitat across the Forest since these owls prefer mature and older spruce-fir.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also change boreal owl habitat. Stands would not be suitable for nesting after a catastrophic wildfire. There would not be sufficient standing trees and snags to be suitable for nesting. This burned habitat would still provide some foraging habitat. Insects within dead trees and coarse woody debris would attract small prey animals.

The final extent of loss of owl habitat to pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Some of this is comprised of the closed-canopied, large lodgepole trees used for nesting. Most habitat will always be available across the Forest since boreal owls nest and feed mostly in mature and older spruce-fir.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of nesting habitat across the Forest. This is only 2% of the more than 300,000 acres of potential nesting habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some foraging opportunity. Stands will regenerate to nesting habitat in approximately 100 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts

these areas, 350 acres, are assumed to be suitable as boreal owl habitat. The 350 acres of harvest will temporarily eliminate these stands as boreal owl habitat. These stands will be available as foraging habitat as regeneration occurs but quality will be very low since state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate cavity nests are available.

In total, there will be an initial reduction in nesting habitat acres and some reduced quality of foraging habitat across the Forest. Depending on the completeness of beetle-kill within stands and across the landscape, nesting habitat may or may not be created in a few years. However, since boreal owls prefer spruce-fir, it is expected that only a small portion of any territory is probably comprised of mature lodgepole. So, any lost lodgepole is not likely to cause any territories to be lost. The boreal owl population across the Forest probably won't decline since most territories for these owls will occur in mature or older spruce-fir habitats. The population might not increase either for several decades since relatively quick and widespread changes could occur in the suitable lodgepole habitat across the Forest.

Proposed Action

Direct Effects and Indirect Effects

There are currently more than 300,000 acres of boreal owl habitat across the Forest. Proposed harvest in lodgepole stands would eliminate 12,699 acres of owl nesting habitat near admin features across the Forest over 10 years. Of course, these stands will also be comprised of dead or dying lodgepole. So, their usefulness for nesting will already be changing; being lost where beetle-kill is complete and widespread. Forest plan standards for recruitment trees, snags and coarse woody debris will retain some habitat features for prey animals in harvest areas. Later increased understory productivity, tree regeneration, and coarse woody debris accumulation would improve foraging habitat quality. These stands could return to nesting habitat in approximately 100 years as the regenerating forest matures, canopy cover increases, and appropriate cavities are created.

Boreal owls would be expected to leave the immediate area surrounding treatment units due to the noise disturbance caused by mechanical equipment. Immediately after harvest, owls could return to those treated areas for foraging.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey animal habitat quality is expected to be reduced (see p. 11-12), so fewer boreal owl nests and foraging sites should be located near roads. There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased nesting and foraging habitat quality. However, this would not occur where beetles restarted succession in lodgepole stands.

Habitat for prey species and, therefore, prey abundance is expected to decline initially from widespread beetle-killed stands across the Forest in just a few years. This decline will be caused by the sharp decrease in canopy cover from mature beetle-killed trees losing foliage. Some ground cover will remain since beetles will not affect the smallest trees. Prey abundance, such as red-backed voles, will increase over the following years and decades as younger, unaffected trees grow to provide greater ground and overstory cover and as beetle-killed trees fall and

increase the amount of coarse woody debris. Still, this would be a very small change to boreal owl foraging habitat across the Forest since these owls prefer mature and older spruce-fir.

Nesting habitat in lodgepole could decline initially across the Forest due to the rapid and widespread loss of mature and older lodgepole. Many snags would be created but a few years would be required for these to develop natural cavities or have cavities excavated by woodpeckers. There will still be a high density of beetle-killed trees available as potential nesting sites in 25 years (USDA 2003 p. D-80). However, some snags will be too soft or will have fallen in 25 years. Around 50 - 100 years would pass before understory trees, unaffected by beetles, could grow and mature to provide sufficient canopy cover for nesting use by boreal owls. Overall, nesting habitat quality in lodgepole could increase over several decades, then decline as snags fall. The quantity and quality of nesting habitat will be dictated by how widespread and complete the beetle outbreak becomes. Still, this would be a very small change to boreal owl nesting habitat across the Forest since these owls prefer mature and older spruce-fir.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also change boreal owl habitat. Stands would not be suitable for nesting after a catastrophic wildfire. There would not be sufficient standing trees and snags to be suitable for nesting. This burned habitat would still provide some foraging habitat. Insects within dead trees and coarse woody debris would attract small prey animals.

The final extent of loss of owl habitat to pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Some of this is comprised of the closed-canopied, large lodgepole trees used for nesting. Most habitat will always be available across the Forest since boreal owls nest and feed mostly in mature and older spruce-fir.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of nesting habitat across the Forest. This is only 2% of the more than 300,000 acres of potential nesting habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some foraging opportunity. Stands will regenerate to nesting habitat in approximately 100 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts these areas, 350 acres, are assumed to be suitable as boreal owl habitat. The 350 acres of harvest will temporarily eliminate these stands as boreal owl habitat. These stands will be available as foraging habitat as regeneration occurs but quality will be very low since state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate cavity nests are available.

In total, there will be an initial reduction in nesting habitat acres and some reduced quality of foraging habitat across the Forest from pine beetles and harvest. Harvested stands would not be used for nesting for decades. Depending on the completeness of beetle-kill within stands and across the landscape, nesting habitat may or may not be created in a few years. However, since boreal owls prefer spruce-fir, it is expected that only a small portion of any territory is probably comprised of mature lodgepole. So, any lost lodgepole is not likely to cause any territories to be lost. The boreal owl population across the Forest probably won't decline since most territories for these owls will occur in mature or older spruce-fir habitats. The population might not increase either for several decades since relatively quick and widespread changes could occur in the suitable lodgepole habitat across the Forest.

Overall, proposed and on-going actions will retain more than 275,000 acres of suitable nesting habitat on the Forest. Boreal owl home ranges average 2920 to 3585 acres (Hayward and Hayward 1993). Proposed and on-going actions (18,699 acres) could temporarily eliminate the equivalent of 6 – 8 home ranges on the Forest. However, harvest is distributed widely across the Forest in small strips around admin features. So, the effect will likely be that a few owls will expand or adjust their territories to accommodate the lack of overstory canopy cover and reduced prey availability in harvested stands. Habitat changes from harvest, beetles, and forest regeneration over time will ensure a continuing supply prey and future nesting habitat and will contribute toward maintaining the boreal owl population on the Forest.

Determination of Effect and Rationale

Across the Forest, there are more than 300,000 acres of possible boreal owl habitat (USDA 2003, p. 3-123). Forest management activities are changing 6% of this habitat. The analysis of habitat changes for the 2003 Forest Plan revision indicated that mature lodgepole habitat changed less than 5% between 1985 and 2003 and indicated that mature spruce-fir decreased by less than 1% during the same period. Therefore, vegetation is being maintained to provide suitable habitat for boreal owls. This habitat is well distributed across the Forest.

A "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide" determination is made for boreal owl based on the following:

- Forest management actions will regenerate 6% of Forestwide habitat.
- Forest Plan standards for snags and coarse woody debris are included in timber harvest, providing woodpecker (cavity creating) and prey habitat.
- Forest Plan guideline to consult Partners-in-Flight Conservation Plans (p. 1-40) for additional guidance was accomplished. Boreal owl is a Level II priority species.
- The proposed activities are consistent with the revised Forest Plan (USDA 2003). The analysis for the Forest Plan revision determined that Forest activities may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide.

Three-toed Woodpecker

Existing Conditions (from USDA 2003, App. I)

American three-toed woodpeckers are yearlong residents in old forest, primarily spruce-fir (and other subalpine or boreal forest) or in any burned forest. Their reliance on insects that inhabit bark may link them to old stands (with a high incidence of dying trees that provide habitat for prey), areas of bark-beetle kill, and recently burned stands. Population density increases greatly following fire. Three-toed woodpeckers observed in a stand that had burned 2 years before spent 97% of the time (of 72 hours of observation) on fire-killed trees. American three-toed woodpeckers excavate cavities for nesting in snags; in subsequent years, these cavities are used by secondary nesters and by animals using communal winter roosts.

The species is widespread at low density in boreal and subalpine forest across North America. The species is a yearlong resident, known to breed on the Forest. Three-toed woodpeckers are uncommon, and unevenly distributed on the Forest due to their disproportionate population increases in beetle-infested tree areas and recently burned forest. They are sufficiently uncommon that they have not been detected on any of the BBS routes on or adjacent to the Forest since the 1st route was surveyed in 1968. Therefore, survey design within the RMBO songbird protocol was specifically adjusted in 2003 to account for birds such as the three-toed woodpecker. Results from

2003 and 2004 are a combination of RMBO survey protocol transects and opportunistic observations (Table 4). After 2004, survey transects were standardized for monitoring across the Forest.

Table 4. Three-toed woodpecker monitoring across the Forest.

YEAR	# Observed	# Survey Transects
1999	1	0
2000	1	0
2001	1	0
2002	1	0
2003	21	16
2004	39	20
2005	15	26
2006	41	26
2007	52	26

Limiting Factors

American three-toed woodpeckers are widely considered barometers of the health of old-growth conifer forests in North America. This relationship is largely the result of the species' apparent dependence on mature and old-growth conifer forests. However, areas of disturbed forests (e.g., recent burns, beetle infestations) have also been widely cited as important habitat. A multitude of published studies from outside the Region suggest that the most likely threats are salvage logging, suppression of bark beetle outbreaks, and logging of old growth forests (Wiggins 2004). While these threats may be important at the local level, where woodpeckers occur at low densities, they appear to be less important at the regional level where existing old-growth conifer forests appear to be providing suitable conditions for viable populations. When logging is carried out within spruce-fir forests, attempts to avoid even-aged stand structure (e.g., by leaving patches of mature/old growth trees) would benefit populations of this woodpecker. Uneven-aged stands would allow for better retention of snags and old-growth trees as foraging and nesting habitat and may also hinder the spread and intensity of spruce beetle attacks.

Alternative 1 – No Action

Direct Effects and Indirect Effects

Endemic levels of insects and pathogens and natural fire intervals play significant ecological roles including tree mortality, defoliation, decay, and deformity. These processes are important attributes in three-toed woodpecker foraging and nesting (cavity excavating) habitat. No action would result in generally positive effects to three-toed woodpecker.

Potential three-toed woodpecker habitat across the Forest corresponds to spruce-fir forest of structural stages 4A through 4C and 5 and lodgepole of stages 4B, 4C, and 5. There are currently more than 300,000 acres of habitat across the Forest. Three-toed woodpeckers use habitat adjacent to the Forest's open roads, trails, and administrative sites (collectively admin features). However, three-toed nesting use could be reduced since research mentioned earlier (p. 11-12) indicated wildlife habitat quality is reduced and disturbance is increased near roads. These areas would still be used for foraging since local experiences indicate that beetles are not avoiding trees near admin features.

Where pine beetles move through stands near admin features at epidemic levels, three-toed woodpecker habitat quality will change through time. The spread of bark beetles would greatly increase prey availability, increasing three-toed woodpecker density during the outbreak. Resulting snags would provide nesting habitat as long as sufficient density of live or dead canopy and limbs remained to prevent nest sites from being directly exposed to

weather elements. Hitchcox (1996), studying bird abundance immediately after a 1600 ha severe fire in conifer stands, found that 89% of three-toed woodpecker nests were at sites ranging from ≤40% green trees to completely brown-needled trees. Nest snags directly exposed to weather such as periodic high winds are not expected to stand long. Nest cavities directly exposed to wind, sun, and temperature variations are not expected to provide a favorable environment for raising young. Still, dead lodgepole would remain nesting habitat for a few decades and much nesting habitat will be available in mature and older spruce stands that are also adjacent to admin features.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey insects should be abundant but vehicle and visitor disturbance and firewood cutting could discourage woodpecker use. There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

Prey abundance across the Forest is expected to increase substantially under the beetle outbreak. There should also be a sharp increase in nesting habitat across the Forest caused by the sharp increase in snags. This improved habitat will last as long as the beetle outbreak continues. When beetles decline again to endemic levels, the three-toed woodpecker density across the Forest will have a corresponding decline to normally expected level. Most beetle-killed trees from the next few years are likely to be still available as hard snags suitable for nesting sites for 25 years (see USDA 2003, p. D-80). Other snags will be too soft or will have fallen in 25 years. Overall, Forestwide nesting habitat quality is expected to increase through time under the beetle outbreak.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased nesting and foraging habitat quality. However, this would not occur where beetles restarted succession in lodgepole stands.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also affect woodpecker habitat. Burned conifer stands would provide a unique and limited habitat, important for these woodpeckers as foraging habitat and future nesting snags. Natural tree mortality from beetles, disease or wildfire would attract insect prey species of woodpeckers. Wiggins' (2004) concluded that three-toed woodpecker preferred nesting habitats included unlogged, old growth conifer forest and conifer forests with some form of natural disturbance with birds also exploiting recently burned (or otherwise damaged) forests that provide a rich supply of food. He also summarized that three-toed woodpecker density increases dramatically at disturbed sites.

The final extent of changes to woodpecker habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of large lodgepole trees potentially used for nesting. These acres would remain as nesting and foraging habitat under no action but the quality of this habitat would improve. Indeed, beetle-infested or burned areas would provide a unique and limited habitat highly desired by three-toed woodpeckers. Woodpecker density in beetle-infested areas would be higher than in the surrounding forest. Woodpecker density would be expected to continue to be elevated as long as the beetle population continued beyond endemic levels. This habitat would only become unsuitable when snags have fallen and younger regeneration dominates the affected sites after several decades.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of nesting habitat across the Forest. This is only 2% of the more than 300,000 acres of potential nesting

habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some foraging opportunity. Stands will regenerate to nesting habitat in approximately 100 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts these areas, 350 acres, are assumed to be suitable as three-toed woodpecker habitat. The 350 acres of harvest will temporarily eliminate these stands as three-toed woodpecker habitat. These stands will not be available as foraging habitat as regeneration occurs because state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate cavity nests are available.

In total, there will be an increase in nesting habitat quality and an increase in foraging habitat quality and quantity across the Forest. The three-toed woodpecker population across the Forest probably will increase in response to the beetle outbreak. The increase will last as long as the beetle outbreak then decline to normal levels.

