Introduction

This biological evaluation (BE) discloses the potential influences of the San Juan Public Lands Plan Revision on Forest Service Rocky Mountain Region (R2) sensitive species and Colorado BLM sensitive species. The list of R2 regional forester sensitive species was updated on June 4, 2007, and became effective on June 8, 2007. The list of BLM Sensitive Species for the San Juan Resource Area is based on the Colorado State Director's list approved in Information Bulletin No. CO-2000-014, and was last updated on April 14, 2000. One additional species not currently on the Forest Service or BLM lists – the bald eagle – is also included in this BE because it was officially removed from the list of federally-protected species under the Endangered Species Act on August 8, 2007. According to BLM and Forest Service policy, the bald eagle is automatically placed on the BLM and Region 2 Sensitive Species List, and will therefore be assessed as Sensitive on all lands administered by the San Juan Public Lands Center.

The FSM directs the Forest Service to develop and implement management practices to ensure that sensitive species do not become threatened or endangered because of Forest Service actions (FSM 2670.22). Sensitive species are those plant and animal species identified by a regional forester for which population viability is a concern as evidenced by a) significant current or predicted downward trends in population numbers or density or b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (FSM 2670.5).

The FSM directs the Forest Service to prepare biological evaluations for projects, as part of the National Environmental Policy Act of 1969, to determine the potential effects from those projects on sensitive species and to ensure that Forest Service actions do not contribute to loss of viability of threatened, endangered, proposed, or sensitive plant and animal species, or contribute to a trend towards federal listing of any species under the ESA (FSM 2672.41 and 2670.32). A biological evaluation is defined as a documented review of Forest Service programs or activities in sufficient detail to determine how an action or proposed action may affect any threatened, endangered, proposed, or sensitive species (FSM 2670.5).

The BLM Manual 6840 states that the conservation of special status species, which includes sensitive species, means using all methods and procedures which are necessary to improve the condition of special status species and their habitats to a point where their special status recognition is no longer warranted. The purpose is to ensure that actions requiring authorization or approval by the BLM are consistent with the conservation needs of special status species and do not contribute to the need to list any special status species, either under provisions of the ESA or other provisions.

Project Area

The project area is the San Juan Public Lands (SJPL) boundary, located in Southwest Colorado at the junction of the Southern Rockies and the Colorado Plateau ecoregions. The Colorado Plateau portion is characterized by sedimentary geology dominated by deep canyons and mesas. The Southern Rocky Mountains portion is characterized by mountains with mixed geology. Life zones represented in the planning area include Semi-Desert, Lower Montane, Upper Montane, Subalpine and Alpine.

The area encompasses about 700,000 acres of BLM land and 1,867,800 acres of USFS land, and includes lands in Archuleta, Conejos, Dolores, Hinsdale, La Plata, Mineral, Montezuma, Montrose, Rio Grande, San Juan, San Miguel counties. The west border of the planning area is the Utah state line. The southern border of the planning area is the New Mexico state line. The eastern border is the Continental divide. The northern border covers the administrative boundaries with the Rio Grande, Gunnison, Grand Mesa and Uncompahgre National Forests and the BLM Uncompahgre Field Office.

Project Description

The San Juan National Forest's Land Management Plan (1983) and portions of the BLM's San Juan/San Miguel Resource Management Plan (1985) are being revised jointly. Land use plans provide broad guidance and information needed for project and activity decision-making. This Plan will guide relevant resource management programs, practices, uses, and protection measures. The associated EIS examines potential environmental effects

that could occur as a result of implementing projects associated with the land use plan.

The key decisions made in this integrated plan for long-term management of SJPL are:

- Establishment of desired outcomes, including multiple-use goals and objectives
- Establishment of management requirements, including criteria that will be applied to guide day-to-day activities. These are primarily expressed as standards and guidelines and other design criteria.
- Establishment of management area direction, including identifying allowable uses, or allocations, restrictions, and prohibitions. All lands within the planning area are allocated to one of seven management areas, or zones, that reflect different levels of development and suitable uses or activities.
- Designation of suitable timber land and establishment of allowable sale quantity.
- Establishment of monitoring and evaluation requirements.

Alternatives

Four issues drove the development of four alternatives.

Issue 1. Balancing Management Between the Ideas of Maintaining "Working Forest and Rangelands" and Retaining "Core Undeveloped Areas"

Issue 2. Recreation and Travel Management

Issue 3. Management of Special Areas and Unique Landscapes

Issue 4. Oil and Gas Leasing and Development

The four alternatives are summarized below.

