Biological Evaluation for the Hazard Tree and Fuels Reduction Project– Routt National Forest (NF) Portion and Those Acres of the Arapaho-Roosevelt National Forest Administered by the Routt NF of the Medicine Bow – Routt NF's Hazard Tree/Fuels Reduction Project.

This includes the Parks, Hahn's Peak/Bears Ears and Yampa Ranger Districts located throughout Garfield, Grand, Jackson, Moffat, Rio Blanco and Routt Counties

February 7, 2008

Signatures

Prepared by: _____ Date:_____
Marcia L. Pfleiderer, Parks Ranger District Wildlife Biologist

Reviewed by:_____ Date:_____
Mary H. Peterson, Forest Supervisor

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

I. INTRODUCTION

The USDA Forest Service (FS) is proposing an array of treatments to address *hazardous trees and fuel loading that include lodgepole pine, Engelmann spruce, sub-alpine fir and aspen throughout the Routt National Forest, which lies within the counties of: Garfield, Grand, Jackson, Moffat, Rio Blanco, and Routt. This project excludes wilderness areas. The majority of the treatments would impact lodgepole pine.

The purpose of this Biological Evaluation (BE) is to determine the likely effects of the proposed action to terrestrial sensitive birds and mammals on national forest lands, as described in Forest Service Manual (FSM) 2672.41. The best available science was used in analysis, including references at the end of this document.

Section 7 of the Endangered Species Act of 1973, as amended, requires federal agencies to use their authorities to carry out programs to conserve endangered and threatened species, and to insure that actions authorized, funded, or carried out by them are not likely to jeopardize the continued existence of listed or proposed species, or result in the destruction or adverse modification of their critical habitats. A Biological Assessment must be prepared for federal actions that are "major construction activities" (defined under NEPA as a project significantly affecting the quality of the human environment) to evaluate the potential effects of the proposal on listed or proposed species. The contents of the BA are at the discretion of the federal agency, and will depend on the nature of the federal action (50 CFR 402.12(f)). The BA is a separate report not included here.

The Forest Service has established direction in Forest Service Manual 2670 to guide habitat management for Proposed, Endangered, Threatened and Sensitive species (PETS). Preparation of a Biological Evaluation as part of the NEPA process ensures that PETS species receive full consideration in the decision-making process.

This proposal is an "authorized project" under the Healthy Forests Restoration Act (HFRA), Title I, Sec. 102(a)(4) (insect and disease epidemics).

Note: Amphibian, fish, and plant species are considered in separate biological evaluations prepared by the Fisheries Biologist and Botanist.

***Definition of a tree hazard** A tree hazard refers to any potential tree failure due to a structural defect that may result in property damage or personal injury. It is difficult to predict tree failure with certainty because of the complex interaction between tree and environment. Every tree will eventually fail; therefore, knowledge of each tree species, site characteristics, and local weather conditions is essential when evaluating tree hazards. A defective tree is hazardous only when its failure could result in damage to something of value. In recreation areas, we are concerned with structures, forest visitors, vehicles, or other property. (Tree Hazard Recognition and Reduction in Recreation Sites, USDA 2004).*

Relationship to Other Plans and Documents

Forest Service Manuals and Handbooks and the Highway Safety Act of 1966 are clear that the Forest Service has a responsibility to maintain the safety of its roads, trails, and other related sites for use by the public. Forest Service Manual 7701.3 – Transportation System Management, 2. Highway Safety Act of 1966 (23 U.S.C. 402, Pub. L. 89-564) "Authorizes State and local governments and participating Federal agencies to identify and survey accident locations; to design, construct and maintain roads in accordance with safety standards; and promote pedestrian safety." Forest Service Manual 7731.1 states, "Manage forest development roads that are not subject to the Highway Safety Act (those not suitable for passenger car traffic) so they are safe for the planned use."

The Revised Routt Land and Resource Management Plan (1997 Revision, LRMP) provide the overall strategy designed to guide the management of the Forest. The Revised Routt Land and Resource Management Plan in Appendix B, Recreation, 3 (page B-6), states: "Sites will be managed and maintained according to the needs of our customers using the site. Safety and cleanliness are of the utmost importance. Remove hazardous and/or dead trees in developed sites."

This Biological Evaluation will be included in the final Forest-wide (Medicine-Bow Routt) Hazardous Tree Removal and Fuels Reduction Project report.

FOREST PLAN DIRECTION *(Refer to Section V. of this document and Appendix B for Design Criteria direction that address how site specific Modified Proposed Actions will stay consistent with Forest Plan direction.)*

The Routt Forest Plan, in addition to goals and objectives, provides guidance at three different geographic scales. The broadest scale, which outlines the most general and basic direction, is applicable to the entire forest (Forest-wide Standards and Guidelines). From there, the direction becomes more focused and applies to the Management Areas and Geographic Areas, respectively. Any proposal to implement the Forest Plan, including the Hazard Tree Removal proposal, must consider the direction provided at each scale.

Management emphasis within the analysis area and larger geographic areas is distributed among several Forest Plan Management Area prescriptions. Application of Management Area prescriptions and associated standards and guidelines will move specific portions of each geographic area towards the desired condition (Forest Plan p. 2-1). The descriptions of each Management Area prescription include: theme, setting, desired condition, and standards and guidelines. This information can be found in the Forest Plan Chapter 2, pp. 2-1 through 2-57.

Analyses at the geographic area level provide a framework for short and long-term projects, for monitoring the effectiveness of Forest-wide goals and Management Area standards and guidelines, and for achieving Forest-wide goals and objectives. A geographic area (GA) is a watershed or aggregation of watersheds, 100,000 acres or smaller, in which management is directed toward achieving a specified desired condition.

Geographic areas link the Forest Plan to management at a landscape or watershed scale. Application of Management Area prescriptions and associated standards and guidelines will move specific portions of each GA towards the desired condition (Forest Plan p. 3-1). The Hazardous Tree and Fuel Loading analysis area includes portions of 29 Geographic Areas on the Routt NF.

II. DESCRIPTION OF THE PROPOSAL

PURPOSE & NEED

The HFRA recognizes forest health as an integral part of forest management. The Proposed Action responds directly to forest health objectives as described in the HFRA.

Based on Forest Plan direction and a comparison of the analysis area's existing condition versus its desired condition, the Forest Service has identified the following resource needs:

The purpose of this project is to: 1) manage forest vegetation affected by the mountain pine beetle epidemic; and 2) to reduce threats to public safety by felling and/or removing trees that are dead and dying along roads and trails, in and adjacent to Forest Service developed recreation sites (campgrounds, trailheads, etc.), and in and adjacent to Forest Service administrative sites.

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 vehicles 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;
- Minimize 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
- Partially offset the cost of treatments by salvaging forest products.

PROJECT BACKGROUND AND DESCRIPTION OF THE PROPOSED ACTION

PROJECT BACKGROUND

While bark beetles are always present in low numbers, recent years have seen a dramatic increase in bark beetle activity and conifer tree mortality on the Medicine Bow-Routt National Forests. The current mountain pine beetle infestations and their impact on lodgepole pine forests have likely been influenced by a number of factors, including: 1) an abundance of older, dense, large diameter lodgepole pine stands; 2) prolonged drought; 3) earlier melting of the smaller, drought-influenced snowpacks, resulting in extended and more severe drought conditions; 4) higher temperatures, allowing for an expansion of the one-year mountain pine beetle lifecycle into areas of lodgepole pine forests at higher elevations (>9,500 feet elevation); and 5) greater survival of mountain pine beetle broods in the high elevation lodgepole pine forests. Unless a period of prolonged and severe low temperatures (<-30° F) occurs during late fall-winter-early spring months, the beetle epidemic is likely to continue and increase.

The extent and numbers of beetle-caused mortality can pose significant threats to public safety for a variety of reasons. For example, there is an increased risk: 1) for persons or property being struck by falling trees; 2) of wildland fire from lightening striking dead trees vs. live green trees; 3) for more catastrophic fire events due to increased fuel loads; and 4) of trees falling and blocking roadways, thus preventing both emergency and non-emergency ingress and egress. All of these factors can be mitigated by the removal of dead and dying trees along roadways and trails and in areas that receive concentrated public use.

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.

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. (*Refer to the LRMP, FEIS, Glossary for a definition of harvest treatments.)* 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, timber sales, free personal use and administrative use permits, Forest Service crews, service contracts, and Stewardship contracts are all examples of instruments that could be used to implement the hazard tree removal project.

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

Following is a summary of the roads and trails potentially affected by this project:

Acres potentially affected:

Along roads, approximately 10,932 acres on the Routt portion of the Forest could be affected by project implementation.

Along trails, approximately 7,368 acres on the Routt portion of the Forest could be affected by project implementation.

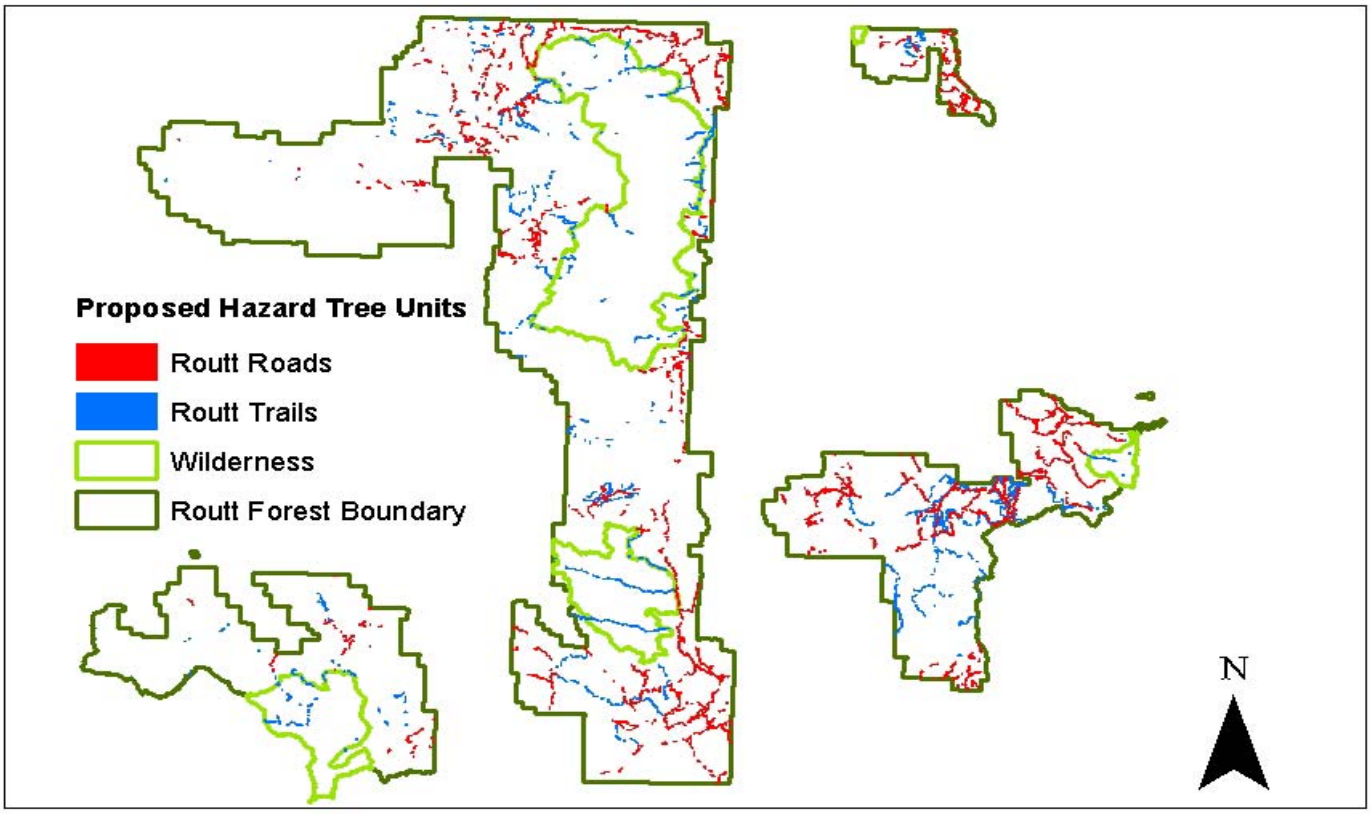
Miles of road potentially affected:

817 on the Routt

Miles of trail potentially affected:

720 on the Routt

Map of the Proposed Action Area



Consistency Determination between the Proposed Action(s) and Wildlife Standards Described in the Routt National Forest Plan

All activities, as embodied in the proposed action described above, are planned consistent with applicable Forest-wide threatened, endangered, sensitive species (TES) and wildlife standards defined within the *Routt National Forest Land and Resource Management Plan* (USDA 1997, p. 1-14 and 1-15). The proposed action is also consistent with the desired conditions for wildlife habitat specific to the Forest-Level, Management Area, and Geographic Area Direction as long as site-specific Wildlife Conservation Measures/ Project Design Criteria (*refer to Appendix B*) have been incorporated into the proposed action and these measures support the requirements and goals and objectives of the wildlife direction defined within the *Plan*.

Project Design Criteria

The action alternatives for this project were developed with the inclusion of project design criteria as fundamental and integral to the design of the action alternatives. The Environmental Assessment lists all of the design criteria associated with the action alternatives. Some design criteria developed by other resource specialists also serve to protect the wildlife and fisheries resources, such as the best management practices for watershed and soils protection.

This section briefly describes nine design criteria specifically developed for the management and protection of the wildlife and fisheries resources that ensure consistency with the Forest Plan. A complete and detailed description of these, project level design criteria are included *Appendix B* of the Wildlife Biological Evalutaion. *Appendix A* lists the general Hazard Tree Design Criteria.

Design Criteria for Snag Retention: Snags are important for many species of wildlife and snag retention is included in the project design to ensure that these important habitat components are retained for the wildlife species that need these structures. The snag retention design criteria that were developed are consistent with the direction provided in the Forest Plan: Biological Diversity Standards 1 and 2 (p. 1-8); 5.11 Vegetation Standard 2 (p.2-40); 5.13 Vegetation Guideline 4 (p. 2-45).

Design Criteria for Live ('Character') Tree Retention: Live tree retention design criteria were developed to ensure that snags will be present on the landscape over the long-term. Live 'character' trees will act as replacement snags to ensure that the important habitat structures provided by snags are maintained over the long-term and available as the new forest developed following management. Additionally, anticipated loss (cutting or natural collapse) of live reserve trees will provide for meeting Forest LRMP standards for retention of coarse woody debris. The live tree retention design criteria was established to ensure consistency with the following Forest Plan direction: Biological Diversity Standards 1 (p. 1-8); 5.11 Vegetation Standard 3 (p.2-40); 5.13 Vegetation Standard 2 (p. 2-45).

Design Criteria for the Protection of Known Goshawk Nest Stands (identified before award of timber sale contract): The protection of known goshawk nest stands is

necessary to ensure that this species is not impacted to a degree that may affect its species viability or cause a reduction in the Forest population. A criterion was developed that is specific to goshawks because of this species specific nesting requirements within forested landscapes. This project design criteria was established to ensure consistency with the following Forest Plan direction: TES Standards 6, 7 and 8 (p. 1-14); General Technical Report RM-217; Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds et al. 1992).

Design Criteria for the Protection of Raptor Nesting Sites (identified before award of timber sale contract and all species other than goshawks): The protection of raptor nest sites is critical to maintain raptor populations. This criterion was developed for raptor nesting areas other than those of the northern goshawk. This project design criteria was established to ensure consistency with the following Forest Plan direction: TES Standards 6, 7 and 8 (p. 1-14).

Design Criteria for Raptor Nesting Period Seasonal Restriction in Logging Operations: Because many raptor species are sensitive to disturbance, seasonal restrictions have been developed to reduce disturbance to nesting raptors within the project area. This project design criteria was established to ensure consistency with the following Forest Plan direction: TES Standards 6, 7 and 8 (p. 1-14); General Technical Report RM-217; Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds et al. 1992).

Design Criteria for Monitoring of Goshawk Nest Locations during Implementation: The intent of this criterion is to ensure that if goshawk nest sites change in location from year to year, that those changes are discovered and can be incorporated into consideration and ensure appropriate management changes are made that will avoid unacceptable impacts. This project design criteria was established to ensure consistency with the following Forest Plan direction: TES Standards 6, 7 and 8 (p. 1-14); General Technical Report RM-217; Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds et al. 1992).

Design Criteria for Protection of Newly Discovered Goshawk Nests and other critical TES Habitats/Sites Identified after the Award of the Timber Sale or other Treatment Contract: This project design criteria was established to ensure that critical TES habitats are protected following the aware of the timber sale contract. This criterion ensures consistency with the following Forest Plan direction and laws: TES Standards 6, 8 and 9 (p. 1-14); The Endangered Species Act of 1973; Timber sale contracting authorities.

Design Criteria for Conservation of Old-growth Lodgepole Pine: This criterion was established to ensure the maintenance of the unique habitat provided by old-growth lodgepole pine to sensitive wildlife species. This project design criteria was established to ensure consistency with the following Forest Plan direction: Late Successional Forests 1 (p. 3-76); Forest Goal 1 (Ecosystem Management)**;** Objective described at the 6th "bullet" (p. 1-2).

Design Criteria for Conservation of Coarse Woody Debris

Coarse woody debris is an important habitat component for wildlife including several sensitive species. Additionally coarse-woody debris is important for ecosystem function and maintenance of soil and watershed health, which also benefits wildlife and fish species. This project design criteria was established to ensure consistency with the following Forest Plan direction: Biological Diversity Standard 1 (p. 1-8).

Analysis Schedule

It is anticipated that hazard tree reduction projects would begin as early as the spring/summer of 2008. The Forest Supervisor for the Medicine Bow-Routt National Forests is the Responsible Official for this proposal.

EXISTING CONDITION

Aerial surveys conducted annually for the Medicine Bow-Routt National Forests show that losses of lodgepole pine to mountain pine beetles have increased significantly in extent and number over the past 11 years. For example, on the Routt National Forest, roughly 230 acres of lodgepole pine trees showed evidence of beetle-caused mortality in 1996. By 2006, that number had increased to 223,000 acres. 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 (Lakewood Service Center Report, LSC-07-06). Data from both surveys clearly indicates that a mountain pine beetle epidemic is underway on the Medicine-Bow Routt National Forests.

General Setting:

The analysis area for proposed hazard tree treatments is the Routt National Forest in northwest Colorado. Approximately 20% of the Routt National Forest is designated wilderness.

About 78% of the Forest is classified as forested. Most of the forested land is composed of spruce/fir, lodgepole pine and aspen. Most of the Forest (60%) is in a mature condition. The nonforested land makes up about 22% of the Forest. It includes grassy meadows, shrubs such as sagebrush and oakbrush, and rock/talus slopes.

Average annual precipitation totals anywhere from 9.7 inches east of the Continental Divide to 67.4 inches west of the Continental Divide. (LRMP) Most incident moisture arrives in winter as snow but some precipitation falls during spring and summer thunderstorms. **Table 1** represents a summary of the habitat structure stages by cover type.

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	0	14.5	21,023	91,079	13,417	14,822	76,042	22,425	0
Blue Spruce	0	0	0	0	0	0	11	0	0	0
Cottonwood	0	0	0	0	0	0	46	8	0	0
Douglas-fir	0	0	0	252	1,615	202	268	1,966	490	0
Gambel oak	0	0	1,858	0	0	0	0	0	0	0
Limber pine	0	0	0	196	119	0	0	0	0	0
Lodgepole pine	0	0	1,890	19,113	122,993	18,932	5,988	177,043	44,611	0
Ponderosa pine	0	0	0	0	0	0	30	7	0	0
Spruce/fir	0	0	570	14,646	64,237	8,484	12,049	145,845	30,281	0
Juniper	0	0	0	53	117	0	0	0	0	0
Other	0	0	0	35	112	0	0	0	0	0
Total Forested (914,771)	**0**	**0**	**4,333**	**57,318**	**280,153**	**41,035**	**33,214**	**400,911**	**97,807**	**0**
HSS as % of Routt Total Forested	**0%**	**0%**	**.473%**	**6.2%**	**30.6%**	**4.4%**	**3.6%**	**43.8%**	**10.6%**	**0%**
Total Non-forested (342,238)	**15,195**	**327,042**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
HSS as %Routt for Non-Forested	**1.6**	**96**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total	**15,195**	**327,042**	**4,333**	**57,318**	**280,153**	**41,035**	**33,214**	**400,911**	**97,807**	**0**
HSS as % of Total (1,257009.00)	**1.2**	**26**	**.034**	**4.6**	**22.2**	**3.2**	**26.4**	**32.**	**7.8**	**0**

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.

Plant Cover Type Summary

Plant cover types (current vegetation communities) that are expected to be present in the analysis area include lodgepole pine forests, Engelmann spruce (*Picea engelmannii*)/subalpine fir (*Abies lasiocarpa*) forests, quaking aspen (*Populus tremuloides*) groves and woodlands, open parklands and riparian areas (including seeps, fens, and carrs). On some lower-elevation south and west-facing slopes, Douglas-fir (*Pseudotsuga menziesii*) dominates in limited areas that have shallow soil or are rocky. Generally, forests below 9800 feet elevation are dominated by lodgepole pine while forests above 9800 feet are wetter and support mainly Engelmann spruce and subalpine fir. These plant communities are segregated along gradients of elevation, aspect, soils and topography and are directly affected by vital plant growth determinants such as temperature, effective precipitation and hydrologic regime.

Plant Cover Types

1. Medium and large-sized Lodgepole Cover Types

Lodgepole pine is the prevalent tree within this cover type; sometimes it is the only tree found in a local area. Lodgepole pines grow at lower elevations on warm to cold sites that are dry to moderately dry. Those stands having a 5 to 8.9 inch average girth at breast height are categorized as medium-sized whereas large-sized lodgepole stands have trees that average 9 to 15.9 inches in diameter at breast height (dbh). Although there are very large (16+ inch dbh) lodgepole pine individuals scattered within this cover type, there are limited, if any stands, in the action areas that have an average dbh that meets the minimum diameter for very large trees.

Lodgepole pines usually comprise 80 percent or more of the basal area in areas of this cover type. Other conifers present in lodgepole stands include subalpine fir, Engelmann spruce and Douglas-fir. Where firs and spruces occur in lodgepole stands, they are seldom members of the (dominant or codominant) overstory. On the other hand, Douglas-firs growing among lodgepole pines are usually the largest trees in the stand and the Douglas-fir crowns typically extend above the overstory, occupying the super-dominant canopy position.