Proposed Action

Direct Effects and Indirect Effects

There are currently more than 300,000 acres of three-toed woodpecker habitat across the Forest. Proposed harvest in lodgepole stands would eliminate 12,699 acres of three-toed woodpecker beetle-killed nesting habitat near admin features across the Forest over 10 years. Forest plan standards for recruitment trees, snags and coarse woody debris will retain some habitat features for prey insects in harvest areas. This will be low quality foraging habitat for approximately 50 years when beetles again begin infesting suitable older trees. These stands could return to nesting habitat in approximately 100 years as the regenerating forest matures.

Three-toed woodpeckers would be expected to leave the immediate area surrounding treatment units due to the noise disturbance caused by mechanical equipment. Immediately after harvest, woodpeckers could return to those treated areas for foraging.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey insects should be abundant but vehicle and visitor disturbance and firewood cutting could discourage woodpecker use. There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

Prey abundance across the Forest is expected to increase substantially under the beetle outbreak. There should also be a sharp increase in nesting habitat across the Forest caused by the sharp increase in snags. This improved habitat will last as long as the beetle outbreak continues. When beetles decline again to endemic levels, the three-toed woodpecker density across the Forest will have a corresponding decline to normally expected level. Most beetle-killed trees from the next few years are likely to be still available as hard snags suitable for nesting sites for 25 years (see USDA 2003, p. D-80). Other snags will be too soft or will have fallen in 25 years. Overall, Forestwide nesting habitat quality is expected to increase through time under the beetle outbreak.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased nesting and foraging habitat quality. However, this would not occur where beetles restarted succession in lodgepole stands.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also affect woodpecker habitat. Burned conifer stands would provide a unique and limited habitat, important for these woodpeckers as foraging habitat and future nesting snags. Natural tree mortality from beetles, disease or wildfire would attract insect prey species of woodpeckers. Wiggins' (2004) concluded that three-toed woodpecker preferred nesting habitats included unlogged, old growth conifer forest and conifer forests with some form of natural disturbance with birds also exploiting recently burned (or otherwise damaged) forests that provide a rich supply of food. He also summarized that three-toed woodpecker density increases dramatically at disturbed sites.

The final extent of changes to woodpecker habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of large lodgepole trees potentially used for nesting. These acres would remain as nesting and foraging habitat but the quality of this habitat would improve. Indeed, beetle-infested or burned areas would provide a unique and limited habitat highly desired by three-toed woodpeckers. Woodpecker density in beetle-infested areas would be higher than in the surrounding forest. Woodpecker density would be expected to continue to be elevated as long as the beetle population continued beyond endemic levels. This habitat would only become unsuitable when snags have fallen and younger regeneration dominates the affected sites after several decades.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of nesting habitat across the Forest. This is only 2% of the more than 300,000 acres of potential nesting habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some foraging opportunity. Stands will regenerate to nesting habitat in approximately 100 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts these areas, 350 acres, are assumed to be suitable as three-toed woodpecker habitat. The 350 acres of harvest will temporarily eliminate these stands as three-toed woodpecker habitat. These stands will not be available as foraging habitat as regeneration occurs because state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate cavity nests are available.

In total, there will be an increase in nesting habitat quality and an increase in foraging habitat quality and quantity across the Forest, even accounting for recent and proposed harvest. The beetle outbreak is becoming so large in creating or improving woodpecker habitat that any habitat losses to harvest are insignificant. The three-toed woodpecker population across the Forest probably will increase in response to the beetle outbreak. The increase will last as long as the beetle outbreak then decline to normal levels.

Overall, proposed and on-going actions will retain more than 275,000 acres of suitable nesting and foraging habitat on the Forest. This amount is increasing with the beetle outbreak. Three-toed woodpeckers have been found at densities of 2/100 ha (Raphael 1987) in an area on this Forest where beetles were at low endemic levels. Proposed and on-going actions (18,699 acres) could temporarily eliminate the equivalent of 75 home ranges on the Forest. However, harvest is distributed widely across the Forest in small strips around admin features, the beetle outbreak is creating more woodpecker habitat, and woodpecker density is increasing as habitat quality increases. So, the

effect will likely be that any woodpeckers that lose territory to harvest will gain suitable habitat in adjacent areas away from admin features. Habitat changes from harvest, beetles, and forest regeneration over time will ensure a continuing supply prey and future nesting habitat and will contribute toward maintaining the three-toed woodpecker population on the Forest.

Determination of Effect and Rationale

Across the Forest, there are more than 300,000 acres nesting habitat distributed among the 4 mountain ranges (USDA 2003, p. 3-98, 123). Forest management activities are changing 6% of this habitat. The analysis of habitat changes for the 2003 Forest Plan revision indicated that mature lodgepole habitat changed less than 5% between 1985 and 2003 and indicated that mature spruce-fir decreased by less than 1% during the same period. Therefore, vegetation is being maintained to provide suitable nesting habitat for three-toed woodpeckers. This habitat is well distributed across the Forest.

A "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide" determination is made for the three-toed woodpecker based on the following:

- Forest management actions will regenerate 6% of Forestwide nesting habitat.
- Forest Plan standards for snags and coarse woody debris are included in timber harvest, providing woodpecker and prey habitat.
- Forest Plan guideline to consult Partners-in-Flight Conservation Plans (p. 1-40) for additional guidance was accomplished. Three-toed woodpecker is a Level II priority species.
- The proposed activities are consistent with the revised Forest Plan (2003). The analysis for the Forest Plan revision determined that Forest activities may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide.

Olive-sided flycatcher

Existing Conditions (from USDA 2003, App. I)

The species is associated with older spruce-fir forest with abundant snags that are used as a perch for flycatching. Olive-sided flycatchers prefer edges and openings with scattered trees, where they perch on treetops, flying up to capture passing insects from the air. Populations increase following fire. Burned areas support high densities of these flycatchers compared to other sites, as do natural openings around ponds, beaver ponds, and windfall. Additional life history information is available in USDA (2003).

The olive-sided flycatcher is a widespread breeding bird in spruce fir forests of Canada, Alaska, and the mountains of the western U.S. Breeding Bird Survey data indicate a population decline of 70% since 1966. The Olive-sided flycatcher is not a species of extreme concern in Wyoming, with a heritage ranking of S3/S4. The species winters in Central and South America. The cause of the decline in population is not known and may be related to effects on the wintering ground. However, Reed (1995) rated 74 bird species in the Great Basin for vulnerability to local extirpation and gave the Olive-sided flycatcher the highest vulnerability of any species, based on its specialized habitat and diet, its low population where it occurs, its susceptibility to cowbird parasitism, as well as its migratory habit. During 2004 RMBO transects and project surveys across the Forest, 34 were observed. Ten were observed in the analysis area in 2004.

Limiting Factors

Fire suppression reduces forest openings. Salvage logging removes habitat that is highly productive for the species prey and is structurally suitable (many foraging perches in an open habitat). Snags are cut in forested areas along

edges of units to reduce safety hazard to loggers, reducing perches adjacent to created openings. Lack of burned areas in spruce-fir would remove the pulses in population that historically resulted from the high density and productivity following burns. However, whether the edge created by logging is used in a similar way to edges along bogs, meadows, and other natural openings is not known. A study in Oregon showed higher nesting success in post-fire than in post-logging habitat.

Alternative 1 – No Action

Direct Effects and Indirect Effects

Endemic levels of insects and pathogens and natural fire intervals play significant ecological roles including tree mortality, defoliation, decay, and deformity. These processes are important attributes in olive-sided flycatcher habitat. No action could result in a variety of effects to olive-sided flycatchers.

Potential olive-sided flycatcher habitat corresponds to spruce-fir forest of structural stages 4A through 4C and 5 and lodgepole of stages 4B, 4C, and 5 in the Forest RIS database. There are currently more than 300,000 acres of habitat across the Forest. It is likely that olive-sided flycatchers use habitat adjacent to the Forest's open roads, trails and administrative sites. However, olive-sided flycatcher use should be reduced since research mentioned earlier (p. 11-12) indicated wildlife habitat is reduced near roads.

Where pine beetles move through stands near admin features at normal levels, olive-sided flycatcher habitat quality could improve. There will be a useful mix of live and dead trees to support a variety of insect prey. These features will also provide canopy cover for nesting and openings with perches for foraging. Where pine beetle tree losses are nearly complete and widespread across many acres as it appears is currently occurring, olive-sided flycatcher habitat will be lost from too much canopy cover loss. A similar response was found in other pine dominated forests (Martin et al. 2006). However, mature and older spruce-fir is the preferred olive-sided flycatcher habitat and this will not be affected by pine beetles.

The edges of these areas could still be used for foraging since the snags and abundant coarse woody debris will support some prey insects. Forest regeneration could produce nesting and foraging habitat again in approximately 100 years.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey insects should be abundant but vehicle and visitor disturbance and firewood cutting and extensive habitat change could discourage olive-sided flycatcher use. There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

Adult beetle prey abundance across the Forest is expected to increase substantially under the beetle outbreak. However, there will also be a sharp decline in suitable lodgepole habitat from all the canopy loss. So, many of these acres of high density prey will be unavailable to flycatching olive-sided flycatcher. Still, this lodgepole change would be a very small change to olive-sided flycatcher foraging habitat across the Forest since they prefer mature and older spruce-fir. Useful foraging habitat would be regenerated in several decades as suitable perches are grown for flycatching.

Nesting habitat in lodgepole could also decline abruptly across the Forest due to the rapid and widespread loss of mature and older lodgepole. Around 100 years would pass before understory trees, unaffected by beetles, could grow and mature to provide sufficient canopy cover for nesting use. Still, this would be a very small change to nesting habitat across the Forest since these birds prefer mature and older spruce-fir.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased nesting and foraging habitat quality. However, this would not occur where beetles restarted succession in lodgepole stands.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also change olive-sided flycatcher habitat. Stands would not be suitable for nesting or foraging after an extensive, catastrophic wildfire. There would not be sufficient standing trees to be suitable for nesting or foraging except at the edges of these burned stands. At these edges, insects within dead trees and coarse woody debris would [provide abundant prey.

The final extent of loss of olive-sided flycatcher habitat to pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of the lodgepole habitat used for foraging and nesting. Most habitat will always be available across the Forest since olive-sided flycatchers nest and feed preferably in mature and older spruce-fir.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of nesting habitat across the Forest. This is only 2% of the more than 300,000 acres of potential nesting habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some foraging opportunity. Stands will regenerate to nesting habitat in approximately 100 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts these areas, 350 acres, are assumed to be suitable as boreal owl habitat. The 350 acres of harvest will temporarily eliminate these stands as boreal owl habitat. These stands will be available as foraging habitat as regeneration occurs but quality will be very low since state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate cavity nests are available.

In total, there will a reduction in nesting and foraging habitat across the Forest where beetle-killed stands are extensive and widespread. Where beetles might kill trees at endemic levels, nesting and foraging habitat quality will be greatly enhanced. However, since olive-sided flycatchers prefer spruce-fir, it is expected that only a few territories or a small portion of a territory is probably comprised of mature lodgepole. So, any lost lodgepole is likely to cause only a few territories to be lost or changed. The olive-sided flycatcher population across the Forest probably won't decline noticeably since most territories for these olive-sided flycatchers occur in mature or older spruce-fir habitats. Any population change would rebound to existing levels over a few decades as canopy cover is regenerated.

Proposed Action

Direct Effects and Indirect Effects

There are currently more than 300,000 acres of olive-sided flycatcher habitat across the Forest. Proposed harvest in lodgepole stands would eliminate 12,699 acres of olive-sided flycatcher habitat near admin features across the Forest over 10 years. Of course, these stands will also be comprised of dead or dying lodgepole. So, their usefulness for nesting will already be changing; being lost where beetle-kill is complete and widespread. Forest plan standards for recruitment trees, snags and coarse woody debris will retain some habitat features for prey insects in harvest areas but these areas will not be useful if no live trees exist nearby. Later increased understory productivity, tree regeneration, and coarse woody debris accumulation would improve foraging habitat quality. These stands could return to foraging habitat in a few decades and nesting habitat in approximately 100 years as the regenerating forest matures and canopy cover increases.

Olive-sided flycatchers would be expected to leave the immediate area surrounding treatment units due to the noise disturbance caused by mechanical equipment. Immediately after harvest, olive-sided flycatchers could return to those treated areas for foraging where live trees are nearby.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey insects should be abundant but vehicle and visitor disturbance and firewood cutting and extensive habitat change could discourage olive-sided flycatcher use. There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased nesting and foraging habitat quality. However, this would not occur where beetles restarted succession in lodgepole stands.

Adult beetle prey abundance across the Forest is expected to increase substantially under the beetle outbreak. However, there will also be a sharp decline in suitable lodgepole habitat from all the canopy loss. So, many of these acres of high density prey will be unavailable to flycatching olive-sided flycatcher. Still, this lodgepole change would be a very small change to olive-sided flycatcher foraging habitat across the Forest since they prefer mature and older spruce-fir. Useful foraging habitat would be regenerated in several decades as suitable perches are grown for flycatching.

Nesting habitat in lodgepole could also decline abruptly across the Forest due to the rapid and widespread loss of mature and older lodgepole. Around 100 years would pass before understory trees, unaffected by beetles, could grow and mature to provide sufficient canopy cover for nesting use. Still, this would be a very small change to nesting habitat across the Forest since these birds prefer mature and older spruce-fir.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also change olive-sided flycatcher habitat. Stands would not be suitable for nesting or foraging after an extensive, catastrophic wildfire. There would not be sufficient standing trees to be suitable for nesting or foraging except at the edges of these burned stands. At these edges, insects within dead trees and coarse woody debris would provide abundant prey.

The final extent of loss of olive-sided flycatcher habitat to pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is

comprised of the lodgepole habitat used for foraging and nesting. However, most habitat will always be available across the Forest since olive-sided flycatchers nest and feed preferably in mature and older spruce-fir.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of nesting habitat across the Forest. This is only 2% of the more than 300,000 acres of potential nesting habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some foraging opportunity. Stands will regenerate to nesting habitat in approximately 100 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts these areas, 350 acres, are assumed to be suitable as boreal owl habitat. The 350 acres of harvest will temporarily eliminate these stands as boreal owl habitat. These stands will be available as foraging habitat as regeneration occurs but quality will be very low since state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate cavity nests are available.