Alternative A (No-Action): Alternative A is the continuation of present management under the existing BLM and Forest Service plans. It meets the requirements of the National Environmental Policy Act that a no action alternative be considered. "No action" means that current management practices based on existing land use plans and other management decision documents would continue.

Alternative B: Alternative B represents a balance among the revision issues. This alternative provides a mix of multiple-use activities with a primary emphasis on maintaining most of the large, contiguous blocks of undeveloped lands and enhancing various forms of recreation opportunities, while maintaining the diversity of uses and active forest and rangeland vegetation management.

Alternative C: Alternative C provides a mix of multiple-use activities with primary emphasis on the undeveloped character of SJPL. Production of goods from vegetation management would continue but may be secondary to other non-commodity objectives. Production of goods and services would be slightly more constrained than in Alternatives A, B, and D, and in some cases and areas, uses would be excluded to protect sensitive resources.

Alternative D: Alternative D provides a mix of multiple-use activities with a primary emphasis on the working forest and rangelands to produce the highest amounts of commodity goods and services of the alternatives. This Alternative would allow the greatest extent of resource use within the planning area, while maintaining ecosystem management principles to protect and sustain resources.

The differences between the four alternatives and their potential implications to sensitive species can be analyzed by the different management areas they are associated with. Management areas outline uses and activities that may occur in them. All San Juan Public Lands have been allocated to one of eight management areas that range from areas where natural processes dominate and shape the landscape to areas that are intensely managed. In general, those alternatives that allow a higher level of management intensity may also require a higher level of management attention to the protection and maintenance of habitats for species that are sensitive to habitat alteration and/or human disturbances. A summary of the differences in management areas by alternative is displayed below.

Table BE-1: Acres of Management Areas by Alternative

Management Area	Alternative A No Action	Alternative B Preferred	*Alternative C*	*Alternative D*
1 Natural Processes Dominate	538,658	651,838	1,080,844	553,971
2 Special Areas & Unique Landscapes	98,973	191,805	195,979	149,250
3 Natural Landscapes w/ Limited Management	893,800	823,517	473,207	788,222
4 High Use Recreation Emphasis	148,465	79,634	54,773	86,248
5 Active Management	674,815	529,067	487,299	683,192
6 Public & Private Lands Intermix	N/A	82,858	73,031	90,218
7 Highly Developed Areas (ski areas and dams)	14,475	10,366	3,952	17,984
Total	**2,369,085**	**2,369,085**	**2,369,085**	**2,369,085**

Sensitive Species Considered and Evaluated

Table BE-2. Forest Service and BLM Sensitive Species and Habitat Associations for the San Juan Public Lands

Sensitive Species	Agency	Habitat Association or Vegetation Type
BIRDS		
American bittern *Botaurus lentiginosus*	FS	Marsh, swamp, or bog with cattails, rushes, grasses, and sedges
American peregrine falcon *Falco peregrinus anatum*	BLM and FS	Breeds on cliffs, often in association with riparian areas; regular breeder SJFO administrative unit
American three-toed woodpecker *Picoides dorsalis*	FS	Mature spruce-fir forests; post-fire areas, especially stand replacement events
Black swift *Cypseloides niger*	FS	Vertical rock faces near waterfalls or in dripping caves
Bald eagle *Haliaeetus americanus*	BLM and FS	Forested stands around aquatic settings
Black tern *Chlidonias niger*	BLM	Edges of bulrush and cattail marshes; not known to occur on SJFO administrative unit. Also R2 FS sensitive but does not occur on NFS lands within SJPL
Boreal owl *Aegolius funereus*	FS	Mature spruce-fir forests with high canopy closure
Brewer's sparrow *Spizella breweri*	FS	Primarily sagebrush but also in mixed shrublands (rabbitbrush, greasewood, etc.)
Columbian sharp-tailed grouse *Pediocetes phasianellus columbianus*	FS	Oak/serviceberry shrublands, often interspersed with sagebrush; aspen forests; irrigated pasture; recently reintroduced near Dolores, not expected for other units
Ferruginous hawk *Buteo regalis*	BLM and FS	Grasslands and semi-desert shrub; not known to breed but a regular winter resident on SJFO administrative unit
Flammulated owl *Otus flammeolus*	FS	Open ponderosa pine forests; dry montane conifer or aspen forests, often with dense saplings
Gunnison sage grouse *Centrocercus minimus*	BLM	Sagebrush grasslands; two small populations known to be resident on SJFO administrative unit. Also R2 FS sensitive; however, does not occur on NFS lands within SJPL.