Most medium or large-sized-tree lodgepole stands in the analysis area are even-aged, mature and are at the mid-seral stage of forest development. With few exceptions, lodgepole stands within proposed activity areas have a single-story canopy. Individual boles are separated somewhat from neighboring stems; only infrequently are there couplet or triplet sets of stems growing closely together. Stem diameters among most dominant and codominant trees frequently vary within a relatively narrow range of 2 to 5 inches. It is suspected that in nearly all stands, there are occasional wolf trees that are larger and occupy substantially more growing space than neighboring trees of similar age. Mature lodgepole stands with 2 distinct age-classes and 2 canopy layers are rarely present. However, where 2-story stands exist in the analysis area they are, almost without exception, the result of past logging.

Very rarely, remnant old-growth pines (trees 150 years old or older with characteristics as described in Mehl 1992) endure locally as individuals or in small groups. These old trees persist in current forest stands because they survived the last stand replacement (disturbance) event. However, old age pine trees are few in number in activity areas generally and their distribution is widely dispersed and irregular within lodgepole pine stands.

Most stands in this cover type had a natural genesis following the last stand-replacement disturbance (a forest fire preceded, perhaps, by a MPB outbreak). Most lodgepole pine stands present today are the result of natural succession, where trees regenerated from seed and stem density was not manipulated by

people, at least until stands matured adequately for trees to reach a commercially valuable size. There are numerous areas of medium-sized trees (40 to 55 years old) that regenerated following clearcut harvesting in the middle part of the last century.
Although most medium and large-sized tree stands in the analysis area did have a natural origin, the majority of both natural and human-created lodgepole stands have been manipulated in the recent past through tree cutting. Thins or other partial cut treatments have typically been completed during the last 50 years in many stands adjacent to roads. Nonetheless, these stands are not much different from adjacent un-thinned lodgepole stands except, perhaps, there are fewer multiple-topped trees and the average trunk diameter is larger in cut stands.

In most cases, stands with a somewhat open canopy are the result of previous tree cutting. In nearly all previously thinned stands, the overhead tree canopy is not as highly interlaced as the tree canopy found in natural stands. In contrast to partially cut stands, un-manipulated natural stands are quite crowded with mature lodgepole and have a higher tree density. In these dense stands, small trees, shrubs and other forest floor vegetation is usually depauperate beneath the dominant canopy.

Where stands were previously cut, and there is sufficient light reaching beneath the dominant canopy, lodgepole pine seedlings and saplings can be moderately abundant in the understory. Aspens are the next most common understory trees growing in these stands. Subalpine firs, and to a lesser extent Engelmann spruces, can be common in some stands but they are typically not abundant within many mature lodgepole stands in the action area. Neither of these species generally occupies a dominant or codominant position in the upper canopy.

Understory plants can be common too, if not abundant, in stands with an open canopy. Herbaceous plants commonly found in most analysis area pine stands include various grasses, sedges (*Carex* spp.) and forbs (herbs other than grasses, grass-likes, and ferns). Common graminoids include bluegrass (*Poa* spp.), mountain brome (*Bromus marginatus*), elk sedge (*Carex geyeri*) and Ross sedge (*C. rossii*). Prevalent forbs include lupine (*Lupinus argenteus*), strawberry (*Fragaria* spp.), pussytoes (*Antennaria rosea, A.* spp.), wintergreen (*Pyrola chlorantha*), heartleaf arnica (*Arnica cordifolia*), hawkweed (*Hieracium* spp.) and Parry's golden-weed (*Oreochrysum parryi*).

Woody plants are common in many stands as well. The most ubiquitous shrub occurring on cold and moderately dry sites is grouse whortleberry (*Vaccinium scoparium*). On warmer and drier sites, the following shrubs occur variably but commonly, depending on openness of the tree canopy and other factors: common juniper (*Juniperus communis*), kinnikinnick (*Arctostaphylos uva-ursi*), creeping Oregon grape (*Berberis repens*), mountain boxwood (*Pachistima myrsinites*) and russet buffaloberry (*Sheperdia canadensis*).

Large-sized snags (*i.e.*, snags with diameters larger than 9 inches dbh) are typically infrequent but are an increasingly common feature of many large-sized lodgepole pine stands in the analysis area. This growing number of snags is directly attributable to the current outbreak of Mountain Pine Beetle (MPB). Because nearly all existing large snags are trees that died only recently (within the last 4 years), they are labeled "hard (*i.e.*, the heartwood and sapwood is sound with little decay or deterioration evident)" snags. In contrast, large standing-dead trees in an advanced state of decomposition, usually described as "soft (rotten)" snags, are uncommon enough in this cover type as to be considered rare.

The explanation for the general lack of hard and soft snags in natural stands is related to the mid-seral development, relative vigor and middle age of lodgepole pine in this cover type. Until now, through what is termed by Oliver and Larson (1996) as the stand initiation and stem exclusion phases of stand development, there simply has not been sufficient time, or loss of tree vigor, for mortality agents (insects, disease, wind, *etc.*) to act upon and kill dominant and codominant trees. Of course, without standing-tree mortality (hard snags) in the overstory, there is no current source for creation of large soft snags.

With the expected increases in large tree mortality occurring (as MPB kills more and more overstory pines), hard snags, soft snags and coarse woody debris quantities are expected to increase considerably. If fire or human intervention does not change the trajectory of lodgepole stands toward increased losses of overstory trees, the beetle outbreak could be seen as the nexus for the onset of the next phase in mature lodgepole pine succession: the understory reinitiation stage of stand development (Oliver and Larson 1996).

Dwarf mistletoe (*Arceuthobium americanum*) is prevalent in many mature lodgepole stands within the analysis area. Mistletoe control efforts have been an ongoing management activity, scattered across the analysis area, for many years. Some stem decays have been identified, during stand examinations, but the extent is quite limited.

Timber harvesting is the primary extractive use that occurs in mature lodgepole pine stands. Logging mature or old age trees has been ongoing within this cover type for many years.

2. Seedling and Small-sized Lodgepole Pine Cover Types

Stands in this cover type (within the analysis area) are mostly plantations that developed following clearcut harvesting. A few young stands have regenerated following fire. For the most part these stands are relatively uniform, human-created forests of even-aged trees. Lodgepole pine predominates and typically composes more than 80 percent of all trees growing on a site. Other tree species scattered amongst the lodgepole are spruce, subalpine fir and aspen. Seedlings are less than 1 inch dbh and small-sized trees of this cover type are 1 to 4.9 inches

dbh and 10 to 25 feet tall. In many plantations, large or very large live trees or snags are seldom present.

In thinned plantations, understory vegetation is responding to the more open tree canopy. Elk sedge, shrubs and grasses, as described for the medium and large-size lodgepole pine cover type, are growing in these stands. In plantations where no thin has yet taken place, crowns of interior trees often persist to the ground but stem densities are generally less than 1000 trees per acre.

3. ***Quaking Aspen Cover Type***

Individual aspen trees, aspen groves or both can be expected to be scattered among and within conifer forests. Where moisture and soil productivity are good, groves of tall, straight white-barked trees develop. Where quaking aspen groves are located within or next to lodgepole stands, the aspens are typically similar in diameter and height to the conifers surrounding them. However, some aspen patches (often associated with sagebrush areas) consist of stems that are clearly subordinate in size to neighboring conifer forests. On rocky slopes, hot aspects or on poor soil, aspens form scrubby thickets and large aspen stems may be few or even absent. Aspens also occur in stringers along the banks of streams and in regenerating forest areas.

In groves of either large or small-sized aspens, conifers have often established themselves in the aspen understory and, many times, there are lodgepole pines overtopping the aspen. This is a visible indication of succession from aspen toward conifer dominance. Ingrowth of conifers into an aspen-dominated stand is commonly termed "conifer encroachment" and is a slow but inexorable vegetative progression that can ultimately result in supplanting of aspens by lodgepole altogether.

Understory vegetation in aspen stands is typically richer and more diverse than in neighboring conifer stands. Common herbaceous understory plants in the larger aspen stands include American vetch (*Vicia americana*), aspen peavine (*Lathyrus leucanthus*), Oregon fleabane/aspen daisy (*Erigeron speciosus*), yarrow (*Achillea millefolium*), Porter loveage (*Ligusticum porteri*), blue wildrye (*Elymus glaucus*), brome (*Bromus* spp.), Colorado columbine (*Aquilegia coerulea*), Fendler meadow-rue (*Thalictrum fendleri*), Richardson geranium (*Geranium richardsonii*) and strawberry.

4. ***Spruce/fir Cover Type***

The spruce/fir cover type occurs on mesic sites at higher elevations and at lower elevations on northerly aspects or other sites of greater moisture retention. Where aspect or riparian moisture creates a mesic to wet environment, spruce can comprise the majority of basal area in the forest while subalpine fir, lodgepole pine and aspen may make up less than 50 percent of remaining trees. Conversely, where less moisture is retained on upland slopes due to aspect or soil porosity, lodgepole pine may compose upwards of 50 percent of the trees in these stands

and spruce may be a minor component. In spruce/fir stands generally, increased variety of tree species and the typically longer subsistence of these stands provides for greater structural complexity than is found in the lodgepole cover type.

Spruce and subalpine fir regeneration is often abundant in the understory. Aspen groves are occasionally encountered in these stands. Grouse whortleberry is a ubiquitous shrub in the understory. Other prevalent shrubs or sub-shrubs include russet buffaloberry, mountain boxwood (*Pachistima myrsinites*) and prince's pine/pipsissewa (*Chimaphila umbellata*). Common forbs include heartleaf arnica, wintergreen, twinflower (*Linnaea borealis*), sweetroot (*Osmorhiza* ssp.), arrowleaf groundsel (*Senicio triangularus*) and bluejoint reedgrass (*Calamagrostis canadensis*).

Timber harvesting is the primary extractive use that occurs in mature spruce/fir stands. Logging mature or old age trees and regeneration of new forests has been ongoing within this cover type for many years.

5. ***Riparian Bottomlands Cover Type (Willow Carrs, Seeps, Springs and Fens)***
Generally diverse plant communities occur along streams and in or near seeps, springs, fens and carrs in the analysis area. Several environmental factors contribute to the patchy, highly variable plant assemblages found adjacent to these wet areas: duration of soil saturation, soil depth and texture, frequency of flooding, depth to the water table, soil oxygen availability, duration of snow cover, growing season length and temperature, animal browsing, and ice damage in the spring (Knight 1994). Terrain features, such as valley width and orientation, drainage basin area, stream gradient and sinuosity in turn influence the importance and primacy of these environmental factors.

Tall willow (*Salix* spp.) plant communities occur along numerous perennial streams forming a riparian greenbelt separate from mesic upland forests or sagebrush parks. Here, centuries of beaver activity have created relatively flat, stair-stepped mountain streams in what might have been a steep-sloping valley. The most frequent willows occurring in the tall willow carrs are planeleaf willow (*Salix planifolia*), Drummond willow (*Salix drummondiana*) and Geyer willow (*Salix geyeriana*). Other willows that are present but less abundant include Booth willow (*Salix boothii*), mountain willow (*Salix monticola*) and Wolf's willow (*Salix wolfii*). Occasionally, thinleaf (or mountain) alder (*Alnus incana*) is encountered.

Sedge/forb-dominated openings are commonly interspersed with riparian willow areas. Frequently encountered sedges associated with streamside areas and seeps/springs/fens are beaked sedge (*Carex utriculata*) and water sedge (*C. aquatilis*). Other sedges present include bighead sedge (*C. pachystachya*), alpine nerve sedge (*Carex nuerophora*), Nebraska sedge (*C. nebrascensis*), smallwing sedge (*C. microptera*) and slender-beaked sedge (*C. arthrostachya*). Rush species

found here include longstyle rush (*Juncus longistylis*), swordleaf rush (*Juncus ensifolius*), Colorado rush (*Juncus confusus*) and small-flowered woodrush (*Luzula parviflora*). Other species observed are panicled bulrush (*Scirpus microcarpus*) and burr reed (*Spraganium emersum*).

Wet meadows and short willow shrublands support other plants. Lush forbs and grasses frequently encountered here include arrowleaf groundsel, gentian family members (*Gentianella* spp., *Pneumonanthe parryi* and *Swertia perennis*), slender hairgrass (*Deschampsia caespitosa*) and bluejoint reedgrass. Bog birch (*Betula nana*) grows in scattered streamside locations in the analysis area, along upland forest edges where soils are seasonally saturated, usually forming complex, low stature, open shrubland mosaics.

6. ***Open Parkland/Sagebrush Steppe Cover Type***
The non-forested park areas of the analysis area include sagebrush and grass dominated communities. Compared to grasslands, the distinguishing features of sagebrush ecosystems are the presence of a conspicuous shrub and a larger proportion of the annual precipitation occurring during winter. In addition, a prominent characteristic of these mountain parks is deep, well-drained soils.

Within parks of the analysis area, silver sagebrush (*A. cana* subsp. *viscidula*) and mountain big sagebrush (*Artemisia tridentata* subsp. *vaseyana*) are the predominant shrubs. Frequently, these 2 sagebrush varieties grow side by side. Other associated shrubs include fringed sagebrush (*A. frigida*), shrubby cinquefoil (*Dasiphora floribunda*) and common rabbitbrush (*Chrysothamnus nauseosus*). Silver sagebrush is normally less than 0.5 meter tall and typically occupies low-lying areas, swales or ephemeral draws. Mountain big sagebrush can attain a height of about 1 meter tall and thrives at higher elevations along forest edges where upland sites provide cooler conditions. Some of the common grass species associated with the sagebrush cover type are Idaho fescue (*Festuca idahoensis*), Thurber fescue, western wheatgrass (*Pascopyron smithii*), prairie junegrass (*Koleria cristata*), needle grass (*Stipa* spp.) and Sandberg bluegrass (*Poa sandbergii*).

Cover Types as Bird and Mammal Habitat
Because of the minimum of six cover types encompassed by the analysis area, and the mixture and juxtaposition of these cover types across the landscape, habitat diversity in the analysis area is high for both birds and mammals. Consequently, wildlife species richness and diversity is high because of the broad assortment of habitats made available by the mosaic of intermingling cover types. A large number of bird and mammal species inhabit the analysis area year around and many more migrate to the area seasonally to breed and raise young.

Other General Setting:
Vegetation Disturbance

In the Routt analysis area ecosystem, disturbance is the critical factor in maintaining the natural diversity of species. Without disturbance, subalpine fir and Engelmann spruce would eventually replace disturbance dependent species such as lodgepole pine and aspen. The presence of these species at the middle and lower elevations of the analysis area is reflective of disturbance in the form of fire. Natural and human caused wildfires have been a major factor in forming the forests we see today in this ecosystem. It is known that fires burned large portions of this range, playing an important role in the appearance of the landscape, and maintaining a mix of tree species in various successional stages. Stand origin dates, estimated from tree growth ring data, provide a map of where and approximately when stand replacing/regenerating fires occurred.
A trend that has been found across the Forest, due to the high amount of fires that occurred around 1900, there is a relatively high amount of stands that are between 80 to 120 years old within the AA.

Forest Insects and Disease
While bark beetles are always present in low numbers, recent years have seen a dramatic increase in bark beetle activity and conifer tree mortality on the Medicine Bow-Routt National Forests. The current mountain pine beetle infestations and their impact on lodgepole pine forests have likely been influenced by a number of factors, including: 1) an abundance of older, dense, large diameter lodgepole pine stands; 2) prolonged drought; 3) earlier melting of the smaller, drought-influenced snowpacks, resulting in extended and more severe drought conditions; 4) higher temperatures, allowing for an expansion of the one-year mountain pine beetle lifecycle into areas of lodgepole pine forests at higher elevations (>9,500 feet elevation); and 5) greater survival of mountain pine beetle broods in the high elevation lodgepole pine forests. Unless a period of prolonged and severe low temperatures (<-30° F) occurs during late fall-winter-early spring months, the beetle epidemic is likely to continue and increase.

Aerial surveys conducted annually for the Medicine Bow-Routt National Forests show that losses of lodgepole pine to mountain pine beetles have increased significantly in extent and number over the past 11 years. For example, on the Routt National Forest, roughly 230 acres of lodgepole pine trees showed evidence of beetle-caused mortality in 1996. By 2006, that number had increased to 223,000 acres. 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 (Lakewood Service Center Report, LSC-07-06). Data from both surveys clearly indicates that a mountain pine beetle epidemic is underway on the Medicine-Bow Routt National Forests.

The extent and numbers of beetle-caused mortality can pose significant threats to public safety for a variety of reasons. For example, there is an increased risk: 1) for persons or property being struck by falling trees; 2) of wildland fire from lightening striking dead

trees vs. live green trees; 3) for more catastrophic fire events due to increased fuel loads; and 4) of trees falling and blocking roadways, thus preventing both emergency and non-emergency ingress and egress. All of these factors can be mitigated by the removal of dead and dying trees along roadways and trails and in areas that receive concentrated public use.

Past Timber Harvest

There has been harvest in some portions of the Routt National Forest in the past. Vegetation changes caused by these actions and the subsequent regeneration are reflected in Table 1. Habitat Structure Stages by Cover Type. Routt-wide projects, and acres, that have been planned, but have not yet been treated are not reflected in Table 1. Future habitat changes caused by these projects are included in the cumulative effects analysis for the appropriate sensitive species.

Livestock Grazing

Grazing of domestic livestock is the primary extractive use that occurs Routt, NF-wide. Livestock are grazed in park and sagebrush areas for only a portion of the year, typically from early summer through early fall. Use of these types of areas for feeding domestic livestock has likely taken place across the Forest for more than a century.

There are several allotments or portions of allotments in the analysis used for domestic sheep or cattle grazing. USDA (1995) included a series of Biological Evaluations that analyzed the effects of livestock grazing to endangered, threatened, proposed, and sensitive species across the Rocky Mountain Region. These Regional BE's addressed many of the species that will be included in this analysis. These BEs were reviewed and were verified to be appropriate and accurate for this analysis area. USDA (1995) determined that livestock grazing in the Rocky Mountain Region has no impact to Northern goshawk, boreal owl, flammulated owl, black-backed woodpecker, American three-toed woodpecker, olive-sided flycatcher, pygmy shrew, American marten, and wolverine. Also, the programmatic BE for the effects of livestock grazing on the Peregrine falcon and its associated habitat within the Rocky Mountain Region (1995b) determined that livestock grazing had no effect on the Peregrine falcon.

Recreation

Several multiple use trails (to include motorized and non-motorized) can be found within the analysis area. Used mostly for hiking in the summertime, the higher elevations contain portions of the trail systems—including the Continental Divide National Scenic Trail (CDNST), which access the Mt. Zirkel Wilderness area. There are nine million acres of National Forest System lands on the Routt NF. All Terrain Vehicle (ATV) use on existing travel ways is high. Area National Forest System Roads (NFSRs) are used by snowmobilers during the winter. Many of the major area Forest roads are groomed for snowmobiling. A non-motorized trail system is also groomed for cross country skiing and snow-shoeing. Parking lots and campgrounds provide parking for snowmobilers and skiers using the extensive area trail system. In addition to the numerous trail opportunities, the area contains a number of developed campgrounds and picnic areas. Other major recreational uses in the area include big game hunting, dispersed camping, ATV/ORV use, driving for pleasure, and personal use firewood cutting.

Although mining activities could be considered insignificant at this time, Routt-wide activity may increase in the future. There is possibly some infrequent, personal use panning by the public but this is not sufficient to disturb individual wildlife species or their habitat.

Roads

The Travel Management roads analysis for the Routt revealed that there are a number of roads within the project area requiring maintenance or closure and rehabilitation to reduce soil erosion and sediment entering area creeks. In addition, high open road density could potentially be degrading wildlife security areas and habitat. The popularity of ATV use in the vicinity has led to the creation of a number of user created trails throughout the area—including ones that have encroached into areas that are currently off limits to motorized use.

III. SPECIES CONSIDERED AND THEIR STATUS

ANALYSIS OF EFFECTS – SENSITIVE SPECIES

As the initial step in my analysis for determining the birds or mammals that would be potentially impacted, I reviewed current information to see whether **Table 1** sensitive birds and mammals, or their habitats, actually occur in or near to proposed treatment areas. Several sources of information were consulted to locate records of listed species that are known or suspected to inhabit the analysis area or are likely to be found near the proposed activity areas, and would be impacted by proposed activities. Those sources include: Routt Ranger District records (FAUNA 1/08' database), Colorado Natural Heritage Program location data (2008), Natural Diversity Information Source records, NDIS (Species Occurrence and Abundance Tool, 2008), Mammals of Colorado (Fitzgerald, etal 1994), Colorado Birds (Andrews, etal 1992), Colorado Breeding Bird Atlas (Kingery etal 1998), the Biological Evaluation and FEIS for the Forest Plan revision (USDA 1997), the USFS Region 2 website for Species Evaluations and Rationale and Species Assessments Reports (USDA 2003-2007), US Fish and Wildlife Service lists (latest provided is dated November, 2007) letters or documents and assorted references on Colorado wildlife, and the Region 2 website which includes a table of sensitive species by the Forest where these species occur or might occur. This table (USDA 2007) was also used to examine sensitive species for further evaluation. This information, together, with previous known occurrences, accepted habitat requirements and known range were used to ascertain whether a listed species is likely to occur in or near activity areas given the existing environment.

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.

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-1
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
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 at or above timberline in the Snowy Range	No-2, habitat not affected by proposed activity
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
Short-eared owl	SS, grasslands, marshes.	No-1

Common Name	Habitat*	Selected
Asio flammeus		
Black swift *Cypseloides niger*	Wet cliff faces. Does not occur on Forest (Wiggins 2007)	No-1
Lewis' woodpecker *Melanerpes lewis*	PP	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 *Calcarius mccownii*	Grasslands. Does not exist on Forest (USDA 2007).	No-1
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*	Grass, RO, MS, Shrublands, Rock outcrops, Alpine. A few herds on the Forest.	No-2
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
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*	SS, Grasslands	No-1
Gunnison's prairie dog *Cynomys gunnisoni*	Dry grasslands at high altitudes. Does not exist on Forest (USDA 2007).	No-1

Common Name	Habitat*	Selected
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*	Known only in Colorado, WET	No-1
Ottoe skipper *Hesperia ottoe*	Tall-grass prairie. Does not exist on Forest (USDA 2007).	No-1
Hudsonian emerald *Somatochlora hudsonica*	Boggy ponds	No-2
regal fritillary butterfly *Speyeria idalia*	Tall-grass prairie. Does not exist on Forest (USDA 2007).	No-1
Nokomis fritillary butterfly *Speyeria nokomis nokomis*	WET	No-2

**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*

Habitats for all existing native and desired non-native plants, fish, and wildlife species will be managed to maintain at least viable populations of such species. In achieving this objective, habitat must be provided for the number and distribution of reproductive individuals to ensure the continued existence of a species throughout its geographic range. Forest Service Manual 2602.