In total, there will a reduction in nesting and foraging habitat across the Forest where beetle-killed stands are extensive and widespread and from regeneration harvest. Where beetles might kill trees at endemic levels, nesting and foraging habitat quality will be greatly enhanced. However, since olive-sided flycatchers prefer spruce-fir, it is expected that only a few territories or a small portion of a territory is probably comprised of mature lodgepole. So, any lost lodgepole is likely to cause only a few territories to be lost or changed. The olive-sided flycatcher population across the Forest probably won't decline noticeably since most territories for these olive-sided flycatchers occur in mature or older spruce-fir habitats. Any population change would rebound to existing levels over a few decades as canopy cover is regenerated.

Overall, proposed and on-going actions will retain more than 275,000 acres of suitable nesting and foraging habitat on the Forest. Olive-sided flycatcher territories average 110 acres (see Altman and Sallabanks 2000). Proposed and on-going actions (18,699 acres) could temporarily eliminate the equivalent of 170 home ranges on the Forest. However, harvest is distributed widely across the Forest in small strips around admin features in habitat that is not preferred. So, the effect will likely be that some olive-sided flycatcher pairs will lose territories and some pairs will expand or adjust their territories to accommodate the lack of overstory canopy cover and reduced prey availability in harvested stands. Habitat changes from harvest, beetles, and forest regeneration over time will ensure a continuing supply prey and future nesting habitat and will contribute toward maintaining the olive-sided flycatcher population on the Forest.

Determination of Effect and Rationale

Across the Forest, there are more than 300,000 acres of habitat distributed among the 4 mountain ranges (USDA 2003, p. 3-98, 123). Forest management activities are changing 6% of this habitat. The analysis of habitat changes for the 2003 Forest Plan revision indicated that mature lodgepole habitat changed less than 5% between 1985 and 2003 and indicated that mature spruce-fir decreased by less than 1% during the same period. Therefore, vegetation is being maintained to provide suitable habitat for olive-sided flycatchers. This habitat is well distributed across the Forest.

A "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide" determination is made for the olive-sided flycatcher based on the following:

- Forest management actions will regenerate 6% of Forestwide nesting habitat.
- Forest Plan standards for recruitment trees, snags and coarse woody debris are included in timber harvest, providing perch sites and habitat for prey insects.
- Forest Plan guideline to consult Partners-in-Flight Conservation Plans (p. 1-40) for additional guidance was accomplished. Olive-sided flycatcher is a Level II priority species.
- The proposed activities are consistent with the revised Forest Plan (2003). The analysis for the Forest Plan revision determined that Forest activities may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide.

Black-backed woodpecker

Existing Conditions (from USDA 2003, App. I)

Black-backed woodpeckers are yearlong residents in coniferous forest. They may be found at low density in lodgepole and other pines and in mixed conifer forest and in patches of trees that have been killed by insects or by flooding. In Alberta, they were found in old growth if no burned areas were available nearby, but none were found in old growth within 50 km of a recent burn: density in old forest was less than half that found in burns. In the western U.S., black-backed woodpeckers are regularly found and are abundant only in recently burned forest with dead or damaged trees over 9" dbh. In the first few years after a fire, the numbers of many woodpeckers rise dramatically. Though the black-backed is never common, it is regularly seen in burns, with the population rising to peak about 5-6 years after the fire. Black-backed woodpeckers select larger trees than three-toed woodpeckers, do not use early successional stands, and remain longer in burns than three-toed woodpeckers. Little is known of how the birds locate patches of this ephemeral habitat.

Black-backed woodpeckers specialize on large wood-boring beetle larvae typical of beetles that are attracted to fires and start to lay eggs while the trees are still smoldering. This woodpecker has been found to use a variety of foraging techniques with wood-boring insects composing the majority of the diet (Anderson 2003). Although black-backed woodpeckers are not abundant, their numbers do increase where recent burns and beetle outbreaks occur (Anderson 2003). They will forage on live trees, snags, and coarse woody debris.

This species uses unsalvaged burned areas but not adjacent burned areas that have been thinned by salvage logging. Of the woodpecker species inhabiting a burned forest, the black-backed woodpecker was the most sensitive to the removal of standing burned trees, nesting only in the densest (unsalvaged) stands. Nest trees are larger than those used by three-toed woodpeckers (averaging 14.6" in the Northwest), but they will use smaller trees than many other woodpeckers, sometimes as small as 8". These woodpeckers excavate nesting cavities in snags (trees that were dead prior to the fire); in subsequent years, these cavities are used by secondary nesters and by birds and small mammals using communal winter roosts.

The Black-backed woodpecker is a Regional sensitive species, but has not been considered a resident of the Forest. There are no historic records that indicate whether the bird was a regular breeder here in the past. The species is very uncommon on the forest (2 sightings by Steve Loose and possible sighting(s) on the Laramie Range). However, good habitat (areas burned by lethal fire in the preceding 1-8 years) has been lacking. There may be a dispersed, inconspicuous population. Forest lands may not have supported a viable population under natural patterns of disturbance. In most years, only 50 to 500 acres burned on the MBNF. Every few decades this acreage might increase substantially for a few years, and very infrequently (every few hundred years), extensive acreages would burn during a warm, dry interval. This pattern of creation of prime habitat (forests that burned in a lethal fire

1-6 years before) may not have sustained a consistent viable population of black-backed woodpeckers even before the environmental changes that followed European settlement. In 2003, the Gramm fire occurred on the Forest near Foxpark. The area was surveyed for woodpeckers several times in August-early November. Numerous hairy and American three-toed woodpeckers were found concentrated in the area, but no black-backed woodpeckers were found.

Limiting Factors

The primary threats are from fire suppression, salvage logging, and removal of snags. Unlike many woodpeckers, which forage opportunistically on burned forest, in the western United States this species rarely nests outside of burns. The black-backed woodpecker is one of the most fire-dependent species known. Removal of snags and old forest, fragmentation of blocks of mature/old forest, and salvage sales reduce the amount and quality of habitat. The stand characteristics that are preferred by this species (larger trees, moderate intensity of burn that leaves bark on the trees) are the same as those preferred for salvage logging. Firewood collection of snags removes potential nesting habitat.

In summary, the Forest contains a limited amount of black-backed woodpecker habitat. Most of this habitat is of lower quality than the preferred burned ponderosa pine forest. The Snowy Range and Sierra Madre contain little of the preferred ponderosa pine habitat and little conifer habitat burned historically on an annual basis. This woodpecker will exist at a lower density in old conifer forest but recently burned conifer forest is the preferred habitat. This woodpecker appears to be transient, or at most a very small part of a larger Rocky Mountain population, on the Forest due to these habitat limitations.

Alternative 1 – No Action

Direct Effects and Indirect Effects

Endemic levels of insects and pathogens and natural fire intervals play significant ecological roles including tree mortality, defoliation, decay, and deformity. These processes are important attributes in three-toed woodpecker foraging and nesting (cavity excavating) habitat. No action could result in generally positive effects to black-backed woodpeckers.

Potential black-backed woodpecker live tree habitat across the Forest corresponds to spruce-fir forest of structural stages 4A through 4C and 5 and lodgepole of stages 4B, 4C, and 5. There are currently more than 300,000 acres of habitat across the Forest. Black-backed woodpeckers use habitat adjacent to the Forest's open roads, trails, and administrative sites (collectively admin features). However, black-backed woodpecker nesting use could be reduced since research mentioned earlier (p. 11-12) indicated wildlife habitat quality is reduced and disturbance is increased near roads. These areas would still be used for foraging since local experiences indicate that beetles are not avoiding trees near admin features.

Where pine beetles move through stands near admin features at epidemic levels, black-backed woodpecker habitat quality will change through time. The spread of bark beetles would greatly increase prey availability, increasing black-backed woodpecker density during the outbreak. Resulting snags would provide abundant nesting and foraging habitat. Based on research information (see Anderson 2003, USDA 2003), it does not appear that the extensive and widespread loss of canopy cover possible under no action is detrimental to black-backed woodpeckers. They would certainly benefit from the increased foraging opportunity and they nest within burned and beetle outbreak areas. Dead lodgepole would remain nesting habitat for a few decades and much nesting habitat will be available in mature and older spruce stands that are also adjacent to admin features.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey insects should be abundant but vehicle and visitor disturbance and firewood cutting could discourage woodpecker use. There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

Prey abundance across the Forest is expected to increase substantially under the beetle outbreak. There should also be a sharp increase in nesting habitat across the Forest caused by the sharp increase in snags. This improved habitat will last as long as the beetle outbreak continues. Most beetle-killed trees from the next few years are likely to be still available as hard snags suitable for nesting sites for 25 years (see USDA 2003, p. D-80). Other snags will be too soft or will have fallen in 25 years. Overall, Forestwide habitat quality is expected to increase through time under the beetle outbreak.

When beetles decline again to endemic levels, the black-backed woodpecker density across the Forest will have a corresponding decline to normally expected level. It doesn't appear that this will be much of a change. As mentioned earlier, fewer than 3 black-backed woodpeckers have been sighted on the Forest in the last 15 years and years of MIS songbird monitoring during this beetle outbreak has found more three-toed woodpeckers but not a single black-backed woodpecker. In fact, it is not clear that black-backed woodpecker occurrence on this Forest is more than an occasional transient individual.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased nesting and foraging habitat quality. However, this would not occur where beetles restarted succession in lodgepole stands.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also improve woodpecker habitat. Burned conifer stands would provide a unique and limited habitat, very important for these woodpeckers as foraging habitat and future nesting snags. Natural tree mortality from beetles, disease or wildfire would attract insect prey species of woodpeckers. Anderson (2003) summarized that burned forest was important in determining the distribution and abundance of this woodpecker.

The final extent of changes to woodpecker habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of large lodgepole trees potentially used for nesting. These acres would remain as nesting and foraging habitat under no action but the quality of this habitat would improve. Indeed, beetle-infested or burned areas would provide a unique and limited habitat highly desired by black-backed woodpeckers. Woodpecker density in beetle-infested areas would be higher than in the surrounding forest. Woodpecker density would be expected to continue to be elevated as long as the beetle population continued beyond endemic levels. This habitat would only become unsuitable when snags have fallen and younger regeneration dominates the affected sites after several decades.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of nesting habitat across the Forest. This is only 2% of the more than 300,000 acres of potential nesting habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some foraging opportunity. Stands will regenerate to nesting habitat in approximately 100 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts these areas, 350 acres, are assumed to be suitable as black-backed woodpecker habitat. The 350 acres of harvest will temporarily eliminate these stands as black-backed woodpecker habitat. These stands will not be available as foraging habitat as regeneration occurs because state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate cavity nests are available.

In total, there will be an increase in nesting habitat quality and an increase in foraging habitat quality and quantity across the Forest. The black-backed woodpecker population across the Forest probably will increase in response to the beetle outbreak. The increase will last as long as the beetle outbreak, then decline to normal levels.

Proposed Action

Direct Effects and Indirect Effects

There are currently more than 300,000 acres of potential black-backed woodpecker habitat across the Forest. Proposed harvest in lodgepole stands would eliminate 12,699 acres of black-backed woodpecker beetle-killed nesting habitat near admin features across the Forest over 10 years. Forest plan standards for recruitment trees, snags and coarse woody debris will retain some habitat features for prey insects in harvest areas. This will be low quality foraging habitat for approximately 50 years when beetles again begin infesting suitable older trees. These stands could return to nesting habitat in approximately 100 years as the regenerating forest matures.

Black-backed woodpeckers would be expected to leave the immediate area surrounding treatment units due to the noise disturbance caused by mechanical equipment. Immediately after harvest, woodpeckers could return to those treated areas for foraging.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey insects should be abundant but vehicle and visitor disturbance and firewood cutting could discourage woodpecker use. There are still several hundred thousands of acres of nesting and foraging habitat across the Forest away from roads.

Prey abundance across the Forest is expected to increase substantially under the beetle outbreak. There should also be a sharp increase in nesting habitat across the Forest caused by the sharp increase in snags. This improved habitat will last as long as the beetle outbreak continues. Most beetle-killed trees from the next few years are likely to be still available as hard snags suitable for nesting sites for 25 years (see USDA 2003, p. D-80). Other snags will be too soft or will have fallen in 25 years. Overall, Forestwide habitat quality is expected to increase through time under the beetle outbreak.

When beetles decline again to endemic levels, the black-backed woodpecker density across the Forest will have a corresponding decline to normally expected level. It doesn't appear that this will be much of a change, however. As mentioned earlier, fewer than 4 black-backed woodpeckers have been sighted on the Forest in the last 15 years and years of MIS songbird monitoring during this beetle outbreak have found more three-toed woodpeckers but not a single black-backed woodpecker.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased nesting and foraging habitat quality. However, this would not occur where beetles restarted succession in lodgepole stands.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would also improve woodpecker habitat. Burned conifer stands would provide a unique and limited habitat, very important for these woodpeckers as foraging habitat and future nesting snags. Natural tree mortality from beetles, disease or wildfire would attract insect prey species of woodpeckers. Anderson (2003) summarized that burned forest was important in determining the distribution and abundance of this woodpecker.

The final extent of changes to woodpecker habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of large lodgepole trees potentially used for nesting. These acres would remain as nesting and foraging habitat but the quality of this habitat would improve. Indeed, beetle-infested or burned areas would provide a unique and limited habitat highly desired by black-backed woodpeckers. Woodpecker density in beetle-infested areas would be higher than in the surrounding forest. Woodpecker density would be expected to continue to be elevated as long as the beetle population continued beyond endemic levels. This habitat would only become unsuitable when snags have fallen and younger regeneration dominates the affected sites after several decades.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of nesting habitat across the Forest. This is only 2% of the more than 300,000 acres of potential nesting habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some foraging opportunity. Stands will regenerate to nesting habitat in approximately 100 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts these areas, 350 acres, are assumed to be suitable as black-backed woodpecker habitat. The 350 acres of harvest will temporarily eliminate these stands as black-backed woodpecker habitat. These stands will not be available as foraging habitat as regeneration occurs because state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Nesting habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate cavity nests are available.