Sensitive Species	Agency	Habitat Association or Vegetation Type
Lewis' woodpecker *Melanerpes lewis*	FS	Open ponderosa pine forest, riparian, and pinyon-juniper woodlands
Loggerhead shrike *Lanius ludovicianus*	FS	Lowland riparian, pinyon-juniper woodlands, semi-desert shrublands
Northern goshawk *Accipiter gentiles*	BLM and FS	Ponderosa pine, aspen, mixed-conifer, and spruce-fir forests
Northern harrier *Circus cyaneus*	FS	Grasslands, agricultural lands, mountain sagebrush, and marshes; requires abundant cover (same as for short-eared owl)
Olive-sided flycatcher *Contopus cooperi*	FS	Snags and conifers, often on steep slopes, open stands, and natural openings
Purple martin *Progne subis*	FS	Mature aspen stands near streams, springs, or ponds
Short-eared owl *Asio flammeus*	FS	Open habitats including grasslands, marsh edges, shrub-steppe, and agricultural lands; requires taller grass cover than northern harrier
Western burrowing owl *Athene cunicularia*	FS	Prairie dog colonies with vacant burrows; grasslands, shrublands, deserts
Western yellow-billed cuckoo *Coccyzus americanus*	BLM and FS	Riparian; gallery cottonwoods with dense understory
White-faced ibis *Plegadis chihi*	BLM	Spring/fall migrant only; wet meadows, marsh edges, and reservoir shorelines
White-tailed ptarmigan *Lagopus leucurus*	FS	Alpine tundra, especially with rock fields and willow carrs
INSECTS		
Nokomis fritillary butterfly *Speyeria Nokomis nokomis*	FS	Riparian; mostly tied to springs
FISH		
Bluehead sucker *Catostomus disobolus*	BLM and FS	Tributaries of the Colorado and San Juan rivers
Colorado River cutthroat trout *Oncorhynchus clarkii pleuriticus*	BLM and FS	Freshwater streams
Flannelmouth sucker *Catostomus latipinnis*	BLM and FS	Tributaries of the Colorado and San Juan rivers
Roundtail chub *Gila robusta)*	BLM and FS	Tributaries of the Colorado and San Juan rivers
MAMMALS		
Allen's big-eared bat *Idionycteris phyllotis*	BLM	Woodlands, mines, and caves
American marten *Martes Americana*	FS	Subalpine spruce-fir forests, alpine tundra, montane forests
Big free-tailed bat *Nyctinomops macrotis*	BLM	Rocky and canyon country
Fringed myotis *Myotis thysanodes pahasapensis*	BLM and FS	Pinyon-juniper and other coniferous woodlands
Gunnison's prairie dog *Cynomys gunnisoni*	FS	Grasslands and semidesert and montane shrublands
North American wolverine *Gulo gulo*	FS	Rare; boreal spruce-fir forest and tundra
River otter *Lontra Canadensis*	FS	Stream and river riparian
Rocky Mountain bighorn sheep *Ovis canadensis canadensis*	FS	
Spotted bat *Euderma maculatum*	BLM and FS	Pinyon-juniper, shrub desert, possibly riparian
Townsend's big-eared bat	BLM and FS	Abandoned mines and caves