In order to ensure that viable oppulations will be maintained, habitat must be provided to support, at leat, 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 readily be predicted, and unoccupied habitats provide potential for future populations. This approach provides a relaible assessment of impacts on individuals and populations.

IV. ANTICIPATED EFFECTS OF THE PROPOSAL ON SENSITIVE BIRDS OR MAMMALS, OR THEIR HABITAT, PRESENT IN THE ACTION AREA

In addition to species specific cited information, the Partners in Flight/Rocky Mountain Bird Observatory, Monitoring Colorado's Birds: 2006 Field Season Report. Tech. Rep. M-MCB06- was used to try and extrapolate a determination of affects to Routt sensitive bird species at the project level. I was unable to make this connection at the project level, and in most cases trend data could not be established for at least another twenty years; therefore making this information inapplicable at this time.
The Routt National Forest Sensitive Species Assessment, 9/23/07 Draft information was also used in preparation of information contained in Section IV of this document.

Refer to Appendix C- Bird and Mammal Life History Profiles, for detailed information on the species listed in ***Table 3.***

Table 3. Effects Determination Summary

Summary of Effects Determination		***Determination of Effects***
Common Name	**Scientific Name**	**Proposed Action**
northern goshawk	*Accipter gentilis*	MAII
boreal owl	*Aegolius funereus*	MAII
Black-backed woodpecker	*Picoides arcticus*	MAII
northern three-toed woodpecker	*Picoides tridactylus*	MAII
olive sided flycatcher	*Contopus cooperi*	MAII
pygmy shrew	*Sorex hoyi*	MAII
American marten	*Martes americana*	MAII
Wolverine	*Gulo gulo*	MAII

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. Aerial surveys conducted annually for the Medicine Bow-Routt National Forests show that losses of lodgepole pine to mountain pine beetles have increased significantly in extent and number over the past

11 years. For example, on the Routt National Forest, roughly 230 acres of lodgepole pine trees showed evidence of beetle-caused mortality in 1996. By 2006, that number had increased to 223,000 acres. 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.

Studies from Oregon found that lodgepole pine killed by MPB began falling three years after death in thinned stands and five years after death in unthinned stands (Lewis, K.J. and I.D. Hartley. 2006, Mitchell and Preisler 1998). These and other 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.

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.

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.

INDIVIDUAL SPECIES

Northern Goshawk

Existing Conditions

Northern goshawks appear to be relatively abundant on the Routt NF. Goshawks are found well distributed across the forest and are regular breeding birds. There are more than 60 recorded nests on the Routt NF (records in the Routt FAUNA database). Forest-wide, goshawk population trend is stable. Annual fluctuations exhibited in **Table 4** are typical for this species and believed related to natural fluctuations in climate and prey.

Table 4. Territory Occupancy across the Routt National Forest

YEAR	Total # of Territories	Total # of Functional Territories	% Occupied	% Territories Active
1990	1	1	100%	100%
1991	2	2	100%	100%
1992	11	11	100%	100%
1993	15	15	58.3%	41.7%
1994	17	17	46.2%	30.8%
1995	20	19	60%	33.3%
1996	29	28	42.3%	38.5%
1997	33	32	39.3%	32.1%
1998	35	34	37.5%	25.0%
1999	36	35	37.0%	18.5%
2000	42	41	41.2%	32.4%
2001	42	41	32.4%	18.9%
2002	45	44	47.2%	33.3%
2003	47	45	29.4%	26.5%
2004	54	52	48.6%	35.1%
2005	49	46	55.2%	41.4%
2006	48	42	46.4%	42.9%
2007	53	47	53.8%	46.2%

Goshawks inhabit live mature or old-growth (usually single-layered) coniferous and mixed conifer/aspen forests, which have relatively high canopy closure (50 to 90%), often in association with small interspersed openings or wetlands (DeGraff *et al.* 1991, Squires and Reynolds 1997, Kingery 1998, Kennedy 2003). Goshawks tend to select forest conditions that offer an enhanced opportunity to use a series of perches from which they can detect, fly to and attack their prey (Reynolds *et al.* 1992). Preferred habitat near the nest is older, tall forests with an open understory where these fast birds can maneuver (Kingery 1998, Kennedy 2003) and where potential threats can be spotted at some distance from the nest. The ideal combination of conditions for both nesting and foraging appears most often in mature forests which have a high basal area, larger trees and relatively high canopy closure in the overstory but where a sparse understory is prevalent (Squires and Reynolds 1997, Kingery 1998, Kennedy 2003).

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/Threats

Timber and fire management practices that alter goshawk habitat are the primary threats to the species (Kennedy 2003). This includes destruction and modification of goshawk

nesting, post-fledging, foraging and wintering habitat. Nests are destroyed by logging activities every year, this may cause breeding densities to be lowered or birds may redistribute to adjacent areas. Especially detrimental are timber activities that create large areas of reduced forest canopy cover (<35-40%), which can increase solar radiation and heat stress, reduce protection from adverse weather and predators, cause fragmentation of the forest, promote loss of tree species diversity, cause a potential increase in younger age classes, or create even-aged and monotypic stands (Kennedy 2003). Additionally, logging activities nearby nests can cause failure, especially during incubation, and even abandonment (Kennedy 2003). Recreation activities, such as camping near nests, can also cause nest failure (Kennedy 2003). Northern goshawks are also harvested by falconers but the impact of this is thought to be minimal (Squires and Reynolds 1997).

Alternative 1 – No Action

Direct Effects and Indirect Effects

There are 60 known goshawk nests within 50 territories across the Forest.

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 found 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 are expected to continue to nest in beetle-killed stands near these administrative features (roads/trails, administrative sites) until the nest trees and the stand deteriorates over 10 to 20 years. 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.

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 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 223,000 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, and some younger stands will mature to suitable nesting habitat over the next few decades.

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). Far fewer goshawk nests are located adjacent to roads across the Forest and prey animal habitat quality is expected to be reduced. 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. Some territories with lodegepole nesting habitat probably won't be affected by beetles; some territories also have aspen nesting habitat. The goshawk population across the Forest probably won't decline 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 be reduced.

Proposed Action

Direct Effects and Indirect Effects

There are 60 known goshawk nests within 50 territories on the Routt NF. There are five known nests within five 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 raptors will be applied (p.1-14) through Design Criteria, and treatment should not occur or should be appropriately adjusted. Surveys (Kennedy and Stahlecker 1993) 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.1-14) are met. This process is generally identified in proposed action design criteria 13 and 14 but will be more thoroughly explained in the design features at the end of this report.

There are 37 nests from 25 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 and treatment should be appropriately adjusted. Surveys (Kennedy and Stahlecker 1993) 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 are met.

There are currently about 320,120.00 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 10,204.20 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 (Kennedy and Stahlecker 1993), as identified in design features, will ensure that Forest Plan standards are followed 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. 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.

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

Cumulative effects

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 223,000 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, and some 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, combined the proposed action will also remove up to 18,437.20 acres of nesting habitat over 10 years. Some of these acres would probably be lost to nesting without harvest. Stands will regenerate to nesting habitat in approximately 80 years.

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). Far fewer goshawk nests on the Forest are located adjacent to roads and prey animal habitat quality is expected to be reduced. 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 beetle-killed territories for years without nesting or nest unsuccessfully. However, some territories could be lost to beetles if goshawk supporting prey cannot be found. Overall, the fundamental outcome of the MPB outbreak is that goshawk nesting and foraging habitat would be detrimentally affected. Direct, indirect and cumulative adverse impacts will accrue to nesting pairs of goshawks whether people intervene in the beetle outbreak or not. Inevitably, over the intermediate-term, important elements of goshawk reproductive habitat are likely to decrease substantially. A sharp decrease in overhead canopy closure from mortality of most or all large live pines would directly reduce the suitability of existing habitats for nesting. Tree mortality would also contribute indirectly to substantial declines in small bird and mammal prey, especially red squirrels (Yeager and Riordan 1953). In turn, reduced prey abundance or availability would contribute to lack of reproductive success for goshawk pairs, most or all of the time. Thus, with the largest trees in a stand killed, goshawks lose suitable nest trees and protective canopy cover while also suffering a decline in the availability and abundance of the birds and mammals they depend upon for food. As a result, goshawks may abandon altogether a territory where substantial or complete mortality of large lodgepole pines occurs. Should fire burn through beetle-killed stands, adverse effects would be exacerbated and complete non-use of the area by goshawks would be expected for 60 to 100 years.

Some territories with lodegepole nesting habitat probably won't be affected by beetles; some territories have also aspen nesting habitat. Harvested areas will be spread across distance and time, so there would be little impact to any individual goshawk territory from harvesting. The goshawk population across the Forest probably won't decline since adults will still occupy territories where beetles have killed the lodgepole nesting habitat, territories with harvest and beetle-killed stands will likely retain some unaffected nesting habitat, and aspen nesting habitat is still available. Still, the population is not expected to increase either since Forestwide goshawk recruitment will be reduced.

In the longer run, though, partial cuts in mature lodgepole pine are expected to result in stands that are more open beneath the live crowns and that have larger tree sizes. Plant growth and succession would gradually improve habitat conditions that support small mammals and birds. Over the long-term, young trees and other vegetation would expand into, or be competitively advantaged by, new growing space created by cut/killed trees. The residual mature lodgepole pines that form the stand overstory would increase in both diameter and crown volume due to the reduced competition among trees (Oliver and Larson 1996). In addition, damaging agents such as MPB, wind and ice would operate to wound or kill some lodgepole pines and other trees, adding structural complexity in the overhead canopy. Together, over a period of 2 or more decades, structural complexity, canopy cover and tree size would increase. Concurrently, prey abundance would increase and larger tree sizes may continue to provide for goshawk foraging or nesting.

Overall, proposed and on-going actions will retain more than 301,000 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 50 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

For the northern goshawk, proposed logging in mature lodgepole pine stands and aspen groves **"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 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 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.
- The proposed activities will be consistent with the revised Forest Plan (2007) when Design Features and Criteria are followed.

Boreal owl

Existing Conditions (from USDA, LRMP EIS - 1997)

This small forest owl is currently documented to occur on the Forest, although there is very little information on population densities or nesting locations (except in nest boxes). In the *Colorado Breeding Bird Atlas*, Kingery (1998) records "possible" and "probable" breeding evidence for this owl inside the analysis area.

Nests of several boreal owl pairs have been found during the past several years in artificial nest boxes in across the Routt. Although difficult to detect with any consistency (except in nest boxes), the scant evidence available suggests boreal owls are a persistent inhabitant of conifer stands on the Forest and they are holding their own, in both distribution and abundance, across the Routt National Forest.

Boreal owls in Colorado are typically associated with spruce/fir forest, at elevations above 9000 feet, near wet meadows (Kingery 1998) or other openings. Much of the proposed treatment area in the analysis area is at 9000 feet elevation or higher so habitat where boreal owls would be expected is clearly available. Nonetheless, records of owl locations recorded in the *Breeding Bird Atlas* (Kingery 1998) suggest they probably nest in spruce/fir forests primarily but are likely to use lodgepole, aspen and other cover types to meet some of their life requisites.

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, pleated 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.

Within the analysis area, spruce/fir forest is likely the only habitat capable of supporting boreal owl reproduction and year-round use. As described above, mature lodgepole pine stands are composed mostly of trees devoid of defects and internal decay in the upper tree bole and so are not suited to excavation by woodpeckers. "As secondary cavity nesters, boreals are intimately linked with the organisms and processes associated with formation of large tree cavities (Hayward 1997)." Spruce/fir forests have the larger-diameter trees, bole defects and decay, coarse woody debris, tree species variety and canopy closure boreal owls favor for breeding, roosting and feeding sites. No stands dominated by fir or spruce are included in any proposed treatment area. In my judgment, nearly all activity area lodgepole pine stands are, at present, generally unsuitable as reproductive habitat because few trees have the diameter or stem decay needed to provide boreal owls with a nest cavity. However, the numerous aspen stands growing in the analysis area may offer suitable nesting opportunities since adequate tree sizes and stem rots are prevalent in these stands.

Limiting Factors/Threats

Nesting habitat conditions, cavity availability, prey availability, and microclimatic conditions related to owl thermoregulation likely limit the distribution and abundance of boreal owls (Hayward 1997). Clearcuts in mature and older subalpine forests eliminate important owl habitat. Predation by mustelids on nests and competition from other owl species may be an important limiting factor in some situations (Hakkarainen and Korpimaki 1996).

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 409,828 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 indications are that 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. 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, 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 re-started 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. 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 223,000 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 habitats will always be available across the Forest since boreal owls nest and feed mostly in mature and older spruce-fir.

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 409,828 acres of boreal owl habitat across the Forest. Proposed harvest in lodgepole stands would eliminate 10,570 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 tolerate human activity and machine noise and seem to accept nearby human presence generally. Moreover, there is no evidence that even nearby, loud diurnal noise or commotion, such as would be caused by proposed logging treatments, might be an important factor in either nest loss or changed owl movements (Hayward 1994). A female adult owl with eggs or young is likely to remain inside the nest cavity unless the

nest tree receives either a hard physical bump or the tree is felled. However, tree felling; tree skidding or other logging operations in close proximity to a roosting male owl would undoubtedly dislodge the owl from its canopy perch. The consequence of dislodging a male owl from its daytime roost would appear to be negligible, though, since boreal owls frequently change roost trees during the course of the day and rarely use the same daytime roost twice (Hayward *et al.* 1993).

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. 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, 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. 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 223,000 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 habitats will always be available across the Forest since boreal owls nest and feed mostly in mature and older spruce-fir.

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 399,257 acres of suitable nesting habitat on the Forest. Boreal owl home ranges average 2920 to 3585 acres (Hayward and Hayward 1993). 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.

<u>Determination of Effect and Rationale</u>
Across the Forest, there are 409,828 acres of possible boreal owl habitat. Forest management activities are changing <3% of this habitat. Vegetation is being maintained to provide suitable habitat for boreal owls, and 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 Plan standards for snags and coarse woody debris are included in timber harvest, providing woodpecker (cavity creating) and prey habitat.
- The proposed activities are consistent with the revised Forest Plan (1997). 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.

- There is Design Criteria identified as a part of project implementation to address possible effects to this sensitive species.
- Decrease in prey abundance or availability caused indirectly by habitat alteration from partial cutting.
- In combination with past logging, there would be a direct and cumulative decline in the dispersion and number of hunting perches, thus decreasing prey access in suitable foraging habitat.

Black-backed woodpecker

Existing Condition

In Region 2, black-backed woodpeckers are found in the conifer and oak woodlands of the Black Hills of South Dakota. They are also thought to occur in old-growth conifer and recently burned areas in the Shoshone National Forest, but have yet to be confirmed (USDA Forest Service 2001i). A few observations have been made in Colorado and documented on or near the Routt National Forest, mostly along the northern border with Wyoming (May 2007 Routt National Forest FAUNA Database); however, they are considered uncommon based on their limited distribution in the region.

Limiting Factors/Threats

Black-backed woodpeckers are most affected by fire suppression and postfire salvage logging. Both activities have reduced their habitat since the early 1900's (Dixon and Saab 2000).

Ecology (Dixon and Saab 2000)

The black-backed woodpecker prefers to breed in burned-over coniferous forests. Being an opportunistic forager, populations tend to irrupt when there are outbreaks of wood-boring beetles in a recently burned habitat. For this reason, they have a great ability to travel long distances. Black-backed woodpeckers depend on fire landscapes and other large-scale forest disturbances as their primary habitat. As fire suppression and postfire salvage logging increases, the species is vulnerable to local and regional extinction. They prefer spruce, Douglas-fir, ponderosa pine, and lodgepole pine. Their diet primarily consists of the larvae of wood-boring beetles, engraver beetles, and mountain pine beetles. They excavate nests in live and dead trees, often in sapwood. Black-backed woodpeckers seem to prefer dead conifers that are a smaller diameter for nesting for this reason. They excavate new nest cavities each year.

Although the black-backed woodpecker appears to be highly dependent upon burned over forests, the "No Action", "Proposed Action", "Determination of Effects and Rationale" analysis can be considered the same for the black-backed woodpecker as the three-toed woodpecker because effects from burned forests area also discussed in the analysis for the three-toed woodpecker.

Three-toed woodpecker

Existing Conditions (from USDA, LRMP EIS - 1997)

Three-toed woodpeckers currently inhabit the Routt NF, though in low numbers. While these birds are most apt to be found in higher-elevation, mature and old-growth spruce/fir forest, they move en masse to areas of widespread insect infestation (Koplin 1969, Kingery 1998). In Garfield County, Grand County and Routt County generally, the Colorado Natural Diversity Information Source project (Colorado Species Occurrence and Abundance Tool 2008) reports the abundance of three-toed woodpeckers as "uncommon" and rare in Jackson County and Moffatt County.

Limiting Factors/Threats

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 *(Wiggins 2004a)* from outside the Region suggest that the most likely threats are:

- Logging of late-successional forests can impact three-toed woodpeckers since they are highly dependent on this habitat for breeding and foraging.
- Fire suppression can negatively impact three-toed woodpeckers by limiting the availability of wood-boring beetles and dead/dying trees for nest sites.
- Salvage and suppression logging of burned and infested trees can reduce the local abundance of three-toed woodpeckers.
- Short logging rotations can impact three-toed woodpeckers by limiting the availability of large, old, and dead and dying trees.

Alternative 1 – No Action

Direct Effects and Indirect Effects

Although not abundant at background population levels, these woodpeckers thrive when fires, insects or diseases ravage a forest (Kingery 1998). Three-toeds forage primarily on larval and adult forms of bark (scolytid) beetles and to a lesser extent on wood-boring beetles (Cerambycidae and Buprestidae), so they are very much dependent on abundant trees infested with these cambium-dwelling insects (Beal 1911, Koplin 1969, DeGraff *et al.* 1991, Kingery 1998, Murphy and Lehnhausen 1998, Leonard 2001, Wiggins 2004). Dead and heartrot-infested trees also supply roosting habitat and a place to drill a nest cavity. Therefore, any forest disturbance, resulting in bark beetle colonization of numerous trees, provides the ideal situation for three-toed woodpeckers to prosper. Likewise, because of the close tie between these birds and beetle-infested trees, the population of three-toed woodpeckers oscillates considerably with the rise and fall of bark beetles numbers and in synchrony with the incidence of disturbance events (Kingery 1998). Once the bark beetle population diminishes in an area, three-toed woodpeckers leave to locate a new source of food (Kingery 1998). In the absence of large-scale disturbance, older spruce/fir forests provide a refuge for endemic populations of the three-toed woodpecker. No action could result in variable effects to three-toed woodpecker.

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.
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 409,828 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 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 several years and much nesting habitat will be available in mature and older spruce stands that are also adjacent to admin features.

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.

Cumulative effects
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. 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 223,000 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.

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 409,828 acres of three-toed woodpecker habitat across the Forest. Proposed harvest in lodgepole stands would eliminate 10,204 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 are active exclusively during the daytime. A new nest cavity is excavated each year. It is not unusual for three-toed woodpecker pairs to construct their nest near a source of human disturbance. In 1 study on the Deschutes National Forest in Oregon, 6 of 20 nests studied were close to a road, trail or trailhead parking lot (Goggans *et al.* 1988). Human presence of itself, or noise, commotion and dust created by project implementation, is unlikely to have any adverse impact to three-toed woodpecker nesting (Leonard 2001). In addition, noise and commotion would need to be very close to a nest tree, and sustained for some time, to cause appreciable distress to these birds sufficient to bring about nest failure.

While apparently tolerant of nearby human-created commotion, these birds are not likely to nest within treatment area lodgepole pines. Currently, even though there are increasing numbers of hard snags of adequate size for nesting, nearly all pines are largely unsuitable for nesting. Most individual trees do not contain heartrot and so have not decayed sufficiently to provide the decadence needed for nest cavity excavation. For three-toed woodpeckers, nest excavation is apparently constrained by the presence of heartrot needed to decay the tree center (Miller *et al*. 1979, Goggans *et al.* 1988). Without the occurrence of widespread stem decay, nesting use is likely to be limited or absent in proposed treatment stands in the near future. Therefore, noise or commotion from proposed logging would have little chance of occurring near an active three-toed woodpecker nest.

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.

Successful implementation of the proposed action would detrimentally and directly impact three-toed woodpecker foraging habitat (and perhaps some nesting habitat as well) by decreasing bark beetle numbers and removing dead trees. As Wiggins (2004) observes in his recent conservation assessment of the species, "habitat loss and degradation appear to be the primary threats [p. 29]" to persistence of three-toed woodpeckers, largely as a result of fire and insect suppression activities that disrupt or truncate natural disturbances. Trees infested with bark beetles, and numerous dead trees in various stages of heartwood decay, are the primary habitat requisites for sustaining these woodpeckers (Crockett and Hansley 1978, Miller *et al*. 1979, Goggans *et al.* 1988, Murphy and Lehnhausen 1998, Bull and Wales 2001, Leonard 2001, Wiggins 2004).

Cutting and removal of beetle-infested trees or beetle-killed timber would largely eliminate most activity areas as suitable foraging or nesting habitats. Even though the project design would aim at retaining 4 to 6 trees (defective live trees and snags) per acre for wildlife use, total numbers of retained live trees and snags would not likely be sufficient in quantity or condition in treated areas to meet foraging and nesting needs for sustaining a three-toed woodpecker breeding territory. In other words, following logging, there would not likely be adequate numbers of beetle-infested or heartrot-infested trees within treated areas to support feeding or nesting of a three-toed woodpecker pair.

Despite the fact that removal of hazard tree killed timber will directly decrease or eliminate feeding habitat for the three-toed woodpecker, the loss of even 10,204 acres of foraging habitat would not be cumulatively significant on this Forest, presently. In the context of the entire Routt National Forest, areas of completely suitable three-toed woodpecker habitat will be substantial, widely available and increasing over the next decade. This improvement in woodpecker habitat suitability across the Forest is a virtual certainty, given those large bark beetle populations that are now developing.