In total, there will be an increase in nesting habitat quality and an increase in foraging habitat quality and quantity across the Forest, even accounting for recent and proposed harvest. The beetle outbreak is becoming so large in creating or improving woodpecker habitat that any habitat losses to harvest are insignificant. The black-backed woodpecker population across the Forest probably will increase in response to the beetle outbreak. The increase will last as long as the beetle outbreak then decline to normal levels. However, the black-backed woodpecker population before, during, or after the beetle outbreak is so small that changes will likely be unnoticed.

Overall, proposed and on-going actions will retain more than 275,000 acres of suitable nesting and foraging habitat on the Forest. This amount is increasing with the beetle outbreak. Black backed woodpeckers occur on this Forest at an extremely low density, if they even occur as more than transient individuals. Proposed and on-going actions (18,699 acres) could temporarily eliminate habitat within territories. However, harvest is distributed widely across the Forest in small strips around admin features, the beetle outbreak is creating more woodpecker habitat, and woodpecker density is likely to increase as habitat quality increases. So, the effect will likely be that any woodpeckers that lose territory to harvest will gain suitable habitat in adjacent areas away from admin features.

Habitat changes from harvest, beetles, and forest regeneration over time will ensure a continuing supply of prey and future nesting habitat and will contribute toward maintaining a black-backed woodpecker population on the Forest.

Determination of Effect and Rationale

Across the Forest, there are more than 300,000 acres of habitat distributed among the 4 mountain ranges (USDA 2003, p. 3-98, 123). Forest management activities are changing 6% of this habitat. The analysis of habitat changes for the 2003 Forest Plan revision indicated that mature lodgepole habitat changed less than 5% between 1985 and 2003 and indicated that mature spruce-fir decreased by less than 1% during the same period. Therefore, vegetation is being maintained to provide suitable nesting habitat for black-backed woodpeckers. This habitat is well distributed across the Forest.

A "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide" determination is made for black-backed woodpecker based on the following:

- Forest management actions will regenerate 6% of Forestwide nesting habitat.
- Forest Plan standards for snags and coarse woody debris are included in timber harvest, providing woodpecker and prey habitat.
- Forest Plan guideline to consult Partners-in-Flight Conservation Plans (p. 1-40) for additional guidance was accomplished. Black-backed woodpecker is a Level II priority species.
- The proposed activities are consistent with the revised Forest Plan (2003). The analysis for the Forest Plan revision determined that Forest activities may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide.

Pygmy shrew

Existing Conditions (from USDA 2003, App. I)

Pygmy shrews are widespread across Canada and northern U.S. with an isolated population (subspecies *S. hoyi montanus)* in Colorado and SE Wyoming. The subspecies *S. hoyi montanus* is a Pleistocene relict, separated by hundreds of miles from the rest of the species in the northern U.S. and Canada. Its lack of dispersal ability, restriction to boreal habitat (especially edges of fen and fenlike wetlands in spruce/fir forest), and limited distribution (mountains in se Wyoming and central Colorado) make the species vulnerable. Little information is available on population or trends. One author suggested the population may be declining. Trap sites where pygmy shrews were found in 1969 (7 specimens) yielded none during intensive trapping in 1979-1980 (Clark and Stromberg 1987 in Welp et al. 2000). However, Beauvais in USDA (2004a) was unaware of any data with which to estimate population trends. Pygmy shrews have been recorded in the Centennial, Green Rock, June Creek areas of the Snowy Range and the Coon Creek area of the Sierra Madres (18 specimens). The species is small and inconspicuous and would be detected only by trapping.

Pygmy shrews are active beneath the snow all winter, feeding primarily on insects and carrion. Pygmy shrews feed on a variety of arthropods, worms, and insects. Feeding areas consist of interspersed wet and dry sites to assure an adequate prey base. As the smallest mammal in North America, pygmy shrews have high-energy demands per unit weight, and must consume considerable amounts of high-energy food to stay alive. (One estimate is over 1,500 spiders/day). Like all shrews, individuals need to hunt many hours a day to gather enough food to survive. In winter, insulation from adequate snow cover is necessary to buffer the extremes of cold found at high elevation. Pygmy shrews further conserve energy by resting in bulky nests. The shorter winter feeding forays may allow them to return while the nest is still warm from the last visit. They need access to enough foraging space beneath the snow to gather adequate food.

Pygmy shrews in Wyoming prefer sphagnum moss on edges of small ponds in spruce-fir forests, moist meadows, bogs, and other wet areas at high elevations, mostly above 9,000 feet. They nest in old, decaying logs and in the roots of tree stumps. Such habitat information as is available for pygmy shrew comes principally from 2 studies where capture site conditions are carefully described. Spencer and Pettus (1966) provide detailed information on vegetation, physical setting and invertebrate fauna where pygmy shrews were collected in Larimer County, Colorado, at an average elevation of 9650 feet. They suggest that Pygmy shrew requires both forest and wetland in close proximity and that, perhaps, these habitats need to be interspersed. Brown (1967) reports similar wetland/forest habitat conditions for pygmy shrews captured at 9620 feet elevation in Albany County, Wyoming, emphasizing that 6 pygmy shrews he trapped were found "only around the periphery of the bog [adjacent to spruce/fir] in an area dominated by a deep, spongy mat of sphagnum moss (p. 621)." Incidental characterizations of habitat provided by Brown (1966), DeMott and Lindsey (1975) and O'Doherty (2003) corroborate an association between pygmy shrews and wetland/forest edges, although 2 shrew specimens caught by DeMott and Lindsey were from habitats at least hundreds of feet away from conifer stands. While not conclusive, available evidence suggests forest/wetland edges are primary (key) habitat for pygmy shrews in the southern Rocky Mountains (Brown 1966, Brown 1967, DeMott and Lindsey 1975, Long 1972, Spencer and Pettus 1966) and this habitat complex may be essential. No published reports were located that indicated pygmy shrew may be affiliated with other habitat(s).

Several areas on the Forest are completely consistent with general habitat characteristics just described. The key macro-elements of habitat present on the Forest and some proposed harvest units are: 1), an ecotone where wetlands and mature-or-older forest adjoin, 2), elevation above 9000 feet and 3), close proximity to water. According to Long (1972), all 7 subspecies of pygmy shrews have usually been collected within 300 feet or so of water.

Insofar as vegetation is concerned, a number of plants and coarse woody debris (CWD) have been associated with pygmy shrew habitats. Engelmann spruce, subalpine fir and lodgepole pine comprise the major tree species in forests where *S. h. montanus* has been collected in Wyoming and Colorado (Brown 1966, Brown 1967, DeMott and Lindsey 1975, Spencer and Pettus 1966, Vaughan 1969). Several investigators have also noted plentiful coarse woody debris within forest sites where pygmy shrews have been captured (DeMott and Lindsey 1975, Long 1972, O'Doherty 2003). In addition to trees, Spencer and Pettus (1966), at their study site west of Fort Collins, Colorado, identified a number of plants they found in association with shrew capture sites. Given their assertion that pygmy shrews require both forest and wetlands, 5 plant genera identified in the Spencer and Pettus study may indicate *S. h. montanus* habitat when found with the above 3 trees (Long 1972). The 5 plants included by Long (1972) as indicators for *montanus* shrew habitat are sedge (*Carex* spp.), reedgrass (*Calamagrostis* spp.), willow (*Salix* spp.), sphagnum moss (*Sphagnum* spp.) and huckleberry (*Vaccinium* spp.). All 5 plant indicators are found in the analysis area.

Habitat for pygmy shrews is clearly present on the Forest, these shrews have been found on the Forest but none have been found in proposed harvest units. Pygmy shrews have been trapped in the Coon Creek watershed and on the east side of the Snowy Range.

Limiting Factors

Local populations of *S. h. montanus* may be vulnerable to extirpation across the subspecies' geographic range due to several characteristics of this shrew's ecology. Considering this subspecies may be relegated to primary habitats of fens, wet meadows, or other wetland areas located adjacent (generally within 300 ft.) to spruce/fir forests, this habitat complex probably is an uncommon occurrence on the landscape. Additionally, suitable wetland/forest habitats may be isolated within the montane landscape and are often limited in area extent as well. At the same time, wetland/forest habitat complexes are discontinuous one from another and are usually separated by habitats seemingly unsuitable for *S. h. montanus* to traverse. Coupled with the fact that suitable habitats are likely disjunct

on the landscape is the reality that dispersal capabilities for this animal seem poor. The inability for pygmy shrews to disperse long distances likely increases the insularity of local population segments (Beauvais 2004). Taken together, these characteristics indicate caution is essential when considering disruption effects or habitat modifications in or near pygmy shrew habitat.

Effects of management are not well understood. As mentioned, the patchy distribution of this subspecies makes it vulnerable to loss of local populations. Loss of downed wood and disruption of habitat at the edge of wetlands may reduce habitat suitability. Logging of subalpine forest creates sites that may be too dry for pygmy shrews (depending on the type of harvest and loss of canopy cover).

Logging alters the amount, arrangement and structure of dead downed wood essential to the species. In their assessment of HRV on the Forest, Dillon et al. (2003), indicated that harvesting has created low levels of coarse woody debris that are beyond the range of HRV. They also indicated that USFS recommendations for coarse woody debris in harvest units (Graham et al. 1994) will still provide less coarse woody debris after several harvest rotations than would occur naturally after the same number of fires. Finally, the authors indicated that natural disturbances do not remove large pieces of wood from forests. The FEIS for the revised Forest Plan also indicated that logged sites have changed the amount, spatial distribution, temporal patterns, and size of downed wood (USDA 2003, p. D-82 – D-85). USDA (2003) also indicated that the greater concern is not the immediate effects but the potential decline in the amount and size and the possible gap in production of downed wood over several decades.

Recreation resulting in compaction of snow, especially near wetlands, may be a threat. Alteration in the physical structure of snow that reduces its insulation and passage of O_2 and CO_2 would reduce habitat suitability for this species. The species would be most vulnerable to compaction effects where compaction is most likely to occur, in open forest or in wet areas adjacent to forest, rather than in denser forest.

Evaluation criteria for the species are the amount of timber harvest planned in subalpine forest (which affects soil characteristics and downed wood abundance, distribution, and recruitment) and pattern of winter recreation (amount of area affected by snow compaction in the subalpine zone). All alternatives [in the FEIS] prevent logging within 100 feet of water (300 feet if riparian dependent TES species are present) and provide for retention of downed wood in logged area (USDA 2003, p.I-121).

Alternative 1 – No Action

Direct Effects and Indirect Effects

Endemic levels of insects and pathogens and natural fire intervals play significant ecological roles on the including tree mortality, defoliation, decay, and deformity. These processes provide features of pygmy shrew habitat. No action could result positive effects to pygmy shrews.

Potential pygmy shrew habitat corresponds to spruce-fir and, to a lesser extent, lodgepole forest near wetlands above 9000 ft. elevation. Typically, most lodgepole sites do not have the greater amounts of coarse woody debris, multiple size classes, and moist ground that are the most productive pygmy shrew habitat. There are currently 68,276 acres of pygmy shrew habitat consisting of wet meadows, fens, slow streams and “bog”-margined ponds within 300 ft. of spruce-fir or lodgepole forest at or above 9000 ft. (USDI 1990, National Wetlands Inventory and Forest vegetation database) across the Forest. It is likely that pygmy shrews use habitat adjacent to the Forest’s open roads, trails and administrative sites. However, use should be reduced since research mentioned earlier (p. 11-12) indicated wildlife habitat is reduced near roads.

Where beetles move through stands near admin features at endemic or epidemic levels, pygmy shrew habitat will be improved. Beetles will kill medium size and larger trees. Smaller trees will remain healthy and provide canopy cover, retaining moisture in pygmy shrew habitat. Loss of large overstory trees will increase the amount of water available to other vegetation and the wetlands. It is expected that shrub and herbaceous vegetation will increase in surrounding wetlands, increasing cover and prey habitat in pygmy shrew habitat. The dying trees will add coarse woody debris over time, also increasing the quality of pygmy shrew habitat.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey insects should be abundant where coarse woody debris still exists but vehicle and visitor disturbance, firewood cutting, and flower picking could discourage pygmy shrew use. There are still tens of thousands of acres of habitat across the Forest away from roads.

Prey abundance across the Forest is expected to increase substantially over time under the beetle outbreak. The accumulation and decay of coarse woody debris will improve prey habitat. The spread of existing bark beetle outbreak would increase the amount of coarse woody debris for pygmy shrew habitat. Dillon et al. (2003) indicated that coarse woody debris, which depends on long periods of forest development, is less common than the HRV in high elevation forests due to past logging. Coarse woody debris was not required to be left during harvest decades ago. Even coarse woody debris required to be retained in harvest units after the adoption of the 1985 Forest Plan was about 10% of the low range that occurs under natural conditions (USDA 2003, p. 3-148). Therefore, the dead and dying trees from the beetle outbreak will begin to restore natural amounts of coarse woody debris over time. This will be a particular benefit during winter when pygmy shrews will rely on the increased coarse woody debris for improved survival in a subnivian environment.

Cover for the shrews, themselves, will improve from the increased understory productivity and forest regeneration. This improved habitat will last for decades after the beetle outbreak ends until coarse woody debris melts into the forest floor. Overall, Forestwide habitat quality is expected to increase through time under the beetle outbreak. The pygmy shrew population across the Forest is expected to follow the changes in coarse woody debris through time.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased habitat quality. Where beetles restarted succession in lodgepole stands the build up of coarse woody debris combined with regenerating forest would also provide some pygmy shrew habitat but at a lower quality.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would change some pygmy shrew lodgepole habitat. This lodgepole habitat would be lost until understory productivity returned, forest regeneration started providing some overhead cover, and coarse woody debris began accumulating. However, since pygmy shrews primarily use spruce-fir near wetlands and this habitat rarely burns, wildfires probably will not change pygmy shrew habitat noticeably across the Forest.

The final extent of changes to pygmy shrew habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of mature and older lodgepole stands potentially used by pygmy shrews if located near wetland features. These acres could remain as pygmy shrew habitat unless wildfire is severe and extensive across the landscape to the point that vegetation and coarse woody debris is lost for some time. Usually, beetle-infested areas would provide

an accumulation of coarse woody debris to improve habitat quality. Pygmy shrew density in beetle-infested areas would be higher than in the surrounding forest. Pygmy shrew density would be expected to continue to be higher as long as the understory was productive, some overhead cover existed, and coarse woody debris was abundant.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 600 acres of nesting habitat across the Forest. This is <1% of the more than 68,000 acres of pygmy shrew habitat available across the Forest. The snags, recruitment trees, and coarse woody debris retained in these units would provide pygmy shrew habitat in approximately 40 years as regeneration also occurs.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. These projects do not include harvest within pygmy shrew habitat.