Sensitive Species	Agency	Habitat Association or Vegetation Type
Corynorhinus townsendii		
Yuma myotis *Myotis yumanensis*	BLM	Pinyon-juniper, semi-desert and tied to riparian
REPTILES		
Desert spiny lizard *Sceloporus magister*	BLM	Shrub-covered dirt banks and sparsely vegetated rocky areas near flowing streams
Longnose leopard lizard *Gambelia wislizenii*	BLM	Shrublands with open ground
AMPHIBIANS		
Boreal toad *Bufo boreas boreas*	FS	Damp conditions; marshes, wet meadows, streams, ponds, lakes
Northern leopard frog *Rana pipiens*	FS	Water's edge; wet meadows, banks of marshes and ponds
PLANTS		
Astragulus naturitensis	BLM	Pinyon-juniper woodlands
Carex viridula	BLM	Riparian areas and wetlands
Cryptogramma stelleri	BLM	Riparian areas and wetlands
Ipomopsis polyantha	BLM and FS (L)	Mountain grasslands and mountain shrublands
Erigeron kachinensis	BLM	Riparian/wetland
Lesquerella pruinosa	BLM and FS	Mountain grasslands and mountain shrublands
Mimulus eastwoodiae	BLM	Riparian/wetland
Pediomelum aromaticum	BLM	Semi-desert shrublands and sagebrush shrublands
Eriophorum gracile	BLM (L) and FS (L)	Riparian/wetland
Salix serissima	FS (L)	Riparian/wetland
Astragalus missouriensis var. humistratus	FS	Pinyon-juniper woodlands, ponderosa pine forests
Astragalus proximus	FS	Ponderosa pine, pinyon-juniper, mountain shrubland
Calochortus flexuosus	FS (L)	Pinyon-juniper, semi-desert shrubland
Carex diandra	FS	Riparian/wetland
Cypripedium parviflorum	FS	Aspen, ponderosa pine
Draba smithii	FS	Mixed conifer, wetland
Drosera anglica	FS	Riparian/wetland
Epipactis gigantean	FS	Riparian/wetland
Eriophorum altaicum var. neogaeum	FS	Riparian/wetland
Eriophorum chamissonis	FS	Riparian/wetland
Gilia sedifolia	FS (L)	Alpine
Machaeranthera coloradoensis	FS	Alpine, spruce-fir
Parnassia kotzebuei	FS	Alpine
Physaria pulvinata	FS	Pinyon-juniper, semi-desert shrubland, sagebrush
Salix arizonica	FS (L)	Riparian/wetland
Salix candida	FS	Riparian/wetland
Sphagnum angustifolium	FS	Riparian/wetland
Triteleia grandiflora	FS	Ponderosa pine
Utricularia minor	FS	Riparian/wetland

L – No known occurrences, but likely to occur due to potential habitat.

Sensitive Species Evaluations

All sensitive species known to occur or suspected to have habitat on the San Juan Public Lands are evaluated below. They are grouped by Mammals, Birds, Insects, Amphibians, Reptiles, Fish, and Plants. This information is

based on the most current scientific information available including Species Assessments, Monitoring Plans, Conservation Assessments and Plans, and Recovery Plans.

Mammals

Allen's big-eared bat *(BLM Sensitive)*

a) Natural History and Background: Allen's big-eared bat (*Idionycteris phyllotis)* occurs in southwestern United States to central Mexico (Adams 2003). In the Rocky Mountain region, it occurs in southern Utah throughout most of Arizona and into southwestern New Mexico. Fitzgerald et al. (1994) mention Allen's big-eared as a species of probable occurrence in Colorado. The species has been reported in southeastern Utah from pinyon-juniper woodlands close to the Colorado border (Armstrong 1974 and Black 1970, cited in Fitzgerald et al. 1994). The animal can be expected in extreme southwestern Colorado (Fitzgerald et al. 1994). Known elevation is from about 1,100 to 3,255 meters (3,500-9,800 feet) (Fitzgerald et al. 1994).

The species has been reported on BLM lands near Dolores, Colorado where it has been detected using canyon habitat along the Dolores River (K. Nickell, pers. comm.). Preferred roosting habitat (crevices on rocky cliffs) is absent from the area, but exists on adjacent lands.

The biology of this species is poorly known. The species inhabits mountainous areas and is commonly found in pine-oak forested canyons and in coniferous forests. It has been found in low elevation ponderosa pine forests, pinyon-juniper woodlands, on occasion in high elevation white fir forests, in areas with narrow leaf cottonwood (Adams 2003). The species forms day roosts in rock crevices, caves, and mines and therefore typically prefers areas associated with cliffs, outcrops, boulder piles, or lava flows. Emergence from day roosts begins well after dark, and serial foraging takes place approximately 10 meters (33 feet) above the ground. Roosts may be shared with other species such as fringed myotis, and Townsend's big-eared bat. Allen's big-eared's use both aerial foraging and gleaning to hunt primarily small moths; however soldier beetles, dung beetles, leaf beetles, roaches, and flying ants also compose the diet.

Little is known about the reproductive biology of the species. Maternity roosts can occur in pine snags, on boulders beneath rock shelters, and in mine entrances (Adams 2003). A single young is born in June or July. Winter ecology of this species is also little known, but single individuals have been observed hibernating in northern Arizona in a cave within pinyon-juniper woodlands habitat (Hoffmeister 1986, cited in Adams 2003).