Together, developing spruce beetle (*Dendroctonus rufipennis*) and mountain pine beetle outbreaks will kill mature trees across tens of thousands of acres in the short-term.

Throughout much of the Forest, the progression of tree mortality will continue along its natural trajectory unimpeded. Most stands infested with these bark beetles will be left "as is" without timber salvage or other treatment intervention. Similarly, spruce beetle infestations will be left also to proceed naturally throughout the Routt NF. Suppression and prevention treatments are planned in only limited areas.

If the bark beetle infestations alone are not enough disturbance to existing forests, large fires, such as the several fires that burned on the Routt during summer 2002, are quite likely to burn beetle-killed forests (as well as uninfested stands) during the next decade. Therefore, even though the Hazard Tree and Fuels Reduction proposal would substantially reduce feeding opportunities for the three-toed woodpecker on 10,204 acres of potentially suitable habitat, these losses would be compensated by parallel disturbances elsewhere on the Forest.

Cumulative effects

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. 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 223,000 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.

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.

Overall, proposed and on-going actions will retain 409,828 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. 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

There are 409,828 acres of nesting habitat 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:

- Small potential for noise or commotion disruption at a nest.
- Forest Plan standards for snags and coarse woody debris are included in timber harvest, providing woodpecker and prey habitat.
- The proposed activities are consistent with the revised Forest Plan (1997). 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

This Routt NF dwelling species utilizes high, exposed perches as an essential habitat feature needed by these flycatchers for hawking insects and singing. Favored breeding habitats for the olive-sided flycatcher are forest edges adjacent to fens, marshes or willow carrs as well as semi-open forest, including burns and timber harvest areas, where some vertical structure is retained (Kingery 1998, Altman and Sallabanks 2000). Within the Analysis Area, snags, dead-top trees, dead limbs or other open-view perches are plentiful

(and increasing) adjacent to riparian, clearcut and parkland openings. Golden-crowned kinglets use spruce/fir habitats within the area at all times of year. In the five counties encompassed in the Routt NF, the Colorado Natural Diversity Information Source project (Colorado Species Occurrence and Abundance Tool 2008) reports species abundance as "uncommon." However, out of 264 confirmed breeding bird species in Colorado, abundance data collected by Kingery (1998) places the olive-sided flycatcher as the 88th most common species found in the State (based on the *Atlas* Mid-estimate, p. 587).

Limiting Factors/Threats

Olive-sided flycatchers are most affected by timber harvesting and fire management practices that do not mimic normal processes (Kotliar 2007). There is also some indication that habitat alteration and loss on Central and South American wintering grounds are contributing to declines in the population (USDA Forest Service 2003c).

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 owl habitat across the Forest corresponds to spruce-fir forest of structural stages 4B, 4C and 5. There are currently 176,125 acres of habitat across the Forest.

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. 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. Much of the habitat lost is comprised of 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.

Timber harvest is occurring Routt-wide. 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.

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.

Proposed Action

Direct Effects and Indirect Effects

Olive-sided flycatchers are diurnal and so are active during daylight hours when proposed activities would occur, and proposed logging in lodgepole pine stands would coincide with the olive-sided flycatcher's breeding and nesting period. Data from *Colorado Breeding Bird Atlas* (Kingery 1998) surveys and other sources (Smith 1927, Phillips 1937, Walkinshaw and Henry 1957), though, suggest that this flycatcher does not often use lodgepole pine trees for nesting. Nonetheless, should a nest be present in a pine or another conifer growing within or next to a treatment unit, noise and commotion from felling and skidding timber may temporarily disrupt attendance of eggs or young by adult flycatchers. The disruption in nest attendance would not be of long duration, however.

Mechanical harvesting operations typically proceed at a brisk pace, so time spent by machinery at any 1 location is limited. I estimate that noise and commotion from logging machines might be of sufficient magnitude in any single location to be disruptive to adult flycatchers for only about 1 or 2 hours. During this time, brooding or providing food to young may be interrupted completely. Still, so long as logging activities do not destroy the nest, permanent harm or mortality to eggs/young by this kind of interruption in attendance is unlikely.

In contrast, there is a specific situation where noise and commotion may be of sufficient duration to cause nest abandonment. Where a log landing is constructed very close to an existing nest, noise and other disruptive effects (dust, commotion, *etc.*) may be intense enough to keep adult flycatchers from their nest for hours or even much of the day. Where flycatcher adults are absent from the nest for several hours or longer, especially if the absences are repeated, mortality of the eggs/nestlings would be all but certain. Contributing causes to mortality include lack of food, loss of thermoregulation or depredation. However, like many passerine birds that suffer a nest loss in the early part of the breeding season, the olive-sided flycatcher is apparently capable of re-nesting or it may routinely produce a second brood (Kingery 1998).

Within mature lodgepole pine stands proposed for treatment, logging conducted during the summer breeding season could directly and detrimentally affect nesting of 1 or several pairs of olive-sided flycatchers each year that harvest operations occur. Adult flycatchers would not be injured but their nests may be destroyed, resulting in loss of eggs or killing of nestlings. While nesting in lodgepole pines does not appear to be common (Smith 1927, Phillips 1937, Walkinshaw and Henry 1957, Kingery 1998), felling of all species of conifers would occur in clearcuts. Thus, it is in the clearcuts where destruction of flycatcher nests is most likely. In partial cut units, too, many large pines would be cut and so olive-sided flycatcher nests may be destroyed in those units as well. Since the distal ends of live conifer branches (spruces and firs are apparently

favored) high up in a tree are the preferred nesting location for these flycatchers (Smith 1927, Phillips 1937, Walkinshaw and Henry 1957, Kingery 1998), felling of any conifer with a flycatcher's nest would directly destroy eggs or nestlings in the cut tree. However, given that olive-sided flycatchers are fairly common in suitable habitat on the Forest, a single year's lost flycatcher recruitment, of the magnitude that could possibly occur because of the project, would not adversely influence sustainability or viability of the Routt National Forest population.

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). 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. Much of the habitat lost is comprised of 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.

Timber harvest is occurring Routt-wide. 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). 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

The forest cover remaining in activity areas following completion of all hazard tree and fuels reduction treatments would probably enhance flycatcher habitat, overall. Open stands, having limited canopy cover, are preferred breeding habitats so long as there is an abundant supply of flying insects and some tall live conifers available to construct a nest (Kingery 1998, Altman and Sallabanks 2000). The variable mosaic of cover conditions across the landscape, and the juxtaposition of treatment areas to streams and natural openings, serves to further increase the habitat's usefulness for flycatchers. The standing snags and live trees to be left in all treatment areas (including clearcuts) would provide adequate foraging and singing perches. The affiliation olive-sided flycatchers have for newly-eliminated canopy cover in a mature forest is illustrated by the increase in numbers of this bird species in post-fire forests (Hutto 1995, Kingery 1998, Altman and Sallabanks 2000).

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 range wide"** determination is made for the olive-sided flycatcher based on the following:

- A beneficial impact to flycatchers would likely accrue because diminished live canopy cover (from beetle mortality, logging or both) would improve breeding habitat suitability. In clearcuts, especially, reserved single trees and tree groups

may provide attractive foraging and singing perches following completion of treatments.

- 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.
- Project design criteria that retain snags and replacement snags as well as BMP's for watershed protection are likely to help maintain habitat for this species within the management units. Some loss of suitable nesting snags, as well as disturbance is possible with implementation of the proposed action. With the forest-wide tree mortality occurring due to bark beetles, snags and potential nesting habitat will increase.

Pygmy Shrew

Existing Conditions

Pygmy shrews are distributed across the northern boreal regions of North America and extend into the northern Rocky Mountains, Great Lakes states, and south along the Appalachians into northern Georgia. North central Colorado and south-central Wyoming harbor a disjunct population of what is considered a subspecies; the montane pygmy shrew (*Sorex hoyi montanus*).

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.

The pygmy shrew is a very small mammal (70-90 mm in length; weight 2-5 g) that appears to be adapted to surviving in a variety of forest conditions, from subalpine to boggy meadows, to willow thickets (Fitzgerald et al. 1994). In the Rocky Mountain Region, the edges of moist boreal environments such as bogs, marshes, and wet meadows appear to be preferred by subspecies *montanus* (USDA Forest Service 2001a). Spencer and Pettus (1966) point out that subspecies *montanus* may actually prefer mosaics of wetlands and dry upland forest, rather than the wet types alone. Pygmy shrews eat primarily small invertebrates and carrion of vertebrates and are active both night and day. Shrews build runways under stumps, fallen logs, and litter, and these as well as other forms of coarse-woody debris appear to be important to shrews in general (Beauvais and McCumber 2006). Shrews do not hibernate in the winter and are suspected of utilizing

subnivean space for shelter and forage. They only produce one litter per year and may live up to two years total.

Pygmy shrews have been documented at only 17 localities across Region 2 national forest management units (Beauvais and McCumber 2006). According to Fitzgerald et al. (1994), prior to 1961, there were no records of pygmy shrews in Colorado. Since then, several shrews have been documented in the mountains of north central Colorado; however the current extent of the species in Colorado appears to be disjunct from more northern populations and may represent relicts from glacial times. So far, all captures have occurred at elevations above 2,900 meters (Fitzgerald et al. 1994).
Several pygmy shrew individuals have been documented on or near the Routt National Forest. One was recorded by T.A. Vaughan in 1965 just south of Highway 40, near Rabbit Ears Pass. Four others have been documented on the eastern edge of the forest near the Neota and Rawah Wilderness Areas between 1961 and 2002.

Limiting Factors/Threats

Pygmy shrew populations on the Routt National Forest are likely small, isolated, and vulnerable and are most affected by management actions that affect their habitat (Beauvais and McCumber 2006). They are habitat and prey specialists, with limited dispersal capability. According to Beauvais and McCumber (2006), in the Rocky Mountains, the most pertinent disturbances are those that convert moist forest to drier and more open type. Such disturbances include timber harvesting, livestock grazing, wildfire, and stand changes wrought by drought and insect outbreaks (Beauvais and McCumber 2006). Additionally, compaction of subnivean space in the winter by snowmobilers, cross-country skiers, and snowshoers could impact winter survival of pygmy shrews and is an area of study that needs further investigation (C.Ferland, USFS, pers. comm.).

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).

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 9,792 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. Of the 9 thousand plus acres of pygmy shrew habitat, 291 acres of suitable pygmy shrew habitat (out of 218 hazard tree polygons of various size) overlap with the hazard tree analysis area, or polygons GIS designated by William Smith, FS, Laramie, WY, 1/08. 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 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. 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

Historic Range of Variability (HRV) in high elevation forests due to past logging. Coarse woody debris was not required to be left during harvest decades ago. 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 223,000 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.

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 9,792 acres of pygmy shrew habitat in the analysis area. Of the 9 thousand plus acres of pygmy shrew habitat, 291 acres of suitable pygmy shrew habitat (out of 218 hazard tree polygons of various size) overlap with the hazard tree analysis area, or polygons GIS designated by William Smith, FS, Laramie, WY, 1/08. Pygmy shrew mainly utilizes spruce/fir structure stages 4B, and 4C. Proposed harvest also 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. 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 (pg. 1-8) for recruitment trees, snags, and coarse woody debris applied to timber sales. 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 at 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. 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. 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 223,000 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.

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.

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. 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 9800 acres (FEIS pg. 3-43) of suitable wetlands for pygmy shrews, and 61,000 acres total Routt-wide (pg 3-126 FEIS). Given the shrews' tendency to use spruce-fir and some lodgepole habitat within approximately 100 yards of these wetlands, there are more than 14,980 acres of wetland/spruce-fir or wetland/lodgepole interface habitat across the Routt NF.
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 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. 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 range wide"** 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.

American Marten

Existing Conditions

Martens are medium-sized carnivores that belong to the family Mustelidae (weasels and allies). They inhabit coniferous forests in and around the analysis area and are present in the analysis area year around. Generally, martens prefer mesic subalpine conifer stands, especially mid to late-successional spruce/fir forests, where coarse woody debris and understory vegetation provides complex physical structure near the ground (Buskirk and Ruggiero 1994). Structurally complex forests provide, among other life needs, diverse prey species, weather protection and reproductive sites in profusion. In contrast, lower elevation subalpine forests dominated by lodgepole pine, while suitable for marten foraging, may not have the all vegetation and structural characteristics marten favor for denning or sheltering.

The American marten is closely associated with a relatively narrow ecological range and the best populations are found in mature and old-growth spruce-fir and lodgepole forests with well-developed structure and abundant coarse-woody debris (USDA Forest Service 2003a). They prefer stands with at least 30% canopy cover and den in tree cavities, logs, rock piles, and burrows (Fitzgerald et al. 1994). Martens seem to avoid traveling across open areas more than 100 to 250 m wide (Fitzgerald et al. 1994). Home ranges reported in the literature vary from less than one to almost 16 km2, depending on season, location, and availability of food (Fitzgerald et al. 1994). They are largely crepuscular to nocturnal and are active year-round, utilizing subnivean space for foraging and resting in the winter. Martens consume a variety of prey; however voles and other mice can constitute over two-thirds of their diet (Fitzgerald et al. 1994). Martens have one litter per year of one to five young.

Marten are primarily crepuscular or nocturnal but also hunt by day (Buskirk and Ruggiero 1994, Fitzgerald *et al.* 1994). Their quarry consists mostly of terrestrial and arboreal rodents. Southern red-backed voles, red squirrels, other meadow mice (*Phenacomys* spp., *Microtus* spp.) and ground squirrels (*Spermophilus* spp.) are frequently captured prey (Buskirk and Ruggiero 1994).

American martens are distributed throughout Alaska, Canada, and northern North America and also along the western coast into the Sierras and the Rocky Mountains. In Colorado, martens occur throughout the Rocky Mountain regions of the state (Fitzgerald et al. 1994). Nearly 200 American marten observations have been documented on or near the Routt National Forest (May 2007 Routt National Forest FAUNA Database). Martens have been routinely seen in suitable habitat and are recorded in winter photographic bait station photos taken across the Forest during the last 15 years.

The Colorado Natural Diversity Information Source Project (Colorado Species Occurrence and Abundance Tool 2008) identifies marten as common in Garfield, Grand and Routt Counties.

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. The state of Colorado occasionally allows legal take of martens.

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 409,828 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 indicated wildlife habitat quality and, relatedly, prey is 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, in the northwest portion of the Parks Ranger District, and 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. 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.
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. 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, to include a supporting road network. 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) 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. 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. 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.

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.

The final extent of changes to marten habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 223,000 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.

Proposed Actions

Direct Effects and Indirect

Hazard tree removal treatments would eliminate suitable habitat in the short-term and intermediate-term because existing vegetation would be completely removed. The interior of newly-created regeneration units are unsuitable for marten use chiefly because both food and cover would be unavailable (Steventon and Major 1982, Buskirk and Ruggiero 1994). The temporary lack of trees and other plants would neither support preferred prey (red squirrels and red-backed voles) nor provide the cover needed by marten for hunting. Clearcuts (and other nearly-complete tree removals) applied under the proposal, even though they would include reserve trees, would have inadequate

overhead (<30%) or ground cover for marten to locate or stalk prey (Fitzgerald *et al.* 1994). This represents a temporary but nearly complete habitat loss for marten.

To summarize, the direct affect hazard tree treatments is to degrade habitat for small mammals that marten eat, especially red squirrels. Indirectly, then, marten foraging habitat would be adversely affected short-term and intermediate-term because of reduced prey species abundance and availability. In the long-term, over the next several decades, stand structural complexity should gradually increase. Trees and other vegetation would expand into or be competitively advantaged by new growing space created by the proposed tree removal project.

The direct and indirect affects just described also need to be placed in the context of broader landscape changes that have occurred, or are about to occur, in or around the action area. Completed logging has, and expected logging could, collectively simplify forest structure on thousands of additional timbered acres across the Routt. While the proposal would only have a modest adverse affect on marten habitat, the cumulative adverse change to habitat in the greater area from logging may be more unfavorable.

Still, even cumulative changes would likely not be much greater than the individual action under discussion because of the expansive areas martens use to meet their life needs. Marten home ranges are typically quite large (1 to 6 square miles, perhaps, varying by habitat type and marten gender - Buskirk and Ruggiero 1994) and so numbers of marten likely to be affected are limited. Moreover, the extended spatial and temporal distribution of timber cutting reduces impacts in any single locality and at any one point in time. Maintaining some large live pines on the landscape may be less detrimental to martens (in the short and intermediate terms), because some red squirrels are likely to persist after logging. In contrast, red squirrels would be expected to be completely absent from large areas due to the widespread and nearly complete mature pine mortality that is expected to result from mountain pine beetle (MPB). Important as well is the fact habitat changes created by the hazard tree removal proposal are likely to be dwarfed by the massive tree-killing that is occurring across the Forest.

There is evidence, too, that partial cutting, which is the majority of the harvesting recently completed or reasonably expected to occur with the proposed action, provides benefits to small-scale horizontal heterogeneity over the long-term. For example, opening the canopy admits sunlight to the forest floor, which stimulates herbaceous growth, which may in turn provide habitat for voles (Buskirk and Ruggiero 1994). Moreover, as trees grow larger, carrying capacity for red squirrels is recovered and a tree's value as a potential den site for marten increases.

There are currently more than 409,828 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 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.

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

Revegetation will turn bare ground to forested foraging habitat within 80 years. Denning habitat could occur in the following decades as appropriate weakened trees and snags are created.

Road use can cause disturbance to wildlife and there is a potential for wildlife/vehicle collisions (USDA 2003c). Vehicle collisions with martens are uncommon on the Forest and it is unlikely that proposed road construction or decommissioning will change this.

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 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.

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)).

The final extent of changes to marten habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 223,000 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.

Overall, this proposal and other proposed and on-going actions will retain more than 399,000 acres (97%) of suitable marten habitat on the Forest. Harvest is distributed widely across the Forest in small strips around admin features.

Finally, most marten habitat occurs in mature and older spruce-fir; lodgepole is generally less used. Thus, changes caused by this Forest management action should retain a stable

marten population across the Forest., although old growth dependent species (population and trend) might decline as habitats change from the loss of old growth associated with the mpb epidemic.

The proposed management actions create some short and mid-term impacts to marten habitat; however habitat components will recover in the long-term. Because of the relatively large home range that this species occupies and the remaining late successional habitat available in the geographic areas for this species, the habitat impacts associated with the proposed action alternatives will not eliminate marten use of the analysis area. However as a result of the impacts to marten habitat resulting from implementation of an action alternative, the proposed project a determination of "**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 range wide"** for the American marten, based on the following:

- Design criteria for snag retention, snag replacement and coarse woody debris will moderate those impacts and help maintain some habitat components of the managed stands.
- The proposed activities are consistent with the revised Forest Plan (1997). 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

The wolverine is a creature thought to prefer remote habitats within the conifer, subalpine, and tundra zones of the Rocky Mountains and northern North America. They are mostly solitary animals who are capable of traveling large distances. Male home ranges have been reported exceeding 100 mi^2 (USDA Forest Service 2001c). Wolverines are mostly nocturnal and active year round. They eat small rodents, rabbits, porcupines, marmots, birds, eggs, fish, carrion, and roots and berries. Ungulate carrion appears to be an important food source in the winter. Their reproductive success is typically low, due in part to loss of kits, lack of mating opportunity, and age at first litter (2 years for females) (Fitzgerald et al. 1994). The state of Colorado lists wolverines as "State Endangered."

Wolverines are distributed across Alaska and portions of Canada as well as the mountainous portions of Idaho, Montana, Wyoming, possibly Colorado, Washington, and Oregon.

According to Fitzgerald et al. (1994), the Rocky Mountain portions of Colorado have suitable habitat for wolverine, though none have been documented since the early 1900's, and no wolverines have been confirmed on or near the Routt National Forest, but suspected sightings have occurred over the years.

Threats/Limiting Factors

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.
Wolverines are likely most affected by the loss of large tracts of interconnected quality habitat. Fitzgerald et al. (1994)

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 Routt is only large enough for a few breeding females, so increased den availability in the analysis area would not noticeably benefit individual wolverines or the population.

If the worst-case scenario occurs, in which tree and stand loss is extensive and widespread, wolverines could still use the analysis area and these habitats. 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. Prey animals and carrion will still be available under the worst-case scenario (similar to lynx).

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 wolverine habitat. No action could result in variable effects to wolverines.

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 Routt is only large enough for a few breeding females, so increased den availability in the analysis area would not noticeably benefit individual wolverines or the population.

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Potential wolverine 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 409,828 acres of habitat across the Forest.

Where pine beetles move through stands near admin features at normal levels, wolverine habitat quality would improve. 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 wolverine habitat for foraging, denning, or resting.

Cumulative Effects

Revegetation will turn bare ground to forested foraging habitat within 80 years. Denning habitat could occur in the following decades as appropriate weakened trees and snags are created.

Road use can cause disturbance to wildlife and there is a potential for wildlife/vehicle collisions (USDA 2003c). Vehicle collisions with wolverine are unknown on the Forest and it is unlikely that proposed road construction or decommissioning will change this.

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.

Snag and coarse woody debris creation combined with larger mature conifer stands would provide 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, wolverine habitat will be lost and then improve. 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 wolverines. 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 maturing of existing spruce-fir would provide increased habitat quality. However, where beetles restarted succession in lodgepole stands, wolverine 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 wolverine habitat. Various amount of subalpine/fir habitat would be lost until forest regeneration started providing some overhead cover, and coarse woody debris began accumulating. Spruce-fir habitat and this habitat burns less frequently, wildfires probably will not change wolverine habitat substantially across the Forest.

Wolverine might also be affected by fragmentation (or perforation), not just habitat loss.

The final extent of changes to wolverine habitat from pine beetles or potential wildfires across the Forest is unknown. Surveys indicate that 223,000 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.

Overall, this proposal and other proposed and on-going actions will retain more than 399,000 acres (97%) of wolverine habitat on the Forest. Harvest is distributed widely across the Forest in small strips around admin features.

Finally, most wolverine habitat occurs in mature and older spruce-fir; lodgepole is generally less used. Changes caused by this Forest management should not affect wolverine habitat across the Forest.

Proposed Actions

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 wolverine habitat. No action could result in variable effects to wolverines.

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 Routt

is only large enough for a few breeding females, so increased den availability in the analysis area would not noticeably benefit individual wolverines or the population.