In total, there will be an increase in pygmy shrew habitat quality, sometimes quantity, in lodgepole across the Forest where pine beetle-kill occurs near wetlands. If catastrophic fires follow and are extensive across the landscape, pygmy shrew habitat will be lost for some time. However, since pygmy shrews prefer spruce-fir/wetland habitat, it is expected that only a few home ranges or a small portion of home ranges are comprised of mature lodgepole. So, any lost lodgepole is likely to cause only a few territories to be lost or changed. The pygmy shrew population across the Forest will follow changes in coarse woody debris accumulation. These changes will be small since the population depends more on mature or older spruce-fir habitat that is not changing.

Proposed Action

Direct Effects and Indirect Effects

There are currently more than 68,000 acres of pygmy shrew habitat across the Forest. Proposed harvest occurs in lodgepole stands that are considered pygmy shrew habitat. However, several design criteria including 3, 8, 11, 31 and 32 limit the amount of disturbance and amount of coarse woody debris removed near pygmy shrew habitat. Proposed actions would temporarily eliminate 370 acres of pygmy shrew habitat near admin features across the Forest over 10 years. These 370 acres would be near the edge of the 300 ft distance from wetlands that pygmy shrews have been found using (Long 1972) since it is impractical to operate machinery adjacent to the wetlands and design criteria limit these operations. Forest plan standards for recruitment trees, snags and coarse woody debris will retain some habitat features that will restore habitat quality as lodgepole regeneration provides overhead cover over 40 years.

Design criteria (3,8,11,31 and 32) also limit mechanized equipment near wetlands. These criteria will protect ground/soil characteristics to ensure wetland habitat quality, promote integrity and persistence of coarse woody debris, and limit disturbance to pygmy shrews. Secondly, the persistence of coarse woody debris will promote habitat quality during winter when shrews survive in subnivian conditions.

Past harvest has removed much of the coarse woody debris from previously harvested areas, as described in Limiting Factors above. The revised Forest Plan does have standards (p. 1-38, 39) for recruitment trees, snags, and coarse woody debris applied to timber sales. These Plan standards provide the low range of snags and coarse woody debris that occurred under natural conditions (USDA 2003, p. 3-148). This could rebuild cover and coarse woody debris over time, if harvest does not continue to occur in these sites.

Pygmy shrews would be expected to leave the edges of their territories that are within treatment units due to the noise disturbance caused by mechanical equipment. Pygmy shrews would forage a the center of their territories near the wetlands until activity stopped. Immediately after harvest, pygmy shrews could return to those treated areas for foraging where some live trees and coarse woody debris remain.

This subspecies of pygmy shrew exists as a relict population of isolated groups with very limited dispersal ability within a narrow range of primary habitat. These shrews are not likely to reoccupy widely separated relics of habitat where habitat is initially lost then habitat quality returns over time. Harvest units and suitable habitat are scattered across the Forest so that no habitat will be isolated by harvest. So, habitat temporarily lost can be reoccupied by pygmy shrews over time.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Prey insects should be abundant but vehicle and visitor disturbance and firewood cutting and flower picking could discourage pygmy shrew use. There are still tens of thousands of acres of pygmy shrew habitat across the Forest away from roads.

Prey abundance across the Forest is expected to increase substantially over time under the beetle outbreak. The accumulation and decay of coarse woody debris will improve prey habitat. The spread of existing bark beetle outbreak would increase the amount of coarse woody debris for pygmy shrew habitat. Dillon et al. (2003) indicated that coarse woody debris, which depends on long periods of forest development, is less common than the HRV in high elevation forests due to past logging. Coarse woody debris was not required to be left during harvest decades ago. Even coarse woody debris required to be retained in harvest units after the adoption of the 1985 Forest Plan was about 10% of the low range that occurs under natural conditions (USDA 2003, p. 3-148). Therefore, the dead and dying trees from the beetle outbreak will begin to restore natural amounts of coarse woody debris over time. This will be a particular benefit during winter when pygmy shrews will rely on the increased coarse woody debris for improved survival in a subnivian environment.

Cover for the shrews, themselves, will improve from the increased understory productivity and forest regeneration. This improved habitat will last for decades after the beetle outbreak ends until coarse woody debris melts into the forest floor. Overall, Forestwide habitat quality is expected to increase through time under the beetle outbreak. The pygmy shrew population across the Forest is expected to follow the changes in coarse woody debris through time.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased habitat quality. Where beetles restarted succession in lodgepole stands the build up of coarse woody debris combined with regenerating forest would also provide some pygmy shrew habitat but at a lower quality.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would change some pygmy shrew lodgepole habitat. This lodgepole habitat would be lost until understory productivity returned, forest regeneration started providing some overhead cover, and coarse woody debris began accumulating. However, since pygmy shrews primarily use spruce-fir near wetlands and this habitat rarely burns, wildfires probably will not change pygmy shrew habitat noticeably across the Forest.

The final extent of changes to pygmy shrew habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of mature and older lodgepole stands potentially used by pygmy shrews if located near wetland features. These acres could remain as pygmy shrew habitat unless wildfire is severe and extensive across the landscape to the point that vegetation and coarse woody debris is lost for some time. Usually, beetle-infested areas would provide an accumulation of coarse woody debris to improve habitat quality. Pygmy shrew density in beetle-infested areas would be higher than in the surrounding forest. Pygmy shrew density would be expected to continue to be higher as long as the understory was productive, some overhead cover existed, and coarse woody debris was abundant.

When coarse woody debris declines again over time, pygmy shrew habitat quality and quantity will also decline. There should be a corresponding decrease of pygmy shrew density across the Forest. It doesn't appear that this will be much of a change, however. As mentioned earlier, few pygmy shrews have been found on the Forest and the preferred spruce-fir habitat is not being affected by pine beetles.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 600 acres of nesting habitat across the Forest. This is <1% of the more than 68,000 acres of pygmy shrew habitat available across the Forest. The snags, recruitment trees, and coarse woody debris retained in these units would provide pygmy shrew habitat in approximately 40 years as regeneration also occurs.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. These projects do not include harvest within pygmy shrew habitat.

In total, there will be an increase in pygmy shrew habitat quality, sometimes quantity, in lodgepole across the Forest where pine beetle-kill occurs near wetlands. The beetle outbreak is becoming so large in creating or improving pygmy shrew habitat that any habitat losses to harvest are insignificant. If catastrophic fires follow and are extensive across the landscape, pygmy shrew habitat will be lost for some time. However, since pygmy shrews prefer spruce-fir/wetland habitat, it is expected that only a few home ranges or a small portion of home ranges are comprised of mature lodgepole. So, any lost lodgepole is likely to cause only a few territories to be lost or changed. The pygmy shrew population across the Forest will follow changes in coarse woody debris accumulation. These changes are unlikely to be noticed since the population depends more on mature or older spruce-fir habitat that is not changing and harvest is affecting a small portion of pygmy shrew habitat.

Overall, proposed and on-going actions will retain more than 65,000 acres of suitable habitat on the Forest. Habitat quality and, sometimes quantity, is increasing with the beetle outbreak. Proposed and on-going actions (970 acres) could temporarily eliminate habitat within some territories. However, harvest is distributed widely across the Forest in small strips around admin features, the beetle outbreak is improving habitat quality, and pygmy shrew density is likely to increase as habitat quality increases. So, the effect will likely be that any pygmy shrews that lose habitat to harvest will gain suitable habitat in adjacent areas away from admin features. Habitat changes from harvest, beetles, and forest regeneration over time will ensure a continuing supply of prey and future habitat and will contribute toward maintaining a pygmy shrew population on the Forest.

<u>Determination of Effect and Rationale</u>

Across the Forest, there are more than 7900 acres of suitable wetlands for pygmy shrews. Given the shrews' tendency to use spruce-fir and some lodgepole habitat within approximately 100 yards of these wetlands, there are

more than 65,000 acres of wetland/spruce-fir or wetland/lodgepole interface habitat across the Snowy and Sierra Madre ranges of the Forest. Forest management activities are changing <2% of this habitat over 10 years. The analysis of habitat changes for the 2003 Forest Plan revision indicated that the current amount and distribution of riparian cover types is similar to what occurred historically (USDA 2003, p. 3-98). However, riparian habitat characteristics relative to this species, particularly coarse woody debris, have been altered by historic actions such as timber harvest and tie-hacking. The analysis for the Plan revision also indicated that riparian habitat will be protected under the aquatic standards and guidelines, watershed conservation practices handbook direction and the regional direction regarding fens (USDA 2003, p. 3-111 and App. I). Finally, the Plan revision (USDA 2003, App. D) and Dillon et al. (2003) indicated that coarse woody debris is below HRV and a gap in future downed wood production is possible (USDA 2003, p. D-84). The beetle outbreak is dramatically increasing coarse woody debris. Vegetation is being maintained and improved to provide habitat for pygmy shrews into the future. Further, design criteria are limiting harvest activities near wetlands suitable to pygmy shrews (see Long 1972). Therefore, vegetation is being maintained to provide suitable habitat for pygmy shrews. This habitat is well distributed across the Forest.

A "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide" determination is made for pygmy shrew based on the following:

- Forest Plan standards for recruitment trees, snags and coarse woody debris are included in timber harvest to provide cover that retains forest floor moisture and provide coarse woody debris habitat characteristics.
- Design criteria in the Proposed Action, specifically 3,8,11,31 and 32 limit activities in pygmy shrew habitat.
- The analysis for the Forest Plan revision determined that Forest activities may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide since "All alternatives prevent logging within 100 feet of water (300 feet if riparian dependent species are present) and provide for retention of downed wood in logged area (USDA 2003, p. I-121)".

American Marten

Existing Conditions (from USDA 2003, App. I)

The marten is abundant in much of its range, though populations have been subject to declines in the past from overtrapping. Habitat degradation (loss of complex structured mature-old forest) and severe fragmentation from logging have caused population declines and extirpation from some areas. Martens are legally designated as furbearers in Wyoming with about 500 animals taken statewide each year (Wyoming Game and Fish Department 2000). American martens are uncommon across the Forest. Marten home range size requirements are disproportionately very large relative to body size, even compared to other carnivores (Buskirk and McDonald 1989 in Potvin et al. 2000). Extensive radio telemetry aided studies of American marten were conducted from 1985 through 1995 in the Coon Creek and East Fork Encampment River watersheds on this Forest. Ninety-six individuals were captured during the study. Researchers found, again, that martens were uncommon but widespread within suitable habitat.

Since martens are uncommon and have disproportionately very large home ranges, the Forest adopted a new survey technique in 2004 to monitor population trend. This hair snare technique is similar to the technique developed by Belant (2003). There are 62 hair snares; each monitoring the Forest for 11 to 14 days with 2 checks during this time. DNA from hair samples, and sometimes fecal samples, are used to determine individuals. Results for this Forestwide monitoring are provided in Table 5.

Table 5. American marten Forestwide monitoring results.

YEAR	Total Marten samples	# New Individuals	# Previously Identified Individuals
2004	14	7	na
2005	31	15	3
2006	15	5	2

Though martens may forage in adjacent meadows, they are primarily animals of dense, old forest with a complex structure of understory and downed wood. Late-successional multi-storied stands of spruce-fir forest are preferred, though multistoried lodgepole (usually with invading subalpine fir) and other forest types with downed wood are also used. Martens are found in dense forest with canopy cover of at least 30%. A complex arrangement of downed wood (large logs, tangles of smaller material, root wads, downed trees with branches, and sloping logs and branches) provides habitat for prey, cover from predators, dens, resting sites, and entry to subnivian habitat. Squirrel middens, hollow logs, cavities in snags, and rock piles are used for dens. Partially arboreal, marten hunt and rest in trees, in cavities and on mistletoe brooms. Marten depend on old forest components like large snags and downed wood for maternal and natal dens. Though summer rest sites vary greatly, during winter, martens rest in large downed wood insulated by snow cover. The home range can have inclusions of mature forest and some openings as long as the old-forest features are abundant and well distributed.

Marten are apparently sensitive to fragmentation (perforation of a matrix of mature/old forest) at the scale produced by timber production. Loss of martens from fragmented forest has been found in Utah, Maine, and Quebec. At a landscape scale, typical habitat had few or no marten when clearcuts under 40 years old occupied over 25%-35% of the area, even when the older forest patches were still connected. In Maine and Quebec, martens positioned their home ranges to avoid heavily clearcut forest. However, all these results may also simply be the effects of habitat loss and not fragmentation. Fragmentation is a measure of the breaking apart of habitat and habitat loss at a landscape scale. See Fahrig (2003) for a detailed discussion of habitat loss versus fragmentation.

Martens strongly avoided patch cuts (approximately 1 to 5 acres in size) in the Coon Creek study area (on the MBNF). The few tracks detected in the cuts occurred only in the 1st or 2nd year following logging and hugged the edge.

Limiting Factors

Loss in amount of primary habitat (late successional forest, especially spruce/fir but also lodgepole if structural elements are present) and, perhaps, fragmentation/perforation of patches (see Fahrig 2003) of late successional forest reduce habitat suitability for marten and are limiting factors. Inadequate retention and provision of long-term gradual recruitment of downed wood reduces insulated subnivian winter resting sites, denning sites, and prey density. Large downed logs (from old trees with heartrot) are used for denning and for subnivian resting sites. Low population density, low reproductive rate, sensitivity to changes in landscape pattern (perforation or fragmentation of blocks of old/mature forest), and vulnerability to trapping make martens vulnerable to population decline. See Fahrig (2003) and later discussion for alternative views on fragmentation.

There is less interior forest on the Medicine Bow than in the past: though the species is not an interior forest obligate, this is an important component of its habitat. In a lightly-roaded area in Ontario, it was found that marten used habitat adjacent to roads significantly less than habitat at a distance from roads.

Alternative 1 – No Action

Direct Effects and Indirect Effects

Natural fire regimes, endemic levels of insects and pathogens play significant ecological roles including tree mortality, defoliation, decay, and deformity. These processes are important attributes in marten habitat. No action could result in variable effects to American martens.