Maternity roosts appear to be the critical limiting factor (O'Farrel 2003). Use of abandoned mine tunnels put the bats at risk; abandoned mines are subject to closure or vandalism. It is critical that proper forest management provides sufficient roosts for this species. The rarity and patchy distribution of this species, as well as it apparent high degree of specialized feeding strategy compounds its sensitivity to disturbance (O'Farrel 2003). Disturbance to maternity roosts from June through July may be limiting.

b) Effects Analysis: Plan Revision activities that could potentially influence Allen's big-eared bat involve fluid minerals development and wildlife management (i.e. abandoned mine closures using bat gates).

Alternative A: No Action

Direct/Indirect Effects: Allen's big-eared bat has an echolocation call that is audible to humans. As such, individuals have been detected while foraging along the far western edge of BLM lands near the Utah border. It is possible that an individual will eventually be captured leading to documented occurrence of individuals in Colorado. It is also possible that a roost or maternity site will eventually be found in western Colorado and provide more insight on this species. To date, however, the species is extremely rare in Colorado with no breeding sites or important habitat elements found. Impacts to these areas are therefore unlikely and cannot be predicted or measured at this time.

In regards to activities that could potentially influence Allen's big-eared bat, Alternative A offers approximately 28,300 more acres that are open to leasing than any of the action alternatives. Alternative A also offers fewer protective lease stipulations than any of the action alternatives, with approximately 700,000 to 746,000 fewer lease acres stipulated with a No Surface Occupancy (NSO). Under the "no new lease" scenario only the existing lease areas have potential for development under this alternative resulting in fewer

acres of potential influence to the species. However, the extreme rarity of Allen's big-eared bat in Colorado suggests that measurable impacts to this species from fluid minerals activities are unlikely.

It is predicted in the Plan Revision that all alternatives will provide the same wildlife management actions in regards to mine closure gates for bats as opportunities arise. Thus, all alternatives install the same quantity and quality of mine closure bat gates over the life of the Plan. These closures are coordinated with the Colorado Division of Wildlife and the Department of Minerals and Geology and will provide undisturbed habitat for mine-associated bat species while also addressing human safety and health issues. Allen's big-eared bat could potentially benefit from such closures if they are ever located in Colorado. While other mine-associated bat species currently benefit from this program no benefits can yet be associated with Allen's big-eared bat.

Action Alternatives: Alternatives B-D

Direct/Indirect Effects: In regards to activities that could potentially influence Allen's big-eared bat, Alternative B, C and D offer approximately 28,300 fewer acres of potential oil and gas lease area than the no action. The action alternatives also offer greater protective lease stipulations, with approximately 746,000 more acres stipulated with a NSO in Alternatives B and C, and approximately 700,000 more acres in Alternative D. The fewer amounts of available lease acres and greater amount of protective lease stipulations suggest that fewer potential impacts to mine, rock, or cliff dwelling bats might be associated with the action alternatives. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species. As with Alternative A, however, the extreme rarity of this species in Colorado suggests that measurable impacts are unlikely and would not differ from the no action.

There is no difference among the Plan revision alternatives in regards to implementation of wildlife management activities that may provide bat gates on abandoned mines used by bat species. Although benefits to several bat species can be expected from these activities, no benefits to Allen's big-eared bat is expected because of its rarity.

Cumulative Effects: The Reasonable Foreseeable Development (RFD) scenario for fluid minerals development predicts that 166 future wells could be developed under Alternative A and, very similarly, 167 wells under all of the action alternatives. Most (136 to 137) of these would occur in the Paradox Basin area with another 30 in the San Juan Sag. Each well development could affect about 1.5 to 3 acres at well pads and other facilities, and involve linear openings along roads and utility corridors. Linear openings would be about 40 feet wide. All trees and other vegetation in these areas would be removed at well pads. In general, developments do not alter cliffs, rock rims, abandoned mines, and other steep sites that could potentially offer roost sites.

There have been approximately 2,300 CBM and conventional gas wells drilled within the cumulative-effects area in the past decade; 2,000 of those are within the boundaries of the Southern Ute Reservation (SUIT). CBM development within the grounds of the SUIT Reservation is expected to increase in the near future. Statistics taken from the SUIT EIS (BLM et al. 2002) indicate that an additional 1,300 conventional gas, CBM methane, and injection wells could be drilled within the bounds of the Reservation over the 25-year life of the project. Activities on SUIT lands are not expected to measurably contribute to cumulative effects for this species because SUIT lands generally lack the canyon lands and rimrock structure that occurs to the north along the Delores River and Paradox Basin.

Fluid minerals activities that could potentially occur within the western boundaries of SJPL are not expected to have any measurable cumulative effects on Allen's big-eared bat because of the species rarity and the lack of potential impacts to the best potential habitat areas. Wildlife management activities that implement bat gates at abandoned mine closures would also have no measurable cumulative effect for the same reasons.