If the worst-case scenario occurs, in which tree and stand loss is extensive and widespread, wolverines could still use the analysis area and these habitats. 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. Prey animals and carrion will still be available under the worst-case scenario (similar to lynx).

Habitat for prey animals will change but overall abundance will remain stable (similar to lynx and marten). Minimal amounts of snowshoe hare habitat will be temporarily lost under proposed actions. These small habitat changes will not cause noticeable changes for the small amount (based on overall wolverine expansive territory requirements) of males or breeding females that could inhabit the entire Routt.

Potential wolverine 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 409,828 acres of habitat across the Forest.

Where pine beetles move through stands near admin features at normal levels, wolverine habitat quality would improve. 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 wolverine habitat for foraging, denning, or resting.

<u>Cumulative Effects</u>
Revegetation will turn bare ground to forested foraging habitat within 80 years. Denning habitat could occur in the following decades as appropriate weakened trees and snags are created.

Road use can cause disturbance to wildlife and there is a potential for wildlife/vehicle collisions (USDA 2003c). Vehicle collisions with wolverine are unknown on the Forest and it is unlikely that proposed road construction or decommissioning will change this.

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.

Snag and coarse woody debris creation combined with larger mature conifer stands would provide 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, wolverine habitat will be lost and then improve. 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 wolverines. 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 maturing of existing spruce-fir would provide increased habitat quality. However, where beetles restarted succession in lodgepole stands, wolverine 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 wolverine habitat. Various amount of subalpine/fir habitat would be lost until forest regeneration started providing some overhead cover, and coarse woody debris began accumulating. Spruce-fir habitat and this habitat burns less frequently, wildfires probably will not change wolverine habitat substantially across the Forest.

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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 223,000 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.

Overall, this proposal and other proposed and on-going actions will retain more than 399,000 acres (97%) of wolverine habitat on the Forest. Harvest is distributed widely across the Forest in small strips around admin features.

Finally, most wolverine habitat occurs in mature and older spruce-fir; lodgepole is generally less used. Changes caused by this Forest management should not affect wolverine habitat across the Forest.

<u>Determination of Effect and Rationale</u>
The limited amount of potential breeding habitat and the wolverine's need for extremely large home ranges suggest that wolverines on the Routt never constituted a viable population. Scattered sightings of wolverine have been reported in Colorado and adjoining Sierra Madre and Medicine Bow Range in Wyoming, but these are

unconfirmed. 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. Across the Forest, there are more than 409, 8280 acres of wolverine habitat distributed among the mountain ranges. Therefore, vegetation is being maintained to provide suitable habitat for wolverines. This habitat is well distributed across the Forest.

The wolverine is considered extirpated in Colorado according to CNDIS records.

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 Plan standards for retaining old-growth forest by mountain range will be met, ensuring that some wolverine habitat will continue to be provided on the Forest.
- Forest Plan standards for recruitment trees, snags and coarse woody debris are included in timber harvest, providing foraging and future denning habitat.

V. RECOMMENDED MEASURES TO AVOID, MINIMIZE, OR MITIGATE ADVERSE EFFECTS

1) The recommended measures are part of the project design and are built into implementation plans for the project. Because they are part of the design, effect evaluations and determination are assessed presuming use of and complete compliance with these measures.

2) Obligation: Notify the respective Ranger District wildlife biologist of operational changes that affect performance, timing or results of the Hazard Tree treatment work prior to initiating felling operations.

3) Comply with the Hazard Tree Removal Project Design Criteria, Version IV, or the most current version. In particular reference Design Criteria:

   #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.

4) The respective Ranger District biologist (or FS appointed professional representative) will provide project specific Design Criteria that address LRMP, Forest Goals and Objectives pg.1-2, Forest-wide Standards and Guidelines pg. 1-6 – 1-8, 1-14 – 1-15, Research Natural Areas 2.2, pg 2-23, Management Area Prescription 5.11, pg. 2-41, 5.13, pg. 2-46, 5.47, pg. 2-48, and Management Area Prescription 7.1, pg. 2-51. *Refer to Appendix A for General Hazard Tree Design Criteria and Appendix B for Wildlife Conservation Measures/Project Design Criteria direction that are project level specific.*

VI. 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.

VII. CONTACTS

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

LITERATURE CITED

Altman, B. and R. Sallabanks. 2000. Olive-sided flycatcher (*Contopus cooperi*), No. 502. *In:* Poole, A. and F. Gill (eds.), The birds of North America. Cornell Laboratory of Ornithology, Ithaca, NY and The Academy of Natural Sciences, Philadelphia, PA. 27 pp.
Smith, C.P. 1927. The olive-sided flycatcher and coniferous trees. The Condor. 29(2): 120-121.

Anderson, T. 2005. Rocky Mountain Capshell Snail (*Acroloxus coloradensis*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/rockymountaincapshellsnail.pdf.

Anderson, T. 2005a. Oreohelix *strigosa cooperi* (Cooper's Rocky Mountain Snail): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/coopersrockymountainsnail.pdf.

Andrews, R. and R. Righter. 1992. Colorado birds: a reference to their distribution and habitat. Denver Museum of Natural History. Denver, CO. 442 pp. + front pages.

Banci, V. 1994. Chapter 5. Wolverine. Pages 99-127 in L. F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski (tech. eds.). 1994. The Scientific Basis for Conserving Forest Carnivores in the Western United States: American Marten, Fisher, Lynx, and Wolverine. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-254.

Beal, F. E. L. 1911. Foods of the woodpeckers of the United States. U.S. Department of Agriculture Bulletin 37. 64 pp.

Beauvais, G.P. and J. McCumber. 2006. Pygmy Shrew (*Sorex hoyi*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/ projects/scp/assessments/pygmyshrew.pdf

Bissonette, J. A., D. J. Harrison, C.A. Hargis, and T.G. Chapin. (1997). The influence of spatial scale and scale-sensitive properties on habitat selection by American marten. Wildlife and Landscape Ecology: Effects of Pattern and Scale. J. A. Bissonette. New York, Springer-Verlag: 410 pp.

Broderdorp, K. 2007-2008. Personal communication. USDI Fish and Wildlife Service, Wildlife Biologist. Grand Junction, CO.

Bull, E.L., K.B. Aubrey and B.C. Wales. 2001. Effects of disturbance on forest carnivores of conservation concern in eastern Oregon and Washington. Northwest Science. Vol. 75, Special Issue. pp. 180-184.

Bull, E.L. and B.C. Wales. 2001. Effects of disturbance on birds of conservation concern in eastern Oregon and Washington. Northwest Science. Vol. 75, Special Issue. pp. 166-173.

Buskirk, S.W., S.C. Forrest, M.G. Raphael and H.J. Harlow. 1989. Winter resting site ecology of marten in the central Rocky Mountains. Journal of Wildlife Management. 53(1): 191-196.

Buskirk, S.W. and L.F. Ruggiero. 1994. American marten. Pages 7-37 *In:* Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Ziellinski (tech. eds.), The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the Western United States. General Technical Report RM-254. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 184 pp.

Canfield, J.E., L.J. Lyon, J.M. Hillis, and M.J. Thompson. 1999. Ungulates. Pages 6.1-6.25 *in* Joslin, G. and H. Youmans, coord. 1999. Effects of Recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307 pp.

Chapin, T.G., D.J. Harrison, and D.D. Katnik. 1998. Influence of landscape pattern.

Colorado Division of Wildlife-Natural Diversity Information Source, Species Occurrence and Abundance Tool http://ndis.nrel.colostate.edu/, accessed 1/9/08

Colorado Division of Wildlife-Yost, Jeff, Terrestrial Biologist, Steamboat Springs CO. 2/4/08. CWD and elk and deer analysis units telephone conversation, and email.

Colorado Division of Wildlife-Broderick, John, Terrestrial Biologist, Glenwood Springs CO. 2/7/08. Deer analysis units, telephone message, D8 numbers.

Colorado Natural Heritage Program, http://www.cnhp.colostate.edu/contact.html, accessed 1/10/08

Crockett, A.B. and P.L. Hansley. 1978. Apparent response of Picoides woodpeckers to outbreaks of the pine bark beetle. Western Birds. 9:67-70.

DeGraff, R.M., V.E. Scott, R.H. Hamre, L. Ernst and S.H. Anderson. 1991. Forest and rangeland birds of the United States: natural history and habitat use. Agriculture Handbook 688. USDA Forest Service. 625 pp.

Dillon, G. K., D. H. Knight, and C.B. Meyer. (2003). Historic Variability for Upland Vegetation in the Medicine Bow National Forest, Wyoming.

Dixon R. D., and V. A. Saab. 2000. Black-backed Woodpecker (*Picoides arcticus*). *In* The Birds of North America, No. 509 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Drew, G. 1995. Winter habitat selection by American marten (Martes Americana) in Newfoundland: why old growth? PhD. Utah State University, Logan, Utah.

Fahrig, L. 2003. Effects of habitat fragmentation on biodiversity. Annu. Rev. Evol. Syst. 34:487-515.

Finch, D.M. 1992. Threatened, endangered, and vulnerable species of terrestrial vertebrates in the Rocky Mountain Region. General Technical Report RM-215. USDA

Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 38 pp.

Fitzgerald, J.P., C.A. Meaney and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado. Niwot, CO. 467 pp.

Geist, V. 1971. Mountain sheep: a study in behavior and evolution. University of Chicago Press, Chicago, Illinois. 383 pp.

Geist, V. 1978. Behavior. Pages 283 – 296 *in* J.L. Schmidt, and D.L. Gilbert, eds. Big Game of North America: ecology and management. Stackpole Books, Harrisburg, Pennsylvania. 494 pp.

Goggans, R., R.D. Dixon and L.C. Seminara. 1988. Habitat use by three-toed and black-backed woodpeckers, Deschutes National Forest, Oregon. Nongame Report 87-3-02. Oregon Department of Fish and Wildlife. Bend, OR. xvii + 49 pp.

Graham, R.T., R.L. Rodriguez, K.M. Paulin, R.L. Player, A.P. Heap and R. Williams. 1999. The northern goshawk in Utah; habitat assessment and management recommendations. General Technical Report RMRS-GTR-22. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Ogden, UT. 48 pp.

Grubb, T.G., L.L. Pater and D.K. Delaney. 1998. Logging [sic] truck noise near nesting northern goshawks. Research Note RMRS-RN-3. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 2 pp.

Hakkarainen, H. and E. Korpimaki. 1996. Competitive and predatory interactions among raptors: an observational and experimental study. *Ecology* 77:1134-1142.

Hargis, C.D., J.A. Bissonette, and D.L. Turner. 1999. The influence of forest fragmentation and landscape pattern on American marten. Journal of Applied Ecology 36(1): 157-172.

Hayward, G.D. 1997. Forest management and conservation of boreal owls in North America. Journal of Raptor Research. 31(2): 114-124

Hamman, B., H. Johnston, P. McClelland, S. Johnson, L. Kelly, and J. Gobielle. 1999. Birds. Pages 3.1-3.34 *in* Joslin, G. and H. Youmans, coords. Effects of recreation on Rocky Mountain wildlife: A Review for Montana. Committee on effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307 pp.

Hayward, G.D. 1994. Chapter 9, Review of technical knowledge: boreal owls. Pages 92-127 *In:* G.D. Hayward and J. Verner (tech. eds.), Flammulated, boreal, and great gray owls in the United States: A technical conservation assessment. General Technical

Report RM-253. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 214 pp. + 3 maps.

Hayward, G.D. 1997. Forest management and conservation of boreal owls in North America. Journal of Raptor Research. 31(2): pp. 114-124.

Hoffman, R.W. 2006. White-tailed ptarmigan (Lagopus leucura): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/whitetailedptarmigan.pdf

Hutto, R.L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology. 9(5): 1041-1058.

Hutto, R.L. 1996. An investigation of the potential threat of habitat fragmentation on some Northern Region bird species. Final report for contract #53-0343-2-00207, Northern Region.

Kennedy, P.L. 1997. The northern goshawk (*Accipiter gentilis atricapillus*): is there evidence of a population decline? Journal of Raptor Research. 31(2): 95-106.

Kennedy, P.L. 2003. Northern goshawk (*Accipiter gentilis atricapillus*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. xi + 189 pp.

Kennedy, P.L. and D.W. Stahlecker. 1993. Responsiveness of nesting northern goshawks to taped broadcasts of three conspecific calls. Journal of Wildlife Management. 57(2): 249-257.

Keinath, D.A. 2004. Fringed Myotis (*Myotis thysanodes*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/fringedmyotis.pdf

Keinath, D., H. Smith, and G.P. Beauvais. 2006. Wyoming Pocket Gopher (*Thomomys clusius*): A Technical Conservation Assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/wyomingpocketgopher.pdf

Kingery, H. E. (ed.). 1998. Colorado breeding bird atlas. Colorado Bird Atlas Partnership. Denver, CO. 636 pp.

Knight, D.H. 1994. Mountains and plains: the ecology of Wyoming landscapes. Yale University Press. New Haven, CT. 338 pp.

Knight, R.L., and D.N. Cole. 1995. Wildlife responses to recreationists. Pages 51 – 69 *in* R.L. Knight, and K.J. Gutzwiller, eds. Wildlife and recreationists: coexistence through management and research. Island Press, Washington, D.C.

Knight, R.L. and S.K. Skagen. 1988. Effects of recreational disturbance on birds of prey: a review. Pages 355-359 *in* Proceedings of Southwest raptor management symposium and workshop. Institute of Wildlife Research, National Wildlife Federation Science Technical Service no. 11. *as referenced in* Joslin, G. and H. Youmans, coord. 1999. Effects of Recreation on Rocky Mountain wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307 pp.

Koplin, J.R. 1969. The numerical response of woodpeckers to insect prey in a subalpine forest in Colorado. Condor. 71:436-438.

Kotliar, N.B. (2007 February 20). Olive-sided flycatcher (*Contopus cooperi*): a technical conservation assessment. USDA Forest Service. Rocky Mountain Region. http://www.fs.fed.us/r2/projects/scp/assessments/olivesidedflycatcher.pdf

K. Hutton, Blakesley, J., J. Beason, G. Giroir, R. Sparks, A. Panjabi, and D. Hanni. 2006. *Monitoring Colorado's Birds: 2006 Field Season Report.* Tech. Rep. M-MCB06-01. Rocky Mountain Bird Observatory, Brighton, CO, 163 pp.

Leonard, Jr., D.L. 2001. Three-toed woodpecker (*Picoides tridactylus*), No. 588. *In:* Poole, A. and F. Gill (eds.), The birds of North America. Cornell Laboratory of Ornithology, Ithaca, NY and The Academy of Natural Sciences, Philadelphia, PA.. 23 pp.

Lewis, K.J. and I.D. Hartley. 2006. (Mitchell and Preisler, 1998) Rate of deterioration, degrade, and fall of trees killed by mountain pine beetle. *BC Journal of Ecosystems and Management* 7(2):11–19. URL: http://www.forrex.org/publications/jem/ISS35/vol7_no2_art2.pdf

MacWhirter, R. B., and K. L. Bildstein. 1996. Northern Harrier (*Circus cyaneus*). *In* The Birds of North America, No. 210 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, D.C.

Martin, K., A. Norris, and M. Drever. 2006. Effects of bark beetle outbreaks on avian biodiversity in the Britich Columbia interior: Implications for critical habitat management. BC Journal of Ecosystems and Management 7(3):10-24.

Mehl, M.S. 1992. Old-growth descriptions for the major forest cover types in the Rocky Mountain Region. Pages 106-120 *In:* Old-growth forests in the Southwest and Rocky Mountain Regions; 1992 March 9-13; Portal, AZ. Conf. General Technical Report RM-213. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO.

Miller, E., A.D. Partridge and E.L. Bull. 1979. The relationship of primary cavity nesters and decay. Presented at the 36th Northeast Fish and Wildlife Conference, April 1-4, 1979. Transactions of the Northeast Section, The Wildlife Society. 36: 60-68.

Murphy, E.C. and W.A. Lehnhausen. 1998. Density and foraging ecology of woodpeckers following a stand-replacement fire. Journal of Wildlife Management. 62(4): 1359-1372.

NatureServe Explorer http://www.natureserve.org, 2007-2008. Bird and mammal information.

Nicholoff, S. H., compiler. 2003. Wyoming Bird Conservation Plan, Version 2.0. Wyoming Partners in Flight. Wyoming Game and Fish Department, Lander, WY.

Oliver, C.D. and B.C. Larson. 1996. Forest stand dynamics update edition. John Wiley and Sons, Inc. New York, NY. 520 pp.

Ortega, Y.K. and D.E. Capen. 2002. Roads as edges: effects on birds in forested landscapes. Forest Science 48(2):381-390.

Packauskas, R.J. 2005. Hudsonian Emerald Dragonfly (*Somatochlora hudsonica*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/hudsonianemeralddragonfly.pdf

Phillips, A.R. 1937. A nest of the olive-sided flycatcher. The Condor. 39(2): 92.

Potvin, F., L. Belenger, and K. Lowell. 2000. Marten habitat selection in a clearcut boreal landscape. Conservation Biology 14(3): 844-857.

Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce Jr., G. Goodwin, R. Smith and E.L. Fisher. 1992. Management recommendations for the northern goshawk in the southwestern United States. General Technical Report RM-217.

Rocky Mountain Bird Observatory, http://www.rmbo.org/aboutus/default.html, accessed 1/23/08

Selby, G. 2007. Regal Fritillary (*Speyeria idalia* Drury): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/regalfritillary.pdf

Spencer, A.W. and D. Pettus. 1996. Habitat preferences of five sympatric species of long-tailed shrews. Ecology 47:677-683

Spencer, W.D. 1987. Seasonal rest-site preferences of marten in the northern Sierra Nevada. Journal of Wildlife Management. 51(3): 616-621.

Squires, J.R. and R.T Reynolds. 1997. Northern goshawk (*Accipiter gentilis*). *In:* Poole, A. and F. Gill (eds.), The birds of North America, No. 298. The Academy of Natural Sciences, Philadelphia, PA, and American Ornithologists' Union, Washington, DC, USA.

Steventon, J.D. and J.T. Major. 1982. Marten use of habitat in a commercially clear-cut forest. Journal of Wildlife Management. 46(1): 175-182.

Tinker, D.B., C.A. Resor, G.P. Beauvis, K.F. Kipfmueller, C.I. Fernandes, and W.L. Baker. 1998. Watershed analysis of forest fragmentation by clearcuts and roads in a Wyoming forest. Land. Ecol. (13) 149-165.

Toweill, Dale E. and Thomas, Jack W. 2002. North American Elk, Ecology and Management, pages 547 – 571.

USDA, Tree Hazard Recognition and Reduction in Recreation Sites, 2004. *http://na.fs.fed.us/spfo/pubs/hazard trees/treehazards/thazards_toc.htm, 11/28/04.*

USDA Forest Service. 1995. Biological Evaluation for sensitive plant and wildlife species that for the most part are not impacted by livestock grazing in the Rocky Mountain Region. Lakewood, CO. 25 pp.

USDA Forest Service. FAUNA database, Jones B. Steamboat Springs CO., GIS, Loose, S. Saratoga WY., GIS, Smith W.A., Laramie WY, January 2008.

USDA Forest Service. 1998. Final Environmental Impact Statement and Revised Land and Resource Management Plan. USDA Forest Service, Medicine Bow National Forest. Steamboat Springs, CO. USDA Forest Service. 2003-2007. Index of Species Evaluated for Region 2 Sensitive Species List. Rocky Mountain Region. http://fsweb.rs.fs.fed.us/rr/scp/spp_index.shtml.

USDA Forest Service. 2007, 2003(f), 2001c. Rocky Mountain Region Endangered, Threatened, Proposed, and Sensitive Species (Matrix of TES Species by Unit) [Online]. Available: http://fsweb.r2.fs.fed.us/rr/tes/tes_r2ss.html.

USDA Forest Service. 2007 Environmental Assessment Management Indicator Species Forest Plan Amendment 04 to the Routt National Forest Land and Resource Management Plan, 1997 Revision MBR NF, Skorkowsky, R. Steamboat Springs CO. 1/07

USDA Forest Service. 2007. Routt National Forest Sensitive Species Assessment, *Draft.* Ferland C., Brown, M., Jones, B., Barmann, M., Steamboat Springs, CO. 165 pages.

USDA Forest Service. 2003a. Final Environmental Impact Statement and Revised Medicine Bow National Forest Land and Resource Management Plan. Laramie, WY.

Walkinshaw, L.H. and C.J. Henry. 1957. Incubation and nestling periods of the olive-sided flycatcher. The Auk. 74(3): 389-390.

Ward, A.L., J.J. Cupal, A.L. Lea, C.A. Oakley, and R.W. Weeks. 1973. Elk behavior in relation to cattle grazing, forest recreation, and traffic. Proceeding of the Thirty-eighth North American Wildlife Conference. 38:327-337.

Ward, A.L. 1984. The response of elk and mule deer to firewood gathering on the Medicine Bow Range, Pages 28-40 *in* southcentral Wyoming in Proceedings of the 1984 Western states and Provinces elk workshop. Edmonton, Alberta.

Ward, A.L. 1985. Study of Elk in the Little Snake River Known Recoverable Coal Resource Area (KRCRA) of Southcentral Wyoming. Final Report. USDA Rocky Mountain Forest and Range Experiment Station. Laramie, WY. 188 pp.

Ward. A.L. 1985a. Elk Movements on the North End of the Sierra Madre Mountains. Unpubl. Report. 40 pp.

Ward, A.L. (undated). Multiple use of timbered areas: views of a wildlife manager specifically for elk and mule deer. USDA Forest Service, Rocky Mountain Experiment Station, Laramie, Wy. 24 pp.

Welp, L., W. F. Fertig, G.P. Jones, G.P. Beauvais, and S.M. Ogle. (2000). Fine filter analysis of the Bighorn, Medicine Bow, and Shoshone National Forests in Wyoming. Unpublished report. Wyoming Natural Diversity Database. Laramie, WY.

Wiggins, D. (2004a July 1). American three-toed woodpecker (*Picoides dorsalis*): a technical conservation assessment. USDA Forest Service. Rocky Mountain Region.

Yeager, L.E. and L.E. Riordan. 1953. Effects of beetle-killed timber on range and wildlife in Colorado. Transactions of the North American Wildlife and Natural Resources Conference. 18: 596-616.