Potential marten habitat across the Forest corresponds to spruce-fir forest of structural stages 4A through 4C and 5 and lodgepole of stages 4B, 4C, and 5 with some structural complexity. There are currently more than 246,000 acres of habitat across the Forest. It is likely that martens use some habitat adjacent to the Forest's open roads, trails, and administrative sites (collectively admin features).

However, marten use could be reduced since research mentioned earlier (p. 11-12) indicated wildlife habitat quality and, relatedly, prey are reduced near roads. Ruggerio et al. (1994) indicated that forest carnivores such as American marten have forest patches with large core areas as important habitat features. Reed et al. (1996) studied the Tie Camp area immediately west of the Blackhall/McAnulty analysis area. They found that roads added to more to breaking apart forested patches than clearcuts by creating smaller patches, more patches, and converting interior habitat to edge habitat. So, usefulness of marten habitat near admin features is reduced. There will be no change to the existing road network under no action.

Where pine beetles move through stands near admin features at normal levels, marten habitat quality would improve, although usefulness might not improved as described in the previous paragraph. There will be a beneficial mix of live and dead trees to support a variety of mammal and bird prey. These features will also retain some canopy cover and increase snags and coarse woody debris over time to improve marten habitat for foraging, denning, or resting. Drew (1995) found that martens foraged through areas of coniferous forest defoliated by spruce budworm and hemlock looper. In fact, these martens used defoliated stands more often than expected by simple random use. However, he also clarified this finding with "...while defoliated forest made up a significant portion of the home ranges of all but 1 marten in Newfoundland, the largest portion of all home ranges was intact mature and older coniferous forest".

Cumulative Effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Snags, coarse woody debris, and prey could become more abundant next to roads. But the fewer core areas (Ruggerio et al. 1994), abundant vehicle and visitor disturbance, firewood cutting and extensive overstory cover change could discourage marten use. There are still several hundred thousands of acres of habitat across the Forest away from roads.

If the outbreak is not complete and widespread, martens would continue to use the beetle-affected habitat. In fact, marten habitat quality would be enhanced if beetles caused only low to moderate amounts of single tree and small group mortality of what are typically the unhealthiest trees in the stand. This level of snag and coarse woody debris creation combined with retention of the larger mature conifer stand would provide more abundant resting sites, denning sites, and prey habitat.

Where pine beetle tree losses are nearly complete and widespread across many acres as it appears is currently occurring, marten habitat will be lost and then improve. The dramatic and relatively sudden decline in canopy cover should not provide enough overhead cover for martens (see Drew 1995 and USDA 2003 App. I). As cone resources decline over a decade, red squirrel prey will become scarce. Since these lodgepole stands generally lack much understory, the loss of overstory cover should also produce a decline in red-backed vole prey.

Over several decades, canopy cover will improve from regeneration and the growth of the small trees not affected by beetles. Snags and coarse woody debris will accumulate to provide resting and denning sites for martens. The increase of these features will also improve foraging habitat by providing an abundance of habitat for small mammals such as the red-backed vole. As lodgepole begin to produce cones again over the following 40 years, red squirrel habitat will improve again. In the long-term, Forestwide habitat quality is expected to increase through time under the beetle outbreak since over head cover is expected to eventually reoccur. The marten population across the Forest is expected to follow the changes in coarse woody debris accumulation and stand regeneration through time.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased habitat quality. However, where beetles restarted succession in lodgepole stands, marten habitat would be lost initially as described in the previous paragraph.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would change marten lodgepole habitat. This lodgepole habitat would be lost until forest regeneration started providing some overhead cover, and coarse woody debris began accumulating. However, since martens primarily use spruce-fir habitat and this habitat burns less frequently, wildfires probably will not change marten habitat substantially across the Forest.

The final extent of changes to marten habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of mature and older lodgepole stands potentially used by martens. These acres could remain as marten habitat unless wildfire is severe and extensive across the landscape to the point that vegetation and coarse woody debris is lost for some time. Usually, beetle-infested areas would provide an accumulation of coarse woody debris to improve habitat quality in time. Marten density in beetle-infested areas would be higher than in the surrounding forest in time. Marten density would be expected to continue to be higher as long as some overhead cover existed, and snags and coarse woody debris was abundant.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of habitat across the Forest. This is <2.5% of the more than 246,000 acres of potential habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some future foraging opportunity. These stands will regenerate to provide characteristics of foraging habitat within 50 years and the large trees, snags, and coarse woody debris useful as marten denning habitat within another 50 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts these areas, 350 acres, are assumed to be suitable as marten habitat. The 350 acres of harvest will temporarily eliminate these stands as marten habitat. These stands will be available later as foraging habitat as regeneration occurs but quality will be very low since state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Denning habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate snags and coarse woody debris are available.

Martens might also be affected by fragmentation (or perforation), not just habitat loss. Potvin et al. (2000) found that martens were fairly intolerant of "habitat fragmentation" and cannot tolerate more than 30-35% cutovers in its home range. They stated that where the objective is to maintain marten habitat at a local scale, $\geq$ 50% uncut forest be preserved inside 10 km^2 (2471 acre) units and that < 30% of the area be clearcut over a 30-year period.

Similarly, Chapin et al. (1998) found that martens tolerated a median of only 20% regenerating clearcuts in their home ranges. Bissonette et al. (1997) indicated that martens appear to avoid landscapes with more than 25% to 30% of the total area in vegetation types other than intact older forests. Finally, Hargis et al. (1999) reported that martens were absent from landscapes ($\geq$9 km^2) having >25% nonforested cover. Further, they found that forested landscapes appeared unsuitable for martens when the distance between open patches was < 100m. This proximity of open areas in their study eliminated nearly all forest interior relative to martens.

However, more recent review (Fahrig 2003) suggests that past research actually evaluated only habitat loss and not the larger landscape-scale process involving both habitat loss and the breaking apart of habitat known as fragmentation. Fahrig (2003) stated that researchers did not measure the breaking apart of habitat, fragmentation, after controlling for habitat loss. Hargis et al. (1999) was one of the research projects evaluated in Fahrig (2003). Furthermore, Potvin, Chapin, and Hargis, above, made evaluations at the scale of a marten home range. Mean home ranges for American martens in the Encampment River watershed of the Forest were found to be 1652 acres in summer and 1462 acres in winter for females and 4494 acres in summer and 3602 acres in winter for males (O'Doherty et al. 1997). Even Bissonette et al. (1997) related "fragmentation" to % loss of habitat at a landscape scale but did not evaluate landscape pattern exclusive of habitat loss. While all these researchers did find strong results related to habitat loss, they did not independently evaluate landscape scale fragmentation as pointed out by Fahrig (2003). Finally, and most important relative to the needs of marten (and other wildlife), Fahrig (2003) concluded that the effects of habitat loss were much greater than the effects of fragmentation.

Regardless of this current debate among researchers on whether fragmentation is truly being measured as an independent effect in wildlife research studies, the Forest has experienced some habitat changes as a result of Forest management actions in the last 5 decades. Some type of timber harvest, and a supporting road network, has occurred over approximately 132,937 acres (12.3%, USDA 2003 p. 3-150) of the forested habitat across the Forest over 50 years. From this standpoint, it appears there has been a small amount of "fragmentation" of marten habitat.

One index to interior forest (see limiting factors for marten) that was evaluated in the recent Forest planning process is security areas; those areas > ½ mile from a road and containing 250 acre blocks of forested habitat with moderate to high canopy cover. So, security areas can provide large expanses of forested cover and low road density for martens. Geographic Areas across the Forest average 20% security habitat. As much as this interior forest index relates to man-caused changes to marten habitat - harvest and supporting roads creating many smaller, younger, uniform size and shape vegetation patches - it appears that Forest management has already affected a considerable amount of potential marten habitat.

Under a potential complete and widespread pine beetle outbreak, these security areas might still be retained. The Forest Plan defined security areas to also include habitat structural stages 3B and 3C (USDA 2003, p. 3-262). While live tree cover will be lost, there would still be standing dead trees and small live trees that could provide cover in these blocks of interior forest. From the standpoint of security habitat then, "fragmentation" will not increase under no action.

An extensive road network contributes to fragmentation characteristics of high edge contrast, smaller patch size, and less interior forest. Hargis et al. (1999) did report that forested landscapes appeared unsuitable for martens when the average distance between open patches was < 100m. However, their open patches were defined by clearcut harvest. Likewise, other marten research has evaluated habitat changes for martens relative to harvest, not roads. Martens might use heavily roaded areas less due to the amount of open patches, similar to harvest created openings, but the exact effect of this habitat change to martens is not known.

Overall, on-going and future actions among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate and Spruce Gulch projects will retain more than 240,000 acres (98%) of the marten habitat across the Forest. Potvin et al. (2000) and Hargis et al. (1999) found that martens occupied home ranges until 25% to 35% of the home range became nonforested. The cumulative effect of habitat loss and the distribution of this habitat loss could have caused 12 marten home ranges to be temporarily unoccupied across the Forest; or martens in these home ranges adapted by expanding or shifting their home ranges. Past, on-going, and future actions for 30 years would create more than 25% nonforested habitat ("fragmented" habitat) within the 12 home ranges. These potential population effects are small in scale and over time in comparison to marten habitat across the Forest. These potential population effects are small compared to the potential habitat changes from any past or the current pine beetle outbreak. Finally, most marten habitat occurs in mature and older spruce-fir; lodgepole is generally less used. Thus, changes caused by Forest management should retain a stable marten population across the Forest.

Proposed Actions

Direct Effects and Indirect Effects

There are currently more than 246,000 acres of marten habitat across the Forest. Many potential marten home ranges on the Forest will not be affected since most of the lodgepole proposed for harvest is not suitable marten habitat. Proposed harvest in lodgepole stands would eliminate 1655 acres of marten habitat near admin features across the Forest over 10 years. These stands are adjacent to roads, so, their usefulness will be reduced as described earlier. These stands will be comprised of dead or dying lodgepole. So, their usefulness to martens will already be changing; being lost where beetle-kill is complete and widespread as discussed earlier. Forest plan standards for recruitment trees, snags and coarse woody debris will retain some habitat features to provide foraging habitat within 50 years and denning habitat within 100 years.

The 1655 acres of treatment in marten habitat are widely distributed across the Snowy Range and Sierra Madre Range. Treatment is scattered across several potential marten home ranges. Most affected marten home ranges will receive only a few acres of treatment within suitable habitat; no marten home range will receive more than 85 acres of treatment within suitable habitat. So, the direct loss of habitat from the proposed action is not going to cause any marten home range to become unoccupied.

Individual martens would be expected to leave the immediate area surrounding treatment units due to the noise disturbance caused by mechanical equipment during harvest. Immediately after harvest, habitat will not be suitable to martens, so martens will continue to avoid these areas. These are such small areas within marten habitat that fitness or survival of individual martens should not be affected.

Cumulative Effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife (see p. 11-12). Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Snags, coarse woody debris, and prey could become more abundant next to roads. But the fewer core areas (Ruggerio et al. 1994), abundant vehicle and visitor disturbance, firewood cutting and extensive overstory cover change could discourage marten use. There are still several hundred thousands of acres of habitat across the Forest away from roads.

If the outbreak is not complete and widespread, martens would continue to use the beetle-affected habitat. In fact, marten habitat quality would be enhanced if beetles caused only low to moderate amounts of single tree and small group mortality of what are typically the unhealthiest trees in the stand. This level of snag and coarse woody debris

creation combined with retention of the larger mature conifer stand would provide more abundant resting sites, denning sites, and prey habitat.

Where pine beetle tree losses are nearly complete and widespread across many acres as it appears is currently occurring, marten habitat will be lost and then improve. The dramatic and relatively sudden decline in canopy cover should not provide enough overhead cover for martens (see Drew 1995 and USDA 2003 App. I). As cone resources decline over a decade, red squirrel prey will become scarce. Since these lodgepole stands generally lack much understory, the loss of overstory cover should also produce a decline in red-backed vole prey.

Over several decades, canopy cover will improve from regeneration and the growth of the small trees not affected by beetles. Snags and coarse woody debris will accumulate to provide resting and denning sites for martens. The increase of these features will also improve foraging habitat by providing an abundance of habitat for small mammals such as the red-backed vole. As lodgepole begin to produce cones again over the following 40 years, red squirrel habitat will improve again. In the long-term, Forestwide habitat quality is expected to increase through time under the beetle outbreak since over head cover is expected to eventually reoccur. The marten population across the Forest is expected to follow the changes in coarse woody debris accumulation and stand regeneration through time.

Potential future increase in spruce-fir by successional replacement of lodgepole and the maturing of existing spruce-fir would provide increased habitat quality. However, where beetles restarted succession in lodgepole stands, marten habitat would be lost initially as described in the previous paragraph.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would change marten lodgepole habitat. This lodgepole habitat would be lost until forest regeneration started providing some overhead cover, and coarse woody debris began accumulating. However, since martens primarily use spruce-fir habitat and this habitat burns less frequently, wildfires probably will not change marten habitat substantially across the Forest.

The final extent of changes to marten habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of mature and older lodgepole stands potentially used by martens. These acres could remain as marten habitat unless beetle activity or wildfire is severe and extensive across the landscape to the point that vegetation and coarse woody debris (wildfire) is lost for some time. Usually, beetle-infested areas would provide an accumulation of coarse woody debris to improve habitat quality in time. Marten density in beetle-infested areas would be higher than in the surrounding forest in time. Marten density would be expected to continue to be higher as long as some overhead cover existed, and snags and coarse woody debris was abundant.

Some timber harvest is occurring or is planned to occur across the Forest. Harvest among the Ryan Park-Tenmile, Box Canyon, Singer Peak, Blackhall/McAnulty, Cottonwood Rim, Soldier Summit, Silver Run, White Rock Estates, French Creek, Devil's Gate projects and the proposed Spruce Gulch project will remove approximately 6000 acres of habitat across the Forest. This is <2.5% of the more than 246,000 acres of potential habitat available across the Forest. These acres would retain snags, recruitment trees, and coarse woody debris to provide some future foraging opportunity. These stands will regenerate to provide characteristics of foraging habitat within 50 years and the large trees, snags, and coarse woody debris useful as marten denning habitat within another 50 years.