While Alternatives A through D include both current and projected new leases, the "no new lease" scenario only includes current leases under each of the Alternatives.

c) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on Allen's big-eared bat or its primary habitat. The rationale for this determination is as follows:

- Allen's big-eared bat is considered a fringe population that is extremely rare in Colorado.

- No reproductive or roost sites for this species have been located in the state or on SJPL despite extensive work involving mine closures for other bat species.

American Marten *(FS Sensitive)*

a) Natural History and Background: The American marten (*Martes americana)*, also known as the pine marten or simply marten, is a carnivorous mammal roughly the size of a small house cat. It is a member of the weasel family (Mustelidae) and is one of seven species in the genus *Martes*. The only other member of the *Martes* group in North America is the fisher (*M. pennanti*), which is much larger and occurs in a much narrower geographic range than marten. One subspecies occurs in Colorado *(M. a. origenes)* (Fitzgerald, et al. 1994). The marten is primarily an inhabitant of upper montane to boreal forests in the western U.S. (ibid.).

The marten is broadly distributed in North America. It extends from the spruce-fir forests of northern New Mexico to the northern limit of trees in arctic Alaska and Canada, and from the southern Sierra Nevada of California to Newfoundland Island. In Canada and Alaska, its distribution is vast and continuous, but in the western United States, its distribution is limited to mountain ranges that provide preferred habitat (Buskirk and Ruggiero 1994).

In Colorado, the marten occurs in most coniferous forest in the higher mountains (Fitzgerald, et al., 1994). Annual snow track surveys are conducted by SJPL personnel in cooperation with CDOW. Regular and widely distributed sightings of animals and tracks on the Forest lead to the conclusion that martens are well distributed and reasonably abundant in suitable habitat on National Forest System lands of SJPL. In addition, in 1992 the CDOW conducted a wolverine survey on the SJPL that detected martens on roughly 80% of bait stations (Dave Kenvin, pers comm.). Although they are most commonly observed in spruce-fir forests, marten are occasionally seen in lower elevational mixed-conifer forests.

Marten have traditionally been considered to occupy a narrow range of habitat types. Recent research suggests however, that they are adaptable to a wide variety of forest habitats (Strickland et al. 1982). Even so, the species is closely associated with late-successional coniferous forest, especially those with complex physical ground structure (Buskirk and Ruggerio 1994). Marten prefer mesic forest conditions and forest stands with xeric conditions, or those that lack structure near the ground, are seldom used (ibid.) They appear to have an affinity for overhead cover and avoid extensive use of open areas, particularly in winter (Bennett 1984). In the central and southern Rockies they are most often associated with spruce-fir or lodgepole pine and are generally absent in stands of ponderosa or pinyon pine. In no part of its range have marten been found to favor hardwood stands over conifer-dominated stands (Buskirk and Ruggerio 1994).

On National forest System lands of SJPL, marten habitat occurs across the Forest at the mid-upper elevational zones and spruce-fir forest types are considered primary habitat. Structural characteristics that are important in determining overall suitability include abundant and well-distributed coarse woody debris, canopy closures >30%, with 40-60% considered optimal. Mature spruce-fir forests with mesic understory conditions and large amounts of large-diameter downed woody material are important to marten because they provide key habitat components for their primary prey, southern red-back vole (Allen 1983) and red squirrel (Fitzgerald, et al. 1994).

Martens are primarily carnivores of small mammals and prey on a wide variety of species. They are somewhat opportunistic with the species taken and frequency of taking, which varies greatly geographically with availability (Martin 1994). The most important prey of marten in the West are red-backed voles, pine squirrels, and various species of Microtus. Changes in small mammal prey can affect the carrying capacity of marten habitat (Strickland et al. 1982). Food shortages have the greatest effect on females and juveniles due to their high energy requirements (ibid.). Other prey include insects, birds, bird's eggs and even fish. They will also take carrion when available, especially during the winter (Strickland et al. 1982). During late summer and fall, soft mast is consumed, especially berries of *Vaccinium* and *Rubrus* (Buskirk and Ruggerio 1994).

Habitat is perhaps the most important limiting and controlling factor for marten populations, particularly loss of habitat components as it effects foraging, resting, breeding, and dispersal. Other limiting factors include fragmentation and geographic isolation, prey availability, low population density, low reproductive potential, predation, competing predators, trapping, weather, parasites and disease. Marten habitat use within their home range is much more limited during