APPENDIX A– (general) **Hazard Tree Design Criteria**

Hazard Tree Removal Project
Design Criteria
Version IV

Version I: In July 3, 2007 IDT Notes
Version II: July 23, 2007

Version III: Updated following July 25, 2007 IDT Meeting
Version IV: Updated following October 25, 2007 IDT Field Trip – Changes are in bold[1]

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. Stream crossings with definable beds and banks will be designated by the Forest Service.
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.** (was #10 in Version III)
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.

[1] If a Design Criterion has only been moved, it is not in bold. The number that it used to be is in bold.

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. In MA 5.13 on the Routt National Forest, (within the following Geographic Areas: 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) across an area of 35 percent of the total treatment area (to provide for "well distributed") of the LP and SF stands of with trees of larger diameter (trees mostly > 9" dbh)**,** hand fall and leave fallen trees in place**.** 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. **Minimize** new road or temporary road construction. 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.** (Was #28 in Version III)
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.** (Was #27 in Version III)

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), Research Natural Areas (RNAs), and Wilderness Areas

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.

28. Hazard trees along Wilderness trails will not be treated – warning signs will be posted at trailheads to indicate potential hazards along the trail.

Slash Disposal/Fuels Treatments

29. 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.
30. 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.
31. 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.
32. 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. **(was #7 in Version III)**
33. 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. **(was #9 in Version III)**
34. 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.**

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[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)."

Visuals

35. 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.

Incorporation of Changes to Design Criteria IV. as of January 11, 2008 Re-Scoping

- Design criterion #5 will be re-worded to state, "The Forest Service will designate heavy equipment crossings for streams that have definable beds and banks."

  Rationale: The re-wording does not change the intent of the design criterion; it simply makes it easier to understand.

- Design criterion #17 will be re-worded to state, "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."

  Rationale: During the October 2007 ID team fieldtrip, several design criteria were deemed too restrictive, making them difficult, if not impossible, to implement. Consequently, the wording was tempered so that implementation would not be unduly restricted and resources would still be protected. While this approach worked in most areas, I believe the current wording in "Design Criteria: Version IV" weakens the original intent of this criterion. Therefore, I am changing it back to its original wording (see Design Criteria: Versions I – III).

APPENDIX B –Wildlife Conservation Measures/Project Design Criteria *(that address how site specific Modified Proposed Actions will stay consistent with Forest Plan direction, with specific applicability to wildlife).*

A. Forest - wide - Forest Goals and Objectives, pg. 1-2 LRMP

- Forest Goals and Objectives- Goal 1: Ecosystem management on the Routt National Forest shall provide for multiple-use outputs and the habitats and processes necessary to maintain the biological diversity found on the Forest.
    - Forest Goals and Objective- Objective bullet statement 6: Maintain or create habitats suitable for a stable or increasing population of federally listed threatened and endangered species and Forest Service, Region 2 sensitive species for the Routt National Forest, including the Colorado River cutthroat trout.

B. Forest - wide – Standards and Guidelines, pg.1-4 LRMP

- Forest-wide Standards (must be followed)
- Guidelines (advisable courses of action should be followed)

Biological Diversity Standard

- Biological Diversity Standard #1 (pg. 1-8): "Develop prescriptions prior to timber harvest to identify the amount, size(s), and distribution of down logs and snags to be left on site, as well as live, green replacement trees for future snags …".

- Biological Diversity Standard #2: "Retain all soft (rotten) snags unless they are a safety hazard".

  ☑ Design Criteria for Snag Retention (Post harvest retention of standing dead trees provides for wildlife denning, nesting and feeding habitat as well as a "biological legacy" to the site. Sensitive wildlife such as marten, three-toed woodpecker, goshawk and boreal owl are likely to benefit in the near and long term: Retain on average 2 existing 'hard' snags (typically, lodgepole pines killed by mountain pine beetles or spruces killed by spruce beetles, decay class 1 or 2) per acre within treatment units. Distribute snags singly or in groups of up to 16 trees (equivalent to 2 snags/acre x 8 acres). Leaving a mixture of single snags (occasionally) as well as snag groups (2 to16 trees/group) would be the most desirable result. Snag clumps are preferred and when the opportunity exists these should be placed in the locations of rare plant species identified as also needing protection (this would result in the snag retention clumps meeting two biological purposes). If a stand does not contain adequate snags to meet this criteria, meet this requirement by retaining this required tree density as additional snag replacement 'live trees' Use the design criteria for 'live tree' retention for marking guidance.

  Selected 'hard' snags should have a larger-than-average diameter for the stand and be at least 25 feet tall, but in no case should a retained snag be smaller than 10 inches dbh. Snags with evidence of existing wildlife use (cavities, nests, etc.) should receive precedence for retention. Select snags that are away from roads or likely landing locations and that appear to be firmly rooted and free of potentially dangerous defects (such as an unstable top or "widow maker" limbs). It is acceptable to connect some snag groups to the unit perimeter (a "peninsula") but most groups (≥ 70% by stem count) should be "islands" retained inside the treatment unit perimeter.

Retain all 'soft' (*i.e.,* rotten, decay class 3 to 5) snags unless they are a safety hazard (Biological Diversity Standard 2 in RNF LRMP on p. 1-8).
Paint retention snags (hard and soft) with an identifiable "wildlife tree" marking. Furthermore, protect snags under special provisions identified in Section A (of the timber sale contract), List of Special Provisions, by distinguishing marked snags as "reserve trees" under provisions C[T]2.3# (Reserve Trees) and C[T]6.32# (Protection of Reserve Trees). **Retention snags should be considered and avoided in the sale layout of skidding and timber removal activities. Should it be determined at the time of logging that a reserve snag would be in a skid trail or that it is a hazard to people, fell (or top) the snag; however, the snag shall be retained on site as coarse woody debris and an equitable replacement snag within the unit should be marked for each snag that cannot be avoided.**

- Biological Diversity Standard #3: "Use genetically local (at the sub-section level), native plant species for revegetation efforts where technically and economically feasible. Use weed-free seed mixtures. Where native perennials are becoming established, nonnative annuals or sterile perennial species may be used to prevent soil erosion".
  - ☑ The appropriate timber sale representative will coordinate with the Botanist or Range Conservationist on the respective district to coordinate revegetation efforts that will comply with the above standard.

Silviculture Standard

- Silviculture Standard #10 (pg. 1-12): "Leave large woody debris on harvested or thinned sites to help retain moisture, trap soil movement, provide microsites for establishment of forbs, grasses, shrubs and trees , and to provide habitat for wildlife."
  - ☑ Design Criteria for Conservation of Coarse Woody Debris (Post-harvest retention of some existing deadfalls and logs provides for current and future wildlife habitat as well as a "biological legacy" of the site. Large down wood is valuable to small mammals for runways, food caches, escape cover, denning sites and weather protection. Sensitive wildlife such as marten, goshawk and boreal owl are likely to benefit near and long term. To the extent practicable, and where available, retain in place within timber harvest units some existing deadfalls (whole trees) or logs (portions of tree boles) measuring ≥16 inches in diameter and that are ≥20 feet in length. Where existing large (*i.e.*, ≥16" x 20') deadfalls and logs are plentiful within a cutting unit, no attempt should be made to retain all (or even most) existing down woody pieces because interference with cutting and skidding operations would result. In particular, avoid retention of deadfalls and logs in areas close to proposed landings or near to open access roads. On the other hand, in cutting units where deadfalls and logs are sparse, retention of much or most of the existing large woody material should be emphasized.

    Large deadfalls and logs identified for retention need <u>not</u> be painted or marked as "reserve" trees/timber. However, to effectively "retain" this material in place on the site during harvest operations, use standing leave (non-included timber) or wildlife reserve trees (snags and live character trees) to shield the deadfall or log

from mechanical damage or displacement. The conservation purpose is to maintain the existing integrity of a deadfall or log by preventing cutting (bucking), displacement from its "bed" or utilization of the material during harvest operations.

In addition to purposeful retention of existing large deadfalls during sale preparation, CWD conservation should be the continuing objective during slash disposal operations conducted in post-harvest cutting units. Only limbs, tops and short chunks of woody material should be the targets of debris collection. Rotten or otherwise unutilized whole down trees or logs left scattered throughout a stand following logging, and that are larger than 8 inches diameter on the small end, should not be targeted for disposal. To the extent practicable, leave this larger woody debris well-distributed in treatment areas and expend diligent effort to conserve coarse woody debris on site.

Threatened, Endangered, Sensitive Species (TES) and Wildlife Standards

- TES Standard #1 "Apply seasonal restrictions on use of travelways under Forest Service jurisdiction to reduce disturbance in sensitive big game areas, such as birthing areas and winter ranges. This does not imply that all birthing areas and winter range are considered equally important, and not all will be considered 'sensitive'".
  - ☑ Harvest and/or haul timing and activity should be coordinated with the respective Wildlife Biologist to insure that seasonal restrictions are adhered to to help protect important elk calving areas.
- TES Standard #2: "Manage human disturbance at caves and abandoned mines where bat populations exist. When closing mines or caves for safety or protection reasons, reduce disturbance to resident bat populations and provide access for bats."
  - ☑ This project does not affect caves or mines, thus design criteria to incorporate this standard are unnecessary for this project
- TES Standard #3: "Provide adequate cover to maintain screening, through time, along roads where timber management activities are taking place to minimize disturbance and harassment of deer and elk".
  - ☑ The appropriate timber sale representative will coordinate with the Biologist on the respective district to coordinate retention and revegetation efforts that will comply with the above standard.
  - ☑ See *Appendix D*, Screening and Habitat Effectiveness
- TES Standard #4 "In areas where tall dense cover is desired for ground-nesting birds, retain adequate residual cover from previous growing seasons since some species begin nesting in April and May before spring growth.
  - ☑ This project does not affect residual cover, thus design criteria to incorporate this standard are unnecessary for this project.
- TES Standard #5 "Some bird species prefer to nest in undisturbed cover. In areas where these species are a primary consideration, manage livestock grazing to avoid adverse impacts to nesting habitat."
  - ☑ This project does not include livestock grazing that would influence cover, thus design criteria to incorporate this standard are unnecessary for this project.

- TES Standard #6: "Protect known active and inactive raptor nest areas. The extent of protection will be based on proposed management activities, human activities existing before nest establishment, species, topography, vegetative cover, and other factors. A no-disturbance buffer around active nest sites will be required from nest site selection to fledging. Exceptions may occur when animals are adapted to human activity".
  It should be noted that previous Routt documents reveal a variance in the "no-disturbance" buffer, anywhere from 1/4 - 3/8 of a mile. A reason for this variance is the diversity of reference material used to provide mitigations or design criteria. A 3/8 mile disturbance buffer is most commonly used on the Routt and adoption of this buffer distance, as a standard, is suggested as a distance interpreted from the General Technical Report RM-217, Management Recommendations for the Northern Goshawk in the Southwestern United States (Reynolds et al. 1992).
  Several proposed treatment areas overlap with or are adjacent to known goshawk nesting areas. 'Known' goshawk nest stands are those verified as active anytime from 1992 through to completion of sale layout. Many more proposed treatment areas overlap with or are adjacent to suitable goshawk nesting habitat. Since the proposed actions can include partial or complete removal of the overstory, there is the potential that harvest could remove habitat where goshawks are actively attempting to successfully nest. Forest Plan standards #6, #7, #8 (p.1-14) protect goshawk nests and nesting areas. Since inception of the plan Routt standardized recommendations have included the protection of nests, nesting areas and post-fledging areas (PFAs) and generally do not allow disturbance within 3/8-mile of an active nest from March through July.
  The project NEPA decision should document the establishment of goshawk known and reserve nest stands. The spatial location of these nest stands should be recorded in the US Forest Service corporate data system and include references to the decision that established management protections for these stands.
  - ☑ Design Criteria for the Protection of Known Goshawk Nest Stands During Implementation: The Forest will provide the resources necessary to survey suitable goshawk nesting habitat in the same summer that these specific stands are to be treated and before these specific stands are treated. Prior to the award of the TS contract- Train timber sale, engineering and resource personnel to identify and report active goshawk nests (or goshawks defending a territory) found during routine field work. Because of the extended duration of proposed treatments, and because of continuing lodgepole pine mortality across the landscape, known goshawk nest stands may be abandoned and/or new nest stands may be established. The intent of ongoing monitoring is to identify new/changed nest locations and to keep a current chronicle of active goshawk nest sites within treatment areas. These surveys will be completed in all suitable goshawk nesting habitat where the applied treatment is more intensive than Forest Service employees removing $\leq$ 10 trees/acre. These goshawk surveys will follow established protocols (Kennedy and Stahlecker 1993, Joy et al. 1994) and occur generally from May 1 through July 31. An adequate survey requires appropriate surveys of the area for two consecutive years. If the Forest does not have the additional resources necessary to complete goshawk surveys (Kennedy and Stahlecker 1993, Joy et al. 1994), it should be assumed that the territory(ies) are active and harvest should not occur in order to ensure compliance with these Forest Plan standards.

☑ Design Criteria for the Protection of Known Goshawk Nest Stands (identified before award of timber sale contract): Where treatment management actions are proposed within a 3/8-mile radius of a known goshawk nest site, a wildlife biologist will delineate three 30-acre nesting habitat protection areas.

One protection area of no less than 30-acres shall be centered on the stand where goshawk nesting is currently active or where nesting occurred most recently. The other two 30-acre reserve areas would be used to protect two additional nearby stands (alternate sites) that are apparently suitable (structurally and compositionally appropriate) for goshawk nesting. Optionally, some or all 60 acres may be used to expand the 30-acre protection area of the active/recently active nest site or to create a single alternative nest stand larger than 30 acres. In any case, a total of no less than 90 mature-forest acres would be segregated as goshawk nest stand protection area(s). Trees within the nest stands and/or reserve nest stands shall not be marked for removal.

☑ Design Criteria for the Protection of Raptor Nesting Sites (identified before award of timber sale contract and all species other than goshawks): Where treatment management actions are proposed within a 3/8-mile radius of a known goshawk nest site, a wildlife biologist will establish one nesting habitat protection area of no more than 30 acres in size. The size of a nest stand protection area necessary for a species' protection will vary by species and for many small owl species is typically no more than 5 acres. One protection area of no more than 30-acres shall be centered on the active or inactive raptor nest site. Trees within the nest stands and/or reserve nest stands shall not be marked for removal.

☑ Design Criteria for the Protection of Raptor Nesting Period Seasonal Restriction in Logging Operations (to minimize noise, commotion, human presence and other disruptive stresses that increase the likelihood of nests abandonment or depredation of eggs/young caused by diverting raptors from nest attendance): This criteria will be implemented as stated for the northern goshawk but may be reduced for other species if determined appropriate to do so by a wildlife biologist. Prohibit all logging-related operations or activities, including log haul, within ¼-mile of an active raptor nest between March 15 and September 15. Use of national forest roads, otherwise open to unrestricted public vehicle use, is specifically exempted from this seasonal control. A wildlife biologist must determine nesting status (active or inactive) for each year during sale implementation.

Within ¼-mile of an active raptor nest, ***limited use*** of an existing road (that has been and is currently closed to public travel) ***may be granted*** to allow workers to access worksites more than ¼-mile beyond the nest. However, permission to use a road for daily access to a worksite would be granted on a case by case basis only and in consultation with a wildlife biologist. On average, no more than 4 separate vehicle passes/day would be allowed on a road that is adjacent to (*i.e.*, within ¼-mile of) an active raptor nest. One "pass" is defined here as the single disruptive event caused by 1 vehicle (or as many as 3 vehicles together) traveling along the road segment (adjacent to an active nest) on a single occasion. This

limited use exception is NOT intended to allow log haul past the nest during the seasonally restricted period. Only vehicles used for transporting workers (including FS sale administration personnel), logging machinery, machinery maintenance equipment or fuel would be permitted to use a road during the seasonal restriction.
Include language in timber sale contract provision C[T]6.25# (Site Specific Protection Measures for Threatened, Endangered and Sensitive Species) defining this nest-centered seasonal restriction. The roads and sections of roads where the seasonal restriction is potentially applicable may be displayed on the sale area map(s). For purposes of identifying in the TS contract areas where logging operations are seasonally restricted, roads or road sections affected by this project design criteria may be shown on contract maps.

☑ Design Criteria for Protection of Newly Discovered Goshawk Nests and other critical TES Habitats/Sites Identified After the Award of the Timber Sale or other Treatment Contract: Pursuant to TS contract standard provision B[T]6.25 (Protection of Threatened, Endangered and Sensitive Species), upon discovery of a new goshawk nest location or other TES wildlife species nesting/breeding (or other essential) site, suspend any active logging or other contract operations underway in the immediate vicinity until a wildlife biologist assesses the situation and determines appropriate action(s) to take for protection of habitat or individual animals. Completion of the assessment and determination of appropriate action should typically occur within 3 working days of discovery.

Appropriate action(s) include(s): Imposition of a seasonal restriction to protect a TES species from disruption/harassment or habitat destruction; changes in timber marking (and included timber species or quantities) to protect or maintain existing habitat(s); or complete withdrawal of included timber within a specified protection area.
Size of Area: Typically, these actions would not be applied over an area larger than 40 acres (roughly equivalent to the area of a circle having a 750 foot radius or a square having 1320 foot sides).
Language in TS contract provision C [T] 8.24 (Termination) defines causes for contract termination in whole or in part.

☑ If a nesting boreal owl is identified, prohibit falling and skidding activities within 100 feet of the nest until July 15.

- TES Standard #7: "Where newly discovered threatened, endangered, proposed, or sensitive species habitat is identified, conduct an analysis to determine if any adjustments in the forest plan are needed."
  ☑ No 'newly discovered' TEPS habitat has been discovered in the project area, thus an analysis to determine if adjustments to the Forest Plan are needed is not necessary and no design criteria have been developed for this standard for this project.
- TES Standard #8: "Manage activities to avoid disturbance to sensitive species which would result in a trend toward federal listing or loss of population viability."

☑ Design Criteria to ensure consistency with this standard have been developed for this project.

- TES Standard #9: "Avoid disturbing threatened, endangered, and proposed species during breeding, young rearing, or at other times critical to survival by closing areas to activities. Exceptions may occur when animals are adapted to human activity, or the activities are not considered a threat."
  ☑ No TEP species other than the Canada lynx are anticipated to occur in the project area. The Canada lynx is addressed in the Biological Assessment developed for this project and that analysis concluded that no design criteria regarding closures of the project areas to operational associated to this project were necessary.

- TES Standard #10: "In forested ecosystems, maintain habitat effectiveness for deer and elk at 50% or greater, as measured at the Geographic Area scale."
  ☑ See *Appendix D,* Screening and Habitat Effectiveness

- TES Standard #11: "Restrict new developments, including new facilities, roads and trails, and concentrations of humans, within a one-mile sight distance of bighorn sheep lambing and mountain goat kidding areas if they would adversely impact lambing or kidding. Restrictions on activities are usually required from April 1 to June 30".
  ☑ There are no new developments proposed or concentrations of humans within a one-mile sight distance expected, thus design criteria to incorporate this standard are unnecessary for this project.

- TES Standard #12: "Prevent interaction between bighorn sheep and domestic sheep, where feasible."
  ☑ This project does not include livestock grazing; however clearing along roads could open travel corridors for the bighorn sheep, and/or domestic cattle and interaction then becomes possible. The respective Range Conservationist and Wildlife Biologist will incorporate site-specific design criteria and mitigations in conjunction with the local Colorado Division of Wildlife representative.

C. Management Area Prescriptions – wide. Refer to Table 2-1, LRMP for the Routt National Forest Management Area Prescriptions (MAP) table encompassing MAP totals.

2.2 Research Natural Areas (RNA)

- Standard #2: "Allow habitat manipulation only for the protection of threatened, endangered, and sensitive species or where it is necessary to perpetuate or restore natural conditions."

  ☑ Design Criteria should be followed as outlined in TES and Wildlife Standards, and only where it is necessary to perpetuate or restore natural conditions.

5.11 General Forest and Rangelands – Forest Vegetation Emphasis

- Guideline for Wildlife: Provide a big-game habitat effectiveness level of 60% or greater. Although the previous sentence provides a "guideline", this guideline should be managed as a standard as stated in TES Standard #10: "In forested ecosystems, maintain habitat effectiveness for deer and elk at 50% **or greater, as measured at the Geographic Area scale."**

☑ See *Appendix D*, Screening and Habitat Effectiveness.

5.13 Forest Products

- Standard - "Wherever available, retain live trees that are broken at the top, have mechanical damage or genetic defect, to replace snags. At a minimum, retain two live trees to replace each snag."
  ☑ Design Criteria to ensure consistency with this desired condition have been developed for this project.
- Guideline - "Retain snags in various conditions of decay and distribution. Select trees with a larger-than-average diameter for the stand, when available."
  ☑ Design Criteria to ensure consistency with this desired condition have been developed for this project.
- Guideline for Wildlife: Provide a big-game habitat effectiveness level of 50% or greater. Although the previous sentence provides a "guideline", this guideline should be managed as a standard as stated in TES Standard #10: "In forested ecosystems, maintain habitat effectiveness for deer and elk at 50% **or greater, as measured at the Geographic Area scale."** Exceptions exist within the 5.13 Geographic Area.
  ☑ See *Appendix D,* Screening and Habitat Effectiveness.

5.41 Deer and Elk Winter Range

- Guideline for Wildlife: In forested areas, provide a big-game habitat effectiveness level of 70% or greater. Although the previous sentence provides a "guideline", this guideline should be managed as a standard as stated in TES Standard #10: "In forested ecosystems, maintain habitat effectiveness for deer and elk at 50% **or greater, as measured at the Geographic Area scale."**

  ☑ See *Appendix D*, Screening and Habitat Effectiveness.

D. Geographic Area – wide

- Guideline for Late Successional Forests: "In Management Areas 5.13, Forest Products, late successional habitats should be provided and well distributed so that individuals of species requiring those habitats can interact with others in the planning area.