Some timber harvest occurred on state lands across the Forest. The state of Wyoming completed 380 acres of harvest and 5.2 miles of road construction among Billie Creek, Dudley Creek, and Damfino Creeks. All clearcuts

these areas, 350 acres, are assumed to be suitable as marten habitat. The 350 acres of harvest will temporarily eliminate these stands as marten habitat. These stands will be available later as foraging habitat as regeneration occurs but quality will be very low since state lands have no requirements to retain live trees, snags, or coarse woody debris that provide structural features to prey habitat. Denning habitat will be lost for about 100 years until sufficient regeneration occurs and appropriate snags and coarse woody debris are available.

Potvin et al. (2000) and Hargis et al. (1999) found that martens occupied home ranges until 25% to 35% of the home range became nonforested. The cumulative effect of habitat loss and the distribution of this habitat loss from this proposal and other proposed and on-going actions could cause 12 marten home ranges to be temporarily unoccupied across the Forest; or martens in these home ranges adapted by expanding or shifting their home ranges. Past, on-going, and proposed actions for 30 years have created more than 25% nonforested habitat ("fragmented" habitat) within the 12 home ranges. The loss of these home ranges was caused by past and on-going actions; none were lost as a result of this proposed action. These potential population effects are small in scale and over time in comparison to marten habitat across the Forest. These potential population effects are small compared to the potential habitat changes from any past or the current pine beetle outbreak. Finally, most marten habitat occurs in mature and older spruce-fir; lodgepole is generally less used. Thus, changes caused by this Forest management should retain a stable marten population across the Forest.

Martens might also be affected by fragmentation (or perforation), not just habitat loss. The debate among researchers on whether marten research has only addressed habitat loss and not the larger landscape-scale process involving both habitat loss and the breaking apart of habitat (fragmentation) is addressed under No Action for martens. That information is not repeated here.

Regardless of this debate, these researchers have shown that martens do not use home ranges that had >25% nonforested cover, including clearcuts <30 years old (see Potvin et al. (2000), Chapin et al. (1998), Hargis et al. (1999)). As discussed in a previous paragraph, past actions have caused the loss of 12 potential home ranges across the Forest but the addition of this proposed action does not cause any more potential home ranges to be lost.

The USDA (2003) identified 3 factors that generally reflect the level of fragmentation in the Forest: patch size, roads, and interior forest/edge relationships (p. 3-139, 245). These characteristics will be evaluated for the Hazard Tree proposed actions.

As mentioned earlier, security areas are an index to interior forest. Research suggests that interior forest can be important to martens (see Potvin, Chapin, Hargis above). The proposed action occurs along existing open roads and trails. No new roads will be constructed into the forest for this project. By definition, security areas are ≥ ½ mile from open roads. Security areas will not be affected by the proposed action. So, there will be no change to the interior forest used by martens. Most important to this point is that most marten habitat is mature and older spruce-fir which is not affected by this proposed action.

Past harvest has changed the size and shape of vegetation patches across the Forest. Some type of harvest has occurred across 12% of the Forest since 1951 (USDA 2003 p. 3-150). The result is that some areas across the Forest are comprised of more, smaller patches with more uniform and abrupt rectangular shapes than would occur naturally. Much of the proposed action occurs across patches that have been harvested in the past. Many of the roads were originally constructed to allow timber harvest, so, harvesting along these roads will consolidate some harvest units from the past. Age class will be similar since all dead and dying trees will be removed and beetles are killing most trees of medium and larger size.

Of course, these new patches will be larger and linear compared to the existing landscape. They will also create a sharp contrast to habitat more than 150 ft from roads. Forest Plan standards for snags, recruitment trees, and coarse woody debris will help reduce this contrast over time.

No new roads are proposed that would add to fragmentation. Existing fragmentation along open roads and motorized trails will be more pronounced since treatment occurs within 150 ft of either side of the road. But, there will be no new breaking apart of habitat pieces. It was already mentioned earlier that marten habitat next to open roads already has reduced quality due to disturbance, reduced prey, and reduced snags and coarse woody debris. So, there will be no increase in the fragmentation of marten habitat caused by roads. These harvested areas would return to foraging habitat in approximately 50 years and mature to provide denning habitat in another 50 years as forest structure matures and canopy cover increases.

Effects of fragmentation to martens also include increased home range size with consequent increases in energy expenditure for winter travel. The increased energy expenditure can reduce individual fitness. Continued reduced fitness can lead to potential reproduction impacts and, therefore, population impacts. Since less than 100 acres of treatment occurs within any potential home range, the proposed action is not expected to increase energy expenditure of individual martens enough to reduce individual fitness.

In total, there could be a reduction in habitat across the Forest from pine beetles and harvest. Harvested stands or stands after catastrophic wildfire would not be used for decades. Depending on the completeness of beetle-kill within stands and across the landscape, habitat may be enhanced or lost. However, since martens prefer spruce-fir, it is expected that only a small portion of any home range is probably comprised of mature lodgepole. So, any lost lodgepole is not likely to cause any territories to be lost. The marten population across the Forest probably won't change since most home ranges will occur in mature or older spruce-fir habitats and harvest and beetle outbreak are not changing this habitat.

Overall, this proposal and other proposed and on-going actions will retain more than 238,000 acres (96%) of suitable marten habitat on the Forest. Past and on-going harvest has probably caused 12 home ranges to be temporarily unoccupied. The proposed action, in combination with these previous actions, does not cause any more home ranges to be lost. Harvest is spread across several home ranges in less preferred lodgepole habitat. So, the effect will likely be that a few martens will expand or adjust their territories to accommodate the lack of overstory canopy cover and reduced prey availability in harvested stands. Habitat changes from harvest, beetles, and forest regeneration over time will ensure a continuing supply prey and future habitat and will contribute toward maintaining the marten population on the Forest.

Determination of Effect and Rationale

Extensive radio telemetry aided studies of American marten were conducted from 1985 through 1995 in the Coon Creek and East Fork Encampment River watersheds. Ninety-six individuals were captured during the study. Researchers found that martens were uncommon but widespread within suitable habitat. Since martens are uncommon and have disproportionately very large home ranges, the Forest adopted a new survey technique in 2004 to monitor population trend. This hair snare technique is similar to the technique developed by Belant (2003). Results from this technique also suggest that martens are uncommon but widespread. Across the Forest, there are more than 246,000 acres of possible marten habitat distributed among the mountain ranges (USDA 2003, p. 3-98,123). Forest management activities are changing 4% of this habitat. The analysis of habitat changes for the 2003 Forest Plan revision indicated that mature lodgepole habitat changed less than 5% between 1985 and 2003 and indicated that mature spruce-fir decreased by less than 1% during the same period. Therefore, vegetation is being maintained to provide suitable habitat for martens. This habitat is well distributed across the Forest.

A "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide" determination is made for American marten based on the following:

- Forest management will regenerate 4% of Forestwide habitat
- Forest Plan standards for recruitment trees, snags and coarse woody debris are included in timber harvest, providing foraging and future denning habitat.
- Forest Plan guidelines for maintaining or increasing security areas will be met since no harvest is proposed in security areas, ensuring that interior forest habitat will continue to be provided for martens.
- The proposed activities are consistent with the revised Forest Plan (2003). The analysis for the Forest Plan revision determined that Forest activities may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide.

Wolverine

Existing Conditions (from USDA 2003, App. I)

No occurrences of wolverine in the Southern Rockies have been recorded since the 1920's (except for a few animals released from captivity), though prior to that it was well known in the area. In the Bridger-Teton NF in NW Wyoming, Hoak et al ((1982 in USDA (2003)) compiled 37 new sightings made during the 1970's. Given the animal's ability to travel long distances, it is not improbable that wolverines could disperse to the northern edge of the Southern Rockies within the life of the Revised Plan. Scattered sightings of wolverine have been reported in the Sierra Madre, Medicine Bow Range, and adjacent Colorado, but these are unconfirmed. These recent sightings may be dispersers from a few captive animals released in Colorado. The Sierra Madre and Snowy Range were very likely part of the species' historic range. Home ranges are large, typically 400 to 600 km^2 for males (roughly 150 to 250 mi^2), though in Idaho, the mean was over 2,000 km. Under ideal conditions, there is potential for one or two breeding females on the forest. If home ranges are near the species' average, only 3 or 4 males could coexist in the combined Sierra Madre and Medicine Bow Ranges. This is far smaller than an independently viable population. Rather, animals occurring here have been a small part of the larger Southern Rockies population.

Limiting Factors

The very high level of human winter activity on the Medicine Bow may preclude re-colonization by breeding females, but the area could provide habitat that would contribute to viability of a restored or recovering Colorado population. Road construction that increases human disturbance reduces the breeding range of wolverines. Winter recreation in previously remote areas reduces or eliminates the potential for adult females denning in the area.

Information on the habitat and population ecology of wolverines in the forests of western North America is mainly anecdotal or not available (Banci 1994). Banci (1994) suggested the impact of logging and associated activities on wolverines and wolverine habitat can only be surmised. Habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness areas, rather than in terms of topography or plant association (Kelsall 1981 cited in Banci 1994).

As suggested by Banci (1994) "*until more information becomes available, habitat management prescriptions that successfully provide for the life needs of species such as the American marten, fisher, and lynx and their prey will also provide for the needs of wolverine at the stand level. However, it is not known whether this will provide for wolverine habitat needs at the landscape or larger scales*". The marten has been analyzed in this document and lynx was analyzed in the Biological Assessment. Prey animal snowshoe hare was analyzed as a Management Indicator Species in the Wildlife Specialist Report. The effects for wolverine would be similar to the effects described in detail for marten and lynx. Prey and carrion abundance would follow the relatively consistent

abundance described for snowshoe hares. These analyses are not repeated here but are summarized for the reader's convenience.

Alternative 1 – No Action

The loss of individual trees and stands of trees would greatly increase coarse woody debris over time to provide more denning sites (similar to marten). Still the entire Medicine Bow is only large enough for 1 or 2 breeding females, so increased den availability across the Forest would not noticeably benefit individual wolverines or the population.

If lodgepole tree and stand loss is extensive and widespread, wolverines could still use the Forest, especially spruce-fir. Wolverines are documented to use a wide variety of conifer forest and associated nonforested habitats. They appear to be tied more closely to food availability than particular forest types.

Cumulative Effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife. Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Snags, coarse woody debris, and prey could become more abundant next to roads. But the fewer core areas (Ruggerio et al. 1994), abundant vehicle and visitor disturbance, firewood cutting and extensive overstory cover change could discourage wolverine use. There are still several hundred thousands of acres of habitat across the Forest away from roads.

The maturing of existing spruce-fir would provide increased habitat quality. However, where beetles restarted succession in lodgepole stands, wolverine habitat would be reduced initially.

Catastrophic fire events from increased fuel loads within beetle-killed stands across the Forest would change wolverine habitat. An unknown amount of lodgepole habitat would be greatly reduce or lost until forest regeneration started providing some overhead cover, and coarse woody debris began accumulating. Spruce-fir habitat is their primary habitat and this habitat burns less frequently, wildfires probably will not change wolverine habitat substantially across the Forest.

The final extent of changes to wolverine habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of mature and older lodgepole stands potentially used by wolverine. These acres could remain as secondary wolverine habitat unless wildfire is severe and extensive across the landscape to the point that vegetation and coarse woody debris is lost for some time. Usually, beetle-infested areas would provide an accumulation of coarse woody debris to improve habitat quality in time.

The Forest is only large enough to support a few wolverines. Prey animals and carrion will still be sufficiently available under extensive and widespread lodgepole loss, similar to effects to lynx. The predominant yearround habitat for a major prey animal, snowshoe hare, is multiple storied conifer. Lodgepole comprises very little of this; spruce-fir is the overwhelming majority of this habitat. This spruce-fir habitat will change little from the pine beetle outbreak. So, snowshoe hare prey, for example, would remain relatively abundant.

Proposed Actions

The proposed actions will temporarily eliminate 1655 acres of mature or late successional lodgepole forest. However, more than 238,000 acres (97%) of mature and older lodgepole and spruce-fir forest will remain (similar to marten). Denning habitat will be created over time by the abundance of coarse woody debris across the Forest (similar to lynx). Most affected lodgepole would be converted to currently unsuitable habitat by pine beetles. Only a small portion of lodgepole proposed for harvest has enough of a spruce-fir component that it would remain suitable after beetles and until it was harvested (similar to lynx).

Habitat for prey animals will change but overall abundance will remain relatively stable (similar to lynx and marten). Less than 1% of snowshoe hare habitat will be temporarily lost under proposed actions. More than 670,000 acres across the Forest could still provide habitat for snowshoe hares and other prey animals. These small habitat changes will not cause noticeable changes for the 3 to 4 males or 1 or 2 breeding females that could inhabit the entire Medicine Bow.

Cumulative effects

Habitat immediately adjacent to the current road system provides reduced quantity and quality habitat to wildlife. Some research has found, for example, that edge effects of roads extend 50m into the forested habitat (Tinker et al. 1998). Snags, coarse woody debris, and prey could become more abundant next to roads. But the fewer core areas (Ruggerio et al. 1994), abundant vehicle and visitor disturbance, firewood cutting and extensive overstory cover change could discourage wolverine use. There are still several hundred thousands of acres of habitat across the Forest away from roads.

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The final extent of changes to wolverine habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 75,000 acres had already been affected by beetle-kill by 2006. Much of this is comprised of mature and older lodgepole stands potentially used by wolverine. These acres could remain as secondary wolverine habitat unless wildfire is severe and extensive across the landscape to the point that vegetation and coarse woody debris is lost for some time. Usually, beetle-infested areas would provide an accumulation of coarse woody debris to improve habitat quality in time.

The Forest is only large enough to support a few wolverines. Prey animals and carrion will still be sufficiently available under extensive and widespread lodgepole loss, similar to effects to lynx. The predominant yearround habitat for a major prey animal, snowshoe hare, is multiple storied conifer. Lodgepole comprises very little of this; spruce-fir is the overwhelming majority of this habitat. This spruce-fir habitat will change little from the pine beetle outbreak. So, snowshoe hare prey, for example, would remain relatively abundant.

Cumulatively, past, on-going, and the proposed project will temporarily eliminate approximately 6000 acres (4%) of mature and late successional habitat across the Forest. Again, this amount of change is too small and limited in extent to affect the few wolverines that might use the Medicine Bow.