  Applicable to the following Geographic Areas: Arapahoe Creek, Corral Peaks, Encampment River, Owl Mountain, Pinkham Mountain, Willow Creek, Little Snake, Sand Mountain, Slater Creek, Upper Elk River, Gore, Red Dirt

  ☑ Design Criteria for Conservation of Old-growth Lodgepole Pine (to maintain structural diversity on the landscape by conserving the oldest age classes of lodgepole pine. Typically, the more diverse the structural features available, the greater the opportunity for increased numbers, mixes, and kinds of habitat niches and wildlife species. Sensitive wildlife species such as marten, three-toed woodpecker, goshawk and boreal owl are likely to benefit near and long term):, Retain all old-growth lodgepole pine trees not infested (at the time of timber marking) with MPB. Old-growth pines can be identified by their structural conformation (Mehl 1992, p. 111), which is reflective of advanced age (150+

years old). Trees over 150 years old typically have boles, crowns and individual limbs that are distinctive from trees of lesser age (second growth). However, tree diameter at breast height might not be substantially larger than nearby second growth (especially wolf) trees, so care in identification is needed.

Usually, old-growth pines have boles that are free of live branches on the lower half of the tree. In addition, crowns are sparse and have flattened tops or are otherwise misshapen. Frequently, too, most live limbs are clustered toward the top of the tree and/or the crown is lop-sided. Moreover, individual limbs have diameters that are unusually large, compared to second growth trees, and/or fewer branches occur at each whorl than would be expected (1 to 3 vs. 3 to 6) such that the crown has a more "open" appearance. Often, mistletoe, rust or stem decay is present and contributes to tree/stand decadence (Mehl 1992).
Live old-growth trees do not necessarily need to be reserved by marking (painting) each tree but their retention must be unequivocally clear to loggers during harvesting. However, marking of old-growth pines within units is encouraged to fulfill live character tree retention requirements.

- Guideline for Wildlife: "In Management Areas 5.13 for this Geographic Area, habitat effectiveness in forested ecosystems will be maintained at 60% or greater. Although the previous sentence provides a "guideline", this guideline should be managed as a standard as stated in TES Standard #10: "In forested ecosystems, maintain habitat effectiveness for deer and elk at 50% **or greater, as measured at the Geographic Area scale."**
  Applicable to the following Geographic Areas: Owl Mountain, Willow Creek, Gore
  ☑ See *Appendix D*, Screening and Habitat Effectiveness.

With the incorporation of these design features, the project is consistent with the Forest Plan.

APPENDIX C- BIRD & MAMMAL LIFE HISTORY & HABITAT PROFILES

BIRDS

northern goshawk (*Accipiter gentilis*)

Listing Status: USFWS: None FS Region 2: Sensitive Colorado State: None

Migratory Status: Breeding season resident (some goshawks may be permanent residents in their breeding habitat or they may migrate short distances and to lower elevations for winter -- Squires and Reynolds 1997).

Cover Type(s)/Special Environ(s)[1/] Where the Species is Found: SF, LPP, AS, RIP

Habitat: This accipiter inhabits live mature or old-growth coniferous and mixed conifer/aspen forests, having relatively high canopy closure, often in association with small, interspersed openings or wetlands (DeGraff *et al.* 1991, Squires and Reynolds 1997, Kingery 1998). Preferred habitat near the nest is older, tall forests with an open understory where these fast birds can maneuver under the canopy (Squires and Reynolds 1997, Kingery 1998, Kennedy 2003).

Food Habits/Diet: Goshawks are saltatory (stop-and-go) predators that hunt from perches in the lower forest canopy (Squires and Reynolds 1997, Kennedy 2003). Their diet consists mostly of birds including corvids, woodpeckers, thrushes, grouse, finches, quail, sparrows, owls, doves, ducks and smaller hawks (Squires and Reynolds 1997, Squires 2000, Kennedy 2003). One-third or (sometimes substantially) more of their food intake, however, is comprised of mammals such as sciurids (including tree squirrels, ground squirrels and chipmunks), rabbits, mice, weasels (*Mustela* spp.), shrews (*Sorex* spp.), marten, muskrat (*Ondatra zibethicus*) and deer (*Odocoileus* spp.) carrion (Squires and Reynolds 1997, Squires 2000, Kennedy 2003). Insects, including grasshoppers and caterpillars, are also eaten (DeGraff *et al.* 1991). They launch to pursue their prey at tremendous speed over short distances (Kingery 1998). Their avian quarry is often chased and subdued within openings. These birds have evolved to maneuver adroitly in pursuit of their prey, especially while going after birds within forest (Squires and Reynolds 1997).

Reproduction: In the northern Colorado Rocky Mountains, goshawks frequently nest in mature lodgepole pine and aspen trees (Kingery 1998, unpublished data on file) where they build large stick nests placed close to the tree bole. On the Routt NF, some pairs have been found nesting in subalpine fir trees as well. Nest stands are typically 30 acres in size and may include 1 to 8 nests (Reynolds *et al.* 1992). The nest stand consists of mature, large-to-very-large trees where the overhead canopy cover is (generally) in excess of 60% and the understory is open (Squires and Reynolds 1997, Kennedy 2003). Goshawks may have a low tolerance for disruption and commotion, associated with forest management activities or other human intrusions, near their nest (Squires and Reynolds 1997). Prolonged interference or human presence near a nest (within 50 to 100 meters) can cause nest failure, especially during incubation (Finch 1992, Squires and Reynolds 1997, Kennedy 2003). Breeding activities are typically initiated in March. Egg-laying usually occurs between late April and early May (Squires and Reynolds 1997). The average clutch size is 2 to 4 eggs but ranges from 1 to 5 (Squires and Reynolds 1997). Incubation lasts approximately 28 to 38 days and is primarily done by the female (Ehrlich *et al.* 1988, Squires and Reynolds 1997). Hatching is asynchronous and generally occurs in late May, June or early July (Squires and Reynolds 1997, Kingery 1998). Nestlings remain in the nest for about 35 to 45 days (Ehrlich *et al.* 1988, Kingery 1998). Fledging usually occurs in July or early August and the young are dependent on their parents for approximately 5 to 6 weeks (Ehrlich *et al.* 1988, Squires and Reynolds 1997). The post-fledging family area (PFA) occupies 300 to 600 acres (mean = 415 acres) surrounding the nest. A PFA is defined as the area used by adult and young

goshawks from the time the young leave the nest until they are no longer dependent on the adults for food (Reynolds *et al.* 1992).

Species Occurrence and Abundance: The following species occurrence and abundance information was obtained from the Natural Diversity Information Source project (Species Occurrence and Abundance Tool 2008) for each county that overlaps with the Routt National Forest.

	Garfield County	**Grand County**	**Jackson County**	**Moffat County**	**Rio Blanco County**	**Routt County**
Occurrence Classification	Known to Occur	Known to Occur	Known to Occur	Known to Occur	Known to Occur	Known to Occur
Abundance Classification	Rare	Rare	Rare	Rare	Rare	Rare

Occurrence/Detections on or near the Routt NF Since 1980: Over 60 goshawk nesting territories have been located on the Routt National Forest.

References:

DeGraff R.M., V.E. Scott, R.H. Hamre, L. Ernst and S.H. Anderson. 1991. Forest and rangeland birds of the United States: natural history and habitat use. USDA Forest Service. Agriculture Handbook 688. 625 pp.

Ehrlich, P.R., D.S. Dobkin and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon and Schuster, Inc. New York, NY. 785 pp.

Finch, D.M. 1992. Threatened, endangered, and vulnerable species of terrestrial vertebrates in the Rocky Mountain Region. General Technical Report RM-215. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 38 pp.

Kennedy, P.L. 2003. Northern goshawk (*Accipiter gentilis atricapillus*): A technical conservation assessment. USDA Forest Service, Rocky Mountain Region. xi + 189 pp.

Kingery, H. E. (ed.) 1998. Colorado breeding bird atlas. Colorado Bird Atlas Partnership. Denver, CO. 636 pp.

Reynolds, R.T., R.T. Graham, M.H. Reiser, R.L. Bassett, P.L. Kennedy, D.A. Boyce, Jr., G. Goodwin, R. Smith and E.L.Fisher. 1992. Management recommendations for the northern goshawk in the southwestern United States. General Technical Report RM-217. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station and Southwestern Region. Fort Collins, CO. 90 pp.

Squires, J.R. and R.T Reynolds. 1997. Northern goshawk (Accipiter gentilis). In: Poole, A. and F. Gill (eds.), The birds of North America, No. 298. The Academy of Natural Sciences, Philadelphia, PA, and American Ornithologists' Union, Washington, DC, USA.

Squires, J.R. 2000. Food habits of northern goshawks nesting in south central Wyoming. Wilson Bulletin. 112:536-539.

Species Occurrence and Abundance Tool. 2008. [web application: Homepage of (Colorado) Natural Diversity Information Source, Wildlife Species Page, Species Occurrence Tool]. Available Online: http://www.ndis.nrel.colostate.edu/wildlife.asp [Accessed: January 21, 2008].

boreal owl (*Aegolius funereus*)

Listing Status: USFWS: None FS Region 2: Sensitive Colorado State: None

Migratory Status: Permanent resident

Cover Type(s)/Special Environ(s)[1/] Where the Species is Found: SF, LPP, AS, WET

Habitat: The boreal owl is associated with relatively inaccessible tracts of high-elevation coniferous forest, especially mature to old-growth spruce and fir (Reynolds *et al*. 1989) at elevations above 9000 feet near openings or wet meadows (Kingery 1998). This owl uses similar habitat during all seasons (Hayward 1994).

Food Habits/Diet: These owls can be classified as "sit-and-wait" predators or searchers; they usually attack prey within 35 feet of their perch and their primary diet is nocturnal rodents (Hayward 1994). Usual prey species are red-backed voles (*Clethrionomys gapperi*), meadow voles (*Microtus* and *Phenacomys* spp.), deer mice (*Peromyscus* spp.), shrews (*Sorex* spp.) and northern pocket gophers (*Thomomys talpoides*). Weasels (*Mustela* spp.), juvenile snowshoe hares and bushy-tailed woodrats (*Neotoma cincerea*) represent unusual prey (Hayward 1994). During the breeding season or food shortages, daytime creatures such as squirrels, chipmunks, pikas, and a variety of small birds may be taken; prey such as frogs, salamanders, small snakes, lizards and even crickets may be eaten occasionally as well (DeGraff *et al.* 1991, Hayward 1994). Food may be cached in crevices, tree forks, *etc.* (Ehrlich *et al.* 1988, Fisher 1997, Hayward 1994). Many forest types and edges are used for hunting; in Idaho and Colorado, though, foraging observations suggest mature and older spruce/fir forest may be especially important (Hayward 1994).

Reproduction: Boreal owls use mixed stands of live mature or old-growth forest for nesting; structural complexity appears to be a necessary factor. This owl is an obligate secondary cavity nester and relies exclusively on natural cavities, woodpecker holes or artificial cavity structures for nest sites (DeGraff *et al.* 1991, Hayward 1994). Nests have been located in a variety of conifers, although lodgepole seems little used, and are common in aspen. This little owl prefers abandoned flicker cavities (DeGraff *et al.* 1991). Boreal owl populations are likely limited in portions of their range by available nesting cavities (Hayward 1994). Clutch size varies in relation to environmental conditions but typically falls between 2 to 6 eggs with laying in Colorado ranging from mid-April to June 1 (Hayward 1994). Brooding is performed exclusively by the female and young hatch asynchronously (Ehrlich *et al.* 1988, Hayward 1994). Fledging occurs about 32 days (ranging from 26 to 36 days) following hatching (Ehrlich *et al.* 1988, Fisher 1997, Hayward 1994).

Species Occurrence and Abundance: The following species occurrence and abundance information was obtained from the Natural Diversity Information Source project (Species

Occurrence and Abundance Tool 2008) for each county that overlaps with the Routt National Forest.

	Garfield County	Grand County	Jackson County	Moffat County	Rio Blanco County	Routt County
Occurrence Classification	Known to Occur	Known to Occur	Known to Occur	No info.	No info.	Known to Occur
Abundance Classification	Rare	Rare	Uncommon	No info.	No info.	Unknown

Occurrence/Detections on or near the Routt NF Since 1980: Several boreal owls have been documented nesting on the Forest. Most recent nesting detections have occurred at artificial nest boxes specifically installed to supplement natural cavity habitat. These owls appear to be holding their own in both distribution and abundance on the Forest.

References:

DeGraff R.M., V.E. Scott, R.H. Hamre, L. Ernst and S.H. Anderson. 1991. Forest and rangeland birds of the United States: natural history and habitat use. USDA Forest Service. Agriculture Handbook 688. 625 pp.

Ehrlich, P.R., D.S. Dobkin and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon and Schuster, Inc. New York, NY. 785 pp.

Fisher, C.C. 1997. Birds of the Rocky Mountains. Lone Pine Publishing. Edmonton, AB (Canada). 336 pp.

Hayward, G.D. 1994. Chapter 9, Review of technical knowledge: boreal owls. Pages 92-127 *In:* Hayward, G.D and J. Verner (tech. eds.), Flammulated, boreal, and great gray owls in the United States: A technical conservation assessment. General Technical Report RM-253. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 214 pp. 3 Maps.

Kingery, H. E. (ed.) 1998. Colorado breeding bird atlas. Colorado Bird Atlas Partnership. Denver, CO. 636 pp.

Reynolds, R. T., R. A. Ryder and B. D. Linhart. 1989. Small forest owls. Pages 134-143 *In* B.G. Pendleton, C.E. Euibal, D.L. Krahe, K. Steenhof, M.N. Kochert and M.N. LeFranc, Jr. (eds.), Proceedings of the western raptor management symposium and workshop, Boise, ID. Natl. Wildl. Fed. Sci. and Tech. Ser. 12.

Species Occurrence and Abundance Tool. 2008. [web application: Homepage of (Colorado) Natural Diversity Information Source, Wildlife Species Page, Species Occurrence Tool]. Available Online: http://www.ndis.nrel.colostate.edu/wildlife.asp [Accessed: January 21, 2008].

(northern) three-toed woodpecker (*Picoides tridactylus*)

Listing Status: USFWS: None FS Region 2: Sensitive Colorado State: None

Migratory Status: Permanent resident

Cover Type(s)/Special Environ(s)[1/] Where the Species is Found: SF, LPP, AS

Habitat: In Colorado and southern Wyoming, the three-toed woodpecker is primarily a denizen of older spruce/fir forests (Kingery 1998, Loose and Anderson 1995). However, this woodpecker is heavily dependent upon a continuous supply of dead and dying conifers, in various stages of decay, in any habitat where it lives. Dead and dying trees are essential for nesting, foraging, drumming and roosting (Bull and Wales 2001, DeGraff *et al.* 1991, Goggans *et al.* 1988, Kingery 1998). While three-toeds in Colorado generally stay in the spruce/fir zone, they "occasionally move en masse to burns and insect infestations (Kingery 1998)." Disturbance events in spruce/fir and lodgepole pine forests provide the best possible conditions for these birds to survive and reproduce (Bull and Wales 2001, DeGraff *et al.* 1991, Fisher 1997). Indeed, three-toed woodpeckers thrive when fires, windstorms, insects or diseases ravage a forest and may reach their highest population densities in areas (such as burns) of substantial tree mortality (Kingery 1998, Koplin 1969, Murphy and Lehnhausen 1998).

Food Habits/Diet: Foraging occurs during daylight hours in areas with dying and dead beetle-infested trees. This woodpecker feeds almost exclusively on adult and larval phloem-boring scolytid (family Scolytidae) beetles found beneath tree bark (Goggans *et al.* 1988, Koplin 1969, Murphy and Lehnhausen 1998, Stallcup 1962); indeed, abundance of the three-toed in Colorado "correlates with abundance of spruce bark beetles (Ehrlich *et al.* 1988)." It extracts insects by surface pecking, bark scaling and drilling (excavating) into the cambium layer of infested trees (DeGraff *et al.* 1991, Murphy and Lehnhausen 1998). In one Colorado study, the three-toed was found to consume spruce beetles for 65 percent of its annual diet and 99 percent of its winter diet (DeGraff *et al.* 1991, Massey and Wygant 1973). The three-toed also occasionally eats the larvae of other wood-boring beetles (families Buprestidae, Cerambycidae and Pythidae) as well as ants, berries and caterpillars (DeGraff *et al.* 1991, Fisher 1997, Massey and Wygant 1973, Stallcup 1962).

Reproduction: A new nest cavity is excavated each year in a dead tree or a live tree with decayed heartwood (DeGraff *et al.* 1991, Goggans *et al.* 1988, Miller *et al.* 1979). Tree boles at least 10 inches in diameter are needed for cavity excavation and nest holes are usually located 5 to 45 feet above the ground (DeGraff *et al.* 1991, Goggans *et al.* 1988). Average clutch size is 2 to 6 eggs with 4 eggs laid most commonly (Ehrlich *et al.* 1988, Kingery 1998). Incubation lasts 11 to 14 days with both the male and female assuming brooding duties. Fledging occurs 22 to 26 days following hatching (Ehrlich *et al.* 1988, Kingery 1998). Fledglings remain dependent on their parents for another month (Kingery 1998).

Species Occurrence and Abundance: The following species occurrence and abundance information was obtained from the Natural Diversity Information Source project (Species Occurrence and Abundance Tool 2008) for each county that overlaps with the Routt National Forest.

	Garfield County	**Grand County**	**Jackson County**	**Moffat County**	**Rio Blanco County**	**Routt County**
Occurrence	Known to Occur	Known to Occur	Known to Occur	Known to Occur	Known to Occur	Known to Occur

Classification Abundance Classification	Uncommon	Uncommon	Rare	Rare	Rare	Uncommon

Occurrence/Detections on or near the Routt NF Since 1980: Sightings of this woodpecker are reported periodically across the Forest.

References:

Bull, E.L. and B.C. Wales. 2001. Effects of disturbance on birds of conservation concern in eastern Oregon and Washington. Northwest Science. Vol. 75, Special Issue. pp. 166-173.

DeGraff, R. M., V. E. Scott, R. H. Hamre, L. Ernst and S. H. Anderson. 1991. Forest and rangeland birds of the United States: natural history and habitat use. USDA Forest Service. Agriculture Handbook 688. 625 pp.

Ehrlich, P.R., D.S. Dobkin and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon and Schuster, Inc. New York, NY. 785 pp.

Fisher, C.C. 1997. Birds of the Rocky Mountains. Lone Pine Publishing. Edmonton, AB (Canada). 336 pp.

Goggans, R., R.D. Dixon and L.C. Seminara. 1988. Habitat use by three-toed and black-backed woodpeckers, Deschutes National Forest, Oregon. Nongame Report 87-3-02. Oregon Department of Fish and Wildlife. Bend, OR. xvii + 49 pp.

Kingery, H. E. (ed.) 1998. Colorado breeding bird atlas. Colorado Bird Atlas Partnership. Denver, CO. 636 pp.

Koplin, J.R. 1969. The numerical response of woodpeckers to insect prey in a subalpine forest in Colorado. Condor. 71:436-438.

Loose, S.S. and S.H. Anderson. 1995. Woodpecker habitat use in the forests of southeast Wyoming. Journal of Field Ornithology. 66(4):503-514.

Massey, C.L. and N.D. Wygant. 1973. Woodpeckers: Most important predator of the spruce beetle. Colorado Field Ornithologist. 16:4-8.

Miller, E., A.T. Partridge and E.L. Bull. 1979. The relationship of primary cavity nesters and decay. Transactions of the Northeastern Section, The Wildlife Society (presented at the 36th Northeast fish and wildlife conference, April 1-4, 1979). 36:60-68.

Murphy, E.C. and W.A. Lehnhausen. 1998. Density and foraging ecology of woodpeckers following a stand-replacement fire. Journal of Wildlife Management. 62(4): 1359-1372.

Species Occurrence and Abundance Tool. 2008. [web application: Homepage of (Colorado) Natural Diversity Information Source, Wildlife Species Page, Species Occurrence Tool]. Available Online: http://www.ndis.nrel.colostate.edu/wildlife.asp [Accessed: January 21, 2008].

Stallcup, P.L. 1962. Contents of 103 stomachs of northern three-toed woodpecker. Journal of the Colorado-Wyoming Academy of Science. 5:39.

olive-sided flycatcher (*Contopus cooperi* [formerly *borealis*])

Listing Status: USFWS: None FS Region 2: Sensitive Colorado State: None

Migratory Status: Neotropical migrant, breeding season resident

Cover Type(s)/Special Environ(s)[1/] Where the Species is Found: SF, LPP, AS, RIP, WM, WET, WC

Habitat: This flycatcher is associated with montane coniferous forests and riparian wetlands, often with aspen nearby, up to 10,000 feet in elevation (DeGraff *et al.* 1991, Fisher 1997, Kingery 1998, Altman and Sallabanks 2000). They prefer forest edges next to openings, either natural or human-created, and tend to increase in numbers as canopy cover decreases (Altman and Sallabanks 2000, Kotliar *et al.* 2002). Tall snags, high conspicuous dead branches and dead-topped live trees along fens or wet meadows are used extensively for foraging perches as well as for singing (DeGraff *et al.* 1991, Kingery 1998, Altman and Sallabanks 2000). These birds are often found in and benefit from clearcuts or selection cuts so long as some snags are left for perching (Franzreb 1977, Kingery 1998, Altman and Sallabanks 2000). Olive-sided flycatchers can be one of the most abundant bird species in post-fire communities, and may reach their highest abundance in burn areas, especially at the edge of a burn where mature forest adjoins (DeGraff *et al.* 1991, Hutto 1995, Kingery 1998, Kotliar *et al.* 2002).

Food Habits/Diet: Arrival on breeding grounds in Colorado is generally late spring and has been attributed to a higher abundance of their primary diet source, flying insects. Hawking their flying prey dictates the association with snags or other exposed open-view perches (Kingery 1998). These birds feed almost exclusively by scanning from a fixed perch for flying insects, especially bees, wasps, flies, flying ants, butterflies, grasshoppers and dragonflies (Ehrlich *et al.* 1988, Kingery 1998, Altman and Sallabanks 2000). As a passive sit-and-wait predator, olive-sided flycatchers remain perched until prey is sighted and then sally out to snatch a flying insect in mid-air (Altman and Sallabanks 2000).

Reproduction: These neotropical migrants usually arrive in May and breeding behavior begins late in the month. Three to 4 eggs are laid from mid-June through July and are incubated for 14 to 17 days. Hatching usually occurs in July with fledging occurring 15 to 23 days thereafter (Ehrlich *et al.* 1988, Kingery 1998). The shallow cup nest, made of twigs, rootlets, lichens, cobwebs, grasses and mosses, is hidden in foliage on the distal end of a horizontal conifer branch, usually between 5 and 75 feet above the ground (Ehrlich *et al.* 1988, DeGraff *et al.* 1991, Kingery 1998, Altman and Sallabanks 2000).

Species Occurrence and Abundance: The following species occurrence and abundance information was obtained from the Natural Diversity Information Source project (Species Occurrence and Abundance Tool 2008) for each county that overlaps with the Routt National Forest.

	Garfield County	**Grand County**	**Jackson County**	**Moffat County**	**Rio Blanco County**	**Routt County**
Occurrence	Known to Occur	Known to Occur	Known to Occur	Known to Occur	Known to Occur	Known to Occur

Classification Abundance Classification	Uncommon	Uncommon	Uncommon	Uncommon	Uncommon	Uncommon

Occurrence/Detections on or near the Routt NF Since 1980: These birds are relatively common in suitable habitat on the Forest, although their distribution across the landscape is irregular. Observations of olive-sided flycatchers are typically repeated year after year at known breeding sites.

References:

Altman, B. and R. Sallabanks. 2000. Olive-sided flycatcher (Contopus cooperi), No. 502. In: Poole, A. and F. Gill (eds.), The birds of North America. Cornell Laboratory of Ornithology, Ithaca, NY, and The Academy of Natural Sciences, Philadelphia, PA. 27 pp.

DeGraff, R. M., V. E. Scott, R. H. Hamre, L. Ernst and S. H. Anderson. 1991. Forest and rangeland birds of the United States: natural history and habitat use. USDA Forest Service. Agriculture Handbook 688. 625 pp.

Ehrlich, P.R., D.S. Dobkin and D. Wheye. 1988. The birder's handbook: a field guide to the natural history of North American birds. Simon and Schuster, Inc. New York, NY. 785 pp.

Fisher, C.C. 1997. Birds of the Rocky Mountains. Lone Pine Publishing. Edmonton, AB (Canada). 336 pp.

Franzreb, K.E. 1977. Bird population changes after timber harvesting of a mixed conifer forest in Arizona. Res. Pap. RM-184. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 26 pp.

Hutto, R.L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology. 9(5): 1041-1058.

Kingery, H. E. (ed.) 1998. Colorado breeding bird atlas. Colorado Bird Atlas Partnership. Denver, CO. 636 pp.

Kotliar, N.B., S. Hejl, R.L. Hutto, V.A. Saab, C.P. Melcher and M.E. McFadzen. 2002. Effects of fire and postfire salvage logging on avian communities in conifer-dominated forests of the western United States. Studies in Avian Biology. 25: 49-64.

Species Occurrence and Abundance Tool. 2008. [web application: Homepage of (Colorado) Natural Diversity Information Source, Wildlife Species Page, Species Occurrence Tool]. Available Online: http://www.ndis.nrel.colostate.edu/wildlife.asp [Accessed: January 21, 2008].

MAMMALS

pygmy (pigmy) shrew (*Sorex* [formerly *Microsorex*] *hoyi montanus*)

Listing Status: USFWS: None FS Region 2: Sensitive Colorado State: None

Migratory Status: Permanent resident.

Cover Type(s)/Special Environ(s)[1/] Where the Species is Found: SF, LPP, WM, WC, WET, RIP

Habitat: Pygmy shrews occupy wetland/forest edges where damp, Engelmann spruce/subalpine fir and lodgepole pine forests are next to or growing amid fens, moist meadows, marshes and other wet areas at high elevation (Brown 1966, Brown 1967, DeMott and Lindsey 1975). Spencer and Pettus (1966) captured pygmy shrews at 9500 to 9800 feet elevation in Larimer County, CO, in an extensively glaciated montane area with relatively gentle relief. They suggest these animals are closely tied to forest adjacent to marsh and that the ecotone between the 2 habitat types may be a habitat requirement. Forest floor and wetland plants that in combination may be indicators of pygmy shrew habitat include huckleberry (*Vaccinium* spp.), willow (*Salix* spp.), sedge (*Carex* spp.), reedgrass (*Calamagrostis* spp.) and sphagnum moss (*Sphagnum* spp.) when they are found growing in close association with mature or older lodgepole pine and spruce/fir trees (Brown 1966, Spencer and Pettus 1966, Brown 1967, Long 1972). At times, this shrew is apparently found in dryer habitats, such as a clearcut opening or dry meadow, but usually 100 yards or so from water (Spencer and Pettus 1966, Vaughan 1969, Long 1972).

Food Habits/Diet: As with other shrews, the pygmy shrew probably eats 1 to 3 times its own weight daily (Prince 1940, Fitzgerald *et al.* 1994, Fisher *et al.* 2000). Feeding areas consist of well-interspersed wet and dry sites to assure an adequate prey base for this shrew (Hoover and Willis 1984). Prey consists almost entirely of arthropods, especially larval and adult insects and arachnids, or other invertebrates (annelids, mollusks, diplopods) but vertebrate carrion is also consumed (Saunders 1929, Prince 1940, Long 1974, Fitzgerald *et al.* 1994, Fisher *et al.* 2000). These shrews likely cache excess food near their den (Saunders 1929).

Reproduction: Breeding takes place in warmer months (Fitzgerald *et al.* 1994), probably from May through July (Fisher *et al.* 2000). Some have suggested that the pygmy shrew has several litters each year but it is more likely females generally have only one litter annually (Long 1972, Fitzgerald *et al.* 1994). Parturition likely occurs in June, July and August; average litter size is probably 4 to 8 young (Long 1972, Fisher *et al.* 2000).

Species Occurrence and Abundance: The following species occurrence and abundance information was obtained from the Natural Diversity Information Source project (Species Occurrence and Abundance Tool 2008) for each county that overlaps with the Routt National Forest.

	Garfield County	**Grand County**	**Jackson County**	**Moffat County**	**Rio Blanco County**	**Routt County**
Occurrence Classification	No info.	Known to Occur	Known to Occur	No info.	No info.	No info.
Abundance Classification	No info.	Very Rare	Very Rare	No info.	No info.	No info.

Occurrence/Detections on or near the Routt NF Since 1980: None. However, 1 record confirms the pygmy shrew is an inhabitant of the RNF. Specimens were captured 3 miles southwest of Rabbit Ears Pass in western Grand County (at an elevation of 9900 feet) in the mid-1960's (Vaughan 1969). Additionally, a number of pygmy shrews were trapped

in the Coon Creek drainage (just north of the Routt NF in southern Carbon County, Wyoming) in the late 1980's and early 1990's (O'Doherty 2003).

References:

Brown, L.N. 1966. First record of the pigmy shrew in Wyoming and description of a new subspecies (Mammalia: Insectivora). Proceedings of the Biological Society, Washington. 79:49-52.

Brown, L. N. 1967. Ecological distribution of six species of shrews and comparisons of sampling methods in the central Rocky Mountains. J. of Mammalogy. 48(4): 617-623.

DeMott, S.L. and G.P. Lindsey. 1975. Pygmy shrew, *Microsorex hoyi*, in Gunnison County, Colorado. Southwestern Nat. 20:417-418.

Fisher, C., D. Pattie and T. Hartson. 2000. Mammals of the Rocky Mountains. Lone Pine Publishing. Edmonton, AB, Canada. 295 pp.

Fitzgerald, J.P., C.A. Meaney and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado. Niwot, CO. 467 pp.

Hoover, R. L. and D. L. Willis (eds.) 1984. Managing forested lands for wildlife. Colorado Division of Wildlife in cooperation with USDA Forest Service, Rocky Mountain Region. Denver, CO. 459 pp.

Long, C. A. 1972. Notes on habitat preferences and reproduction in pigmy shrews, *Microsorex.* The Canadian Field-Naturalist. Vol. 86: 155-160.

Long, C. A. 1974. *Microsorex hoyi* and *Microsorex thompsoni*. The American Society of Mammalogists. Mammalian Species. 33:1-4

O'Doherty, E. 2003. [Personal communications w/J. Wells in October and November regarding unpublished pygmy shrew trapping data collected during the Coon Creek Watershed Study]. Research Ecologist, USDA Forest Service, Rocky Mountain Research Station. Laramie, WY.

Prince, L.A. 1940. Notes on the habits of the pigmy shrew (Microsorex hoyi) in captivity. The Canadian Field-Naturalist. Vol. 54:97-100.

Saunders, P.B. 1929. *Microsorex hoyi* in captivity. J. of Mammalogy. 10:78-79.

Species Occurrence and Abundance Tool. 2008. [web application: Homepage of (Colorado) Natural Diversity Information Source, Wildlife Species Page, Species Occurrence Tool]. Available Online: http://www.ndis.nrel.colostate.edu/wildlife.asp [Accessed:January 21, 2008].

Spencer, A.W. and D. Pettus. 1966. Habitat preferences of five sympatric species of long-tailed shrews. Ecology. 47(4): 677-683.

Vaughan, T.A. 1969. Reproduction and population densities in a montane small mammal fauna. Pages 51-74 *In*: Jones Jr., J.K. (ed.), Contributions in mammalogy. Misc. Publication of the Museum of Natural History, University of Kansas. 51:1-428.

American (or pine) marten (*Martes americana*)

Listing Status: USFWS: None FS Region 2: Sensitive Colorado State: None

Migratory Status: Permanent resident

Cover Type(s)/Special Environ(s)[1/] Where the Species is Found: SF, LPP, AS, RIP

Habitat: Martens are usually associated with mesic, mature to overmature, Engelmann spruce (*Picea engelmannii*)/subalpine fir (*Abies lasiocarpa*), lodgepole pine (*Pinus contorta*) and mixed conifer/aspen forests (Yeager and Remington 1956, Fitzgerald *et al.* 1982, Fitzgerald *et al.* 1994, Buskirk and Powell 1994). Martens seem to prefer stands having abundant coarse woody debris with complex, heterogeneic physical structure near the ground (Buskirk and Powell 1994, Buskirk and Ruggiero 1994). Thus, martens are often linked with old-growth forests (Fitzgerald *et al.* 1994). These small predators tend to avoid habitats lacking substantial overhead cover (Hawley and Newby 1957, Buskirk and Powell 1994, Buskirk and Ruggiero 1994). However, exceptions to exclusive dependence on forests for overhead cover have been noted in the literature. One study in Colorado reported martens sometimes forage in rocky habitats above treeline ½ to 2 miles (0.8 to 3.2 km) from the nearest forest stand (Streeter and Braun 1968). Martens also have been documented in California hunting in talus and other kinds of rock fields at or above timberline (Grinnell *et al.* 1937). In areas without tree cover, rock jumbles with extensive interstitial space appear to provide a substitute for woody cover while offering sufficient security and prey for marten foraging (and perhaps other uses).

Food Habits/Diet: Marten feed primarily on small mammals, especially southern red-backed voles (*Clethrionomys gapperi*) or other mice and red squirrels (*Tamiasciurus hudsonicus*); however, marten also feed opportunistically on snowshoe hares (*Lepus americanus*), chipmunks (*Tamias* spp.), ground squirrels (*Spermophilus* spp.), pikas (*Ochotona princeps*), bird eggs and nestlings (including boreal owls), reptiles, fish, insects and berries (Fitzgerald *et al.* 1994, Buskirk and Ruggiero 1994). "[V]oles and other mice may constitute over 60 to 88 percent of the diet (Fitzgerald *et al.* 1994)." This mustelid captures prey primarily by engaging in terrestrial, subnivean or arboreal stalking and pursuit.

Reproduction: Breeding occurs from late June through early August but with delayed implantation of the embryo (diapause), the total gestation period is 260 to 275 days (Buskirk and Ruggiero 1994). Birth occurs in March and April. "Two types of dens are recognized in the literature: natal dens, in which parturition takes place, and maternal dens, which are occupied by the mother and young but, are not whelping sites (Buskirk and Ruggiero 1994)." Dens of either type are commonly located in: a live tree, log or snag hollow, areas of concentrated deadfall, rock jumbles or abandoned ground burrows (Fitzgerald *et al.* 1994, Buskirk and Ruggiero 1994). Litter size is typically 3 to 4 but can range from 1 to 6 young (Buskirk and Ruggiero 1994, Fisher *et al.* 2000).

Species Occurrence and Abundance: The following species occurrence and abundance information was obtained from the Natural Diversity Information Source project (Species Occurrence and Abundance Tool 2008) for each county that overlaps with the Routt National Forest.

	Garfield County	Grand County	Jackson County	Moffat County	Rio Blanco County	Routt County
Occurrence Classification	Known to Occur	Known to Occur	Known to Occur	No info.	Likely to Occur	Known to Occur
Abundance Classification	Common	Common	Unknown	No info.	Unknown	Common

Occurrence/Detections on or near the Routt NF Since 1980: Marten are routinely seen in suitable habitat and are recorded regularly in winter photographic bait station photos across the Forest.

References:

Buskirk, S.W. and R.A. Powell. 1994. Habitat ecology of fishers and American martens. Pages 283-296 *In:* Buskirk, S.W., A.S. Harestad and M.G. Raphael (comps. eds.). Martens, sables, and fishers: biology and conservation. Cornell Univ. Press. Ithaca, NY.

Buskirk, S.W. and L.F. Ruggiero. 1994. American marten. Pages 7-37 *In:* Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, L. J. Lyon and W. J. Ziellinski (tech. eds.), The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. General Technical Report RM-254. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 184 pp.

Fisher, C., D. Pattie and T. Hartson. 2000. Mammals of the Rocky Mountains. Lone Pine Publishing. Edmonton, AB, Canada. 295 pp.

Fitzgerald, J.P., D.M. Armstrong, J.C. Halfpenny, J. Freeman, B. Bauerle, and C. Tourtillott. 1982. Small mammals, furbearers, and small game mammals of northwestern Colorado: a review and synopsis of information. Prepared for the USDI Bureau of Land Management by the Northwest Colorado Wildlife Consortium. Univ. of Colorado. Boulder, CO. 290 pp.

Fitzgerald, J.P., C.A. Meaney and D.M. Armstrong. 1994. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado. Niwot, CO. 467 pp.

Grinnell, J., J. S. Dixon and J. M. Linsdale. 1937. Furbearing mammals of California. Vol. 1. Berkeley, CA. Univ. of California Press. 375 pp.

Hawley, V.D. and F.E. Newby. 1957. Marten home ranges and population fluctuations. Journal of Mammalogy. 38: 174-184.

Species Occurrence and Abundance Tool. 2008. [web application: Homepage of (Colorado) Natural Diversity Information Source, Wildlife Species Page, Species Occurrence Tool]. Available Online: http://www.ndis.nrel.colostate.edu/wildlife.asp [Accessed: January 21, 2008].

Streeter, R. G. and C. E. Braun. 1968. Occurrence of pine marten, *Martes americana* (Carnivora: Mustelidae) in Colorado alpine areas. Southwestern Naturalist. 13: 449-451.

Yeager, L.E. and J.D. Remington. 1956. Sight observations of Colorado martens, 1950-1955. Journal of Mammalogy. 37: 521-524.

[1/] **COVER TYPES:** **AL**=Alpine/Tundra, **SF=**Spruce/Fir, **AS**=Aspen, **LPP**=Lodgepole Pine,**PP**=Ponderosa Pine **PJ**=Pinyon/Juniper Woodland **GO=**Gambel Oak, **FM**=Forest Meadow **WM**=Wet Meadow **MS**=Mountain Shrubland,

SS=Shrub Steppe **WC**=Willow Carr **PR**=Prairie/Grassland
WET=Wetland/Marsh/Fen

SPECIAL ENVIRONS: RIP=Riparian, **AQ**=Lakes/Streams/Rivers, **RO**=Rock/Cliff/Cave/Mine

APPENDIX D – SCREENING AND HABITAT EFFECTIVENESS

Rocky Mountain elk (*Cervus canadensis*), and Mule deer (*Odocoileus hemionus*)

The Forest plan originally classified elk and deer as a management indicator species (MIS) due to its importance in Colorado as a hunted big game species, and identified that the, then, MIS species would be monitored as per the monitoring requirements 36CFR 219.19 (a) (6), as stated in the EIS pg. 3-122, using HABCAP model capability outputs as a baseline and Colorado Division of Wildlife (CDOW) population estimates. However elk and deer were removed as MIS with the 2007 decision of the *Environmental Assessment, Management Indicator Species Forest Plan Amendment to the Routt LRMP,*

1997 Revision. The rationale stating that "elk were originally selected as an economically important game species associated with the mature conifer, aspen, shrub, grass/forb, and lodgepole pine habitat complexes. Elk are very adaptable and populations have been steadily increasing despite new approaches by the Colorado Division of Wildlife to control the populations through hunting. Elk tend to move from public-land summer range to private-land winter range and can be impacted by changes in land use on private-land winter range. Intensive management has not significantly changed populations although some work has clarified the relationships between elk and open road densities (Ward et al. 1973, Bumstead 1975, Leege 1984). Elk populations may also be influenced by chronic wasting disease and are significantly influenced by hunter success (which can be largely driven by fall weather conditions). If chronic wasting disease becomes more prevalent, management of this species may be dictated largely by goals related to management of this disease. Because of the multiple factors influencing elk populations and their apparent lack of response (in regards to overall population numbers) to most land management actions on the Routt N.F., this species is recommended for removal from the existing MIS list. Other species may be more appropriate indicators, should management issues be identified in the mature conifer, aspen, shrub, grass/forb, or lodgepole pine habitat complexes; and, "the mule deer was originally selected as an economically important game species associated with the mature conifer, aspen, shrub, and grass/forb habitat complexes. Mule deer populations have been steadily increasing over the last several years. Mule deer tend to move from public-land summer range to private-land winter range and can be impacted by changes in land use on private-land winter range. Intensive management has not significantly changed populations and there is no clear relationship between primary Forest Service land management actions and deer populations. Mule deer populations may also be influenced by chronic wasting disease and hunter success (which can be largely driven by fall weather conditions). If chronic wasting disease becomes more prevalent, management of this species may be dictated largely by goals related to management of this disease. Because of the multiple factors influencing deer populations and their apparent lack of response (in regards to overall population numbers) to most Forest Service land management actions on the Routt N.F., the mule deer is recommended for removal from the existing MIS list. Other species may be more appropriate indicators, should management issues be identified in the mature conifer, aspen, shrub, and grass/forb habitat complexes.

Criteria for determining these two species are not appropriate as MIS include:

2. Species whose populations are significantly influenced by factors beyond the control of land managers.

5. Species that do not clearly respond to management actions.

Specific to the two bulleted points above is the continued existence of Chronic Wasting Disease. It is not yet known the toll that this disease will have on elk and deer; however Jeff Yost, CDOW Terrestrial Biologist stated that it is thought that at this time the impacts to population numbers are insignificant because prevalence across elk and deer analysis units have been documented to normally occur at a 1%-2% low occurrence range.

Elk and deer are identified in the LRMP Threatened, Endangered and Sensitive and Wildlife standards, page 1-14. It is these two standards, as stated below, that refer to Habitat Effectiveness (HE) as identified in the MIS monitoring requirements.

- TES Standard #3: "Provide adequate cover to maintain screening, through time, along roads where timber management activities are taking place to minimize disturbance and harassment of deer and elk".

- TES Standard #10: "In forested ecosystems, maintain habitat effectiveness for deer and elk at 50% or greater, as measured at the Geographic Area scale."

Elk use on the Forest within the analysis area occurs primarily in the spring, summer, and fall, with some use of south facing slopes at lower elevations as winter range during milder winters. Two primary components of effectiveness of elk habitat are hiding cover and road density. Hiding and escape cover provide security or a means of escape from the threat of predators or harassment (Skovlin 1982). The Forest Plan defines hiding cover as structural stages of vegetation (boles and foliage) capable of hiding 90% of a standing adult elk from human view at a distance equal to or less than 200 feet. Road density is simply the total miles of road per square mile. Because road density effects how elk will utilize potential habitat, it is used along with hiding cover as indices to measure elk habitat effectiveness. Habitat effectiveness is defined as the percent of usable habitat during the non-hunting season (USDA Forest Service 1998a). As road densities approach one mile per square mile in optimal elk habitat, potential elk habitat effectiveness will drop from 100% to 60%. The Forest Plan requires that habitat effectiveness for deer and elk be maintained at 50% or greater, as measured at the geographic area scale; 60% or greater in '5.11 General Forest and Rangeland' prescription areas; and 70% or greater in '5.41 Deer and Elk winter range' prescription areas. The current elk habitat effectiveness model is not designed to account for the effects of closed roads, so only open road and motorized trail densities were used to generate values. Several research studies have qualitatively demonstrated the negative effects of closed roads upon elk habitat effectiveness (Leege 1984; Bumstead 1975; Ward et.al. 1973). Closed roads are used by many recreational hikers, bicyclists, hunters, and for occasional administrative use. Human presence on closed roads has negative effects, and though not easily measured, should be strongly considered in situations where values produced by elk habitat effectiveness models are borderline when compared to Forest Plan Standards and Guidelines and State agency objectives.

The Colorado Division of Wildlife (CDOW) monitors elk and deer populations annually by monitoring hunter success and summer aerial surveys. CDOW, Yost, J. 2/4/08. Elk and deer are at high population levels across the analysis area. The Routt currently has the highest population of elk in the history of the forest. The Routt National Forest Elk Habitat effectiveness model indicates that many areas are currently below established standard or guideline. The model will not be used beyond general discussions relating to effects to elk habitat in the effects section because the established model is insufficient in evaluating effects to elk. The current elk and deer herd objective and current population in the Analysis Area is presented in the following table:

Elk and Deer Herd Objective and Current Population (by thousands)

ELK	E-2	E-3	E-6	E-7	E-8
Population Goal	18-22	4-5	28,5	4,4	2,7
Population Estimate	15-20	8	26	1,5-4,5	2,6
DEER	D-2	D-3	D-7	D-8	D-9
Population Goal	40	5,4-6,6	67,5	21,000	10,5
Population Estimate	36-45	6	90	25,921	10,5

There are many studies that indicate roadsides are less than suitable habitat for a variety of species as stated previously in this report.

It is my conclusion that although this project may have short term (direct) effects to elk and deer, long-term (direct or indirect) impacts from implementation of this project would be negligible. Direct and indirect effects would most likely be; short term displacement of elk and deer due to disturbance along roads, more growth in vegetation as canopy cover is removed stimulating understory growth and perhaps concentrating elk and deer in lush vegetation areas. It should also be noted that there are permanent and seasonal road closures in place to minimize disturbance in elk calving areas and winter range, mitigate travel management and provide for other areas of resource protection such as minimizing traffic on roads during spring thaw, that all serve to provide effective, quality habitat for elk and deer.