Determination of Effect and Rationale

The limited amount of potential breeding habitat and the wolverine's need for extremely large home ranges suggest that wolverines on the MBNF never constituted a viable population. Scattered sightings of wolverine have been reported in the Sierra Madre, Medicine Bow Range, and adjacent Colorado, but these are unconfirmed. These recent sightings may be dispersers from a few captive animals released in Colorado. No occurrences of wolverine in the Southern Rockies have been recorded since the 1920's (except for a few animals released from captivity), though prior to that it was known in the area. Under ideal conditions, there is potential for one or two breeding females on the forest. Across the Forest, there are more than 246,000 acres of possible habitat distributed among the mountain ranges (USDA 2003, p. 3-98,123). Forest management activities are changing 4% of this habitat. The analysis of habitat changes for the 2003 Forest Plan revision indicated that mature lodgepole habitat changed less than 5% between 1985 and 2003 and indicated that mature spruce-fir decreased by less than 1% during the same period. Therefore, vegetation is being maintained to provide suitable habitat for wolverines. This habitat is well distributed across the Forest.

A "may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide" determination is made for wolverine based on the following:

- Forest management will regenerate 4% of Forestwide habitat
- Forest Plan standards for recruitment trees, snags and coarse woody debris are included in timber harvest, providing foraging and future denning habitat.
- Forest Plan guidelines for maintaining or increasing security areas will be met since no harvest is proposed in security areas, ensuring that more remote, interior forest habitat will be provided.
- The proposed activities are consistent with the revised Forest Plan (2003). The analysis for the Forest Plan revision determined that Forest activities may adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide.

IV. DESIGN FEATURES

Locations of the proposed action harvest units include or are near known goshawk nests. There are 16 known nests from 13 territories across the Forest that are within harvest units of the proposed action. There are also 72 nests from 42 known territories within ¼ mile of proposed actions. It is likely there are other undiscovered nests within or near proposed actions based on this information. Some monitoring results indicate that some goshawks continue to nest in beetle-killed pine forest (see Graham et al. 1999). Medicine Bow Forest Plan standards for threatened, endangered, and sensitive species include the following for goshawks:

4. Within each occupied northern goshawk territory, select three nests and protect 30 acres of dense vegetation surrounding each, defining the boundaries of each area based on habitat quality. If fewer than 3 nests are found within an occupied territory, substitute 30-acre areas with characteristics of nesting habitat. [Medicine Bow NF]

5. Within each occupied northern goshawk territory, designate a northern goshawk post-fledging area (PFA) of a minimum of 200 acres that includes the three 30-acre nest sites selected. The large tree component within the PFA should include snags, down dead wood, and clumps of trees with interlocking crowns. Within the PFA, prohibit management activities that may degrade goshawk foraging habitat. [Medicine Bow NF]

6. To help reduce disturbance to nesting goshawks, prohibit construction, drilling, timber harvest and fuel treatments, and other intensive management activities within ¼ mile of active northern goshawk nests from April 1

to August 30 unless site-specific conditions are such that a lesser distance can be shown to provide the same degree of protection. [R2 Desk Guide]

Standard 5 will be met with the proposed action and its included 34 design criteria since promoting lodgepole regeneration will also provide foraging habitat.

The Proposed Action includes Design Criteria 13 and 14 to protect species including goshawks. These Design Criteria state:

13. Prior to each field season, provide district wildlife biologists and botanists with GIS layers and hardcopy maps. PETS species and species of local concern (known or discovered during project layout or implementation) will be individually evaluated as they occur within proposed hazard tree removal projects.
14. District wildlife biologists and botanists will determine consultation and site protection needs on an individual and as needed basis. For any PETS species or species of concern with identified viability concerns, the wildlife biologist and/or botanist will identify activity restrictions (area, timing etc.) such that implementation will not result in a trend toward Federal listing or loss of population viability.

It is my professional opinion that Design criteria 13 and 14 will meet Forest Plan standards 4 and 6 for goshawks as long as the Forest acquires the resources to survey these units for active goshawk nests prior to implementation. Not finding active nests until implementation is not likely to provide the ¼ mile no disturbance buffer during nesting or allow 90 acres of nesting habitat to be protected surrounding the active nest. Joy et al. (1994) modified an existing sampling technique that efficiently locates active goshawk nests. The Forest has been using this technique successfully for years and can accurately survey 200 acres/person/day during the nesting season (approx. June 21 – August 4). This technique can ensure that Forest Plan standards for nesting goshawks are met.

V. CONSERVATION OR MITIGATION MEASURES

No conservation or mitigation measures are necessary as long as Forest Plan standards for goshawks (p. 1-42) and, therefore, goshawk nesting habitat can be protected with the design feature above.

VIII. RESPONSIBILITY FOR A REVISED BIOLOGICAL EVALUATION

This Biological Evaluation was prepared based on the best available science. If the action is modified in a manner that causes effects not considered, or if new information becomes available that reveals that the action may impact endangered, threatened, proposed, or sensitive species in a manner or to an extent not previously considered, a new or revised Biological Evaluation will be required.

IX. CONTACTS

Contacts with the US Fish and Wildlife Service are detailed in the Biological Assessment.

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Appendix A. Design Criteria

The following design criteria will aid in reduction of environmental impacts from hazard tree felling and clearing operations:

General

1. On Level 3 – 5 roads and on county and state highways, warning signs and traffic control shall be in accordance with the "Manual of Uniform Traffic Control Devices."
2. **Minimize damage to** natural features such as rock outcrops, young healthy trees, and understories of trees and shrubs; cut stumps as low to the ground as feasible and remove heavy slash within the immediate foreground (approximately 25 to 200 feet from edges of road) roads and trails located in MAs that are assigned Retention and Partial Retention VQOs and High and Moderate SIOs.
3. Locate staging areas and refueling locations at least 100 feet away from streams and wetlands.
4. Decking and landing areas will be designated by the Forest Service.
5. The Forest Service will designate heavy equipment crossings for streams that have definable beds and banks.
6. Stream crossings and other instream structures will be designed to provide for passage of flow and sediment, withstand expected flood flows, and allow free movement of resident aquatic life.
7. Any hazard tree and any associated debris cut down or lying within 200 feet **upstream** of a perennial or intermittent stream/road culvert crossing will be moved at least 100 feet upslope away from the stream. (Note: This design criterion takes precedence over other design criteria intended to protect wet areas). **Any tree that has the potential to obstruct a culvert will be removed.**
8. Do not remove trees within 100 feet of the tie driven streams (shown in Appendix A) if they provide a potential source of large woody debris to the stream system. Felled hazard trees should be left in place.
9. Off-road equipment shall not be moved onto the sale area without having first taken reasonable measures to make sure each piece of equipment is free of soil, seeds, vegetative matter, or other debris that could contain or hold invasive seeds.
10. Revegetation on any area may be required where ground cover is disturbed (e.g. landings, burned slash pile sites, skid trails, etc.). As a general guideline, ground cover should recover to its normal range of variability for the landtype and geoclimatic area by the end of the third growing season. Native plant species should ultimately dominate the site, although introduction of nonpersistent species may be used to ensure vegetation cover initially.
11. Within old growth areas identified in the interpretation of the Medicine Bow Revised Plan Aquatic and Old Growth Standards memo (07/19/05) and in those polygons identified in the old growth strategy on the MBNF, hand fall and leave fallen trees in place. If necessary, fallen trees may be stabilized to prevent movement onto a roadway. Lop and scatter slash to a height of less than 24 inches above the ground. Do not designate landings in these areas.
12. This design criterion applies to the following Geographic Areas on the Routt National Forest: Arapahoe Creek, Corral Peaks, Encampment River, Owl Mountain, Pinkham Mountain, Willow Creek, Little Snake, Sand Mountain, Slater Creek, Upper Elk River, Gore and Red Dirt. In MA 5.13, dead and dying trees will be hand felled and left in place on 35 percent of the total treatment area of the LP and SF stands with trees of larger diameter (trees mostly > 9" dbh)**.** If necessary, fallen trees may be stabilized to prevent movement onto a roadway. These areas of "hand fall and leave in place" can be located mostly within SF stands where there will be more residual green timber after hazard tree removal and/or combined with wildlife connectivity needs. Lop and scatter slash to a height of less than 24 inches above ground. Do not designate landings in these areas. Trees will be felled adjacent (or on top of each other) to each other wherever possible to reduce movement impacts to elk.
13. Prior to each field season, provide district wildlife biologists and botanists with GIS layers and hardcopy maps. PETS species and species of local concern (known or discovered during project layout or implementation) will be individually evaluated as they occur within proposed hazard tree removal projects.
14. District wildlife biologists and botanists will determine consultation and site protection needs on an individual and as needed basis. For any PETS species or species of concern with identified viability concerns, the wildlife biologist and/or botanist will identify activity restrictions (area, timing etc.) such that implementation will not result in a trend toward Federal listing or loss of population viability.

15. Known or identified cultural resource sites that are located within areas identified for mechanical treatment will be evaluated for National Register eligibility. Sites that are eligible for, or listed on, the National Register of Historic Places will not have mechanical treatment occur within the site boundary plus a 50 foot buffer around the site. If treatment is necessary, these sites and the 50 foot buffer will be hand-treated for hazard trees and accumulated fuel build up.
16. Erect barricades and/or proper signs at any traffic hazards left in or adjacent to the road at the end of each workday. All felled trees and slash shall be removed from the bladed, mowed, or brushed road corridor each day before crews leave the work area for the day.

Roads

17. No new specified road or temporary road construction will be authorized. No excavated skid trails will be authorized except where necessary to gain access up the cut slope or down the fill slope of an existing road.
18. **Minimize damage** to drainage structures and road features. Repair any damaged drainage structures and road features and rehabilitate any damage to cut and fill slopes.
19. When operating on or along the road prism, do not skid within or across drainage ditches; limit impacts to road surface. When damage is unavoidable, reconstruct and/or replace surfacing as necessary. Engineering will determine post-operation/haul road maintenance, repair, reconditioning, or resurfacing needs on an individual basis.
20. Honor existing seasonal road closures and other road restrictions during hazard tree removal operations for species or resources that are sensitive to disturbance.
21. Remove felled hazard trees and slash from wing ditches, lead-off ditches, tail ditches, and culvert outlets. Place all slash such that it will not fall, roll, or be blown into these areas.

Developed Recreation Sites, Trails, Trailheads, and Administrative Sites

22. **Minimize damage to designated infrastructure from tree felling operations.**
23. Felled trees and slash shall be removed from the corridor of roads and other mowed or maintained areas within developed recreation sites and scattered outside the developed site in areas designated by the Forest Service. **Felled trees will be whole tree skidded to designated landings outside of the developed site.**
24. Coordinate closure of heavily used trailheads, **administrative sites**, campgrounds, and travel corridors with District recreation staffs to minimize impacts to the public. Provide information to the recreating public on the purpose and duration of the closure as well as on alternative recreation opportunities in the vicinity.
25. **Where feasible, fresh cut ends of logs that are felled, but not removed, will not be visible from the trail in MA 1.2. When cutting trees that fall naturally across trails in MA 1.2, lop and scatter logs and limbs outside the corridor as to provide and maintain the naturalness of trail corridor and meet Preservation VQO and Very High SIO.**

Inventoried Roadless Areas (IRAs)

26. Trees may be cut but left in place in all IRAs. Lop and scatter slash to a height of 24 inches above the ground.

Special Interest Areas (SIAs) and Research Natural Areas (RNAs)

27. Ground skidding is not allowed in SIAs and RNAs. Trees may be hand felled, and boles must be left in place. Lop and scatter limbs to a height of less than 24 inches above the ground. This design criterion applies to the following SIAs/RNAs on the Medicine Bow National Forest: Cinnabar Park, Medicine Bow Peak, White Rock Canyon, Kettle Ponds, Sunken Gardens, Ribbon Forest, Platte Canyon, and Brown's Peak. It also applies to the following SIAs/RNAs on the Routt National Forest: Black Mountain, Oliphant and Welba Peaks, California Park, Camp Creek, Little Snake, and Kettle Lakes.

Slash Disposal/Fuels Treatments

28. The preferred slash treatment method for the majority of the project area is to whole tree skid and/or whole tree removal where the entire tree, including the top and limbs, is removed. The limbs and tops are to be cut off at designated landings and piled for later burning by the Forest Service or chipped and hauled off-site by the Contractor.

    Where terrain and topography allow: for road clearing operations and at all trailheads, the limbs may also be chipped on-site with the chips left in place; the depth of the chips cannot exceed three inches above the surface. At administrative sites and developed recreation areas, chips resulting from chipping operations must be hauled off-site for disposal.

29. Remove slash from felled hazard trees from stream channels unless otherwise specified by the Forest Service. Lop and scatter slash to a height of less than 24 inches above the ground.

30. After slash piles are initially burned, plan on follow-up re-piling or scattering[2] of the pile remnants by a dozer equipped with a brush rake. Where re-piling occurs, the piles will be re-burned.

31. Ground based equipment will not be permitted within 100 feet of identified riparian areas or within 200 feet of identified wetlands/fens (by GIS or located on ground during implementation); hand felling of hazard trees is permitted in the 100 foot riparian buffer and the 200 foot wetland buffer. Felled trees will either be left in place in riparian areas or may be removed by winching where there will be no disturbance such that bare ground is exposed. If tree removal (including whole tree yarding) is not possible, slash may be lopped and scattered to a height of less than 24 inches above ground level.

32. Ground based equipment will not be permitted on identified hydric soils[3] (by GIS or located on ground during implementation); hand felling of hazard trees is permitted in the hydric soils. Felled trees will either be left in place on hydric soils or winched as specified by the Forest Service. If tree removal is not possible, slash may be lopped and scattered to a height of less than 24 inches above ground level.

33. Slash treatment shall include lopping/scattering outside the developed area or cut and piled for rental property firewood. **Lop and scatter slash to a height of less than 24 inches above ground level.**

Visuals

34. Cut stumps as low to the ground as feasible and remove heavy slash to designated slash pile within the developed recreation areas and administrative sites. **Minimize damage to** all retaining mature trees that were sprayed; young healthy trees of lodgepole pine and spruce/fir and understory of trees and shrubs from ground based equipment within developed campsites and administrative sites for present and future shade and screening, and to maintain high quality recreational setting and desired scenic condition.

[2] Whether a pile is re-piled for later burning or the pile remnants are scattered is determined by how much unburned slash is left.

[3] Hydric soils are defined as "a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, July 13, 1994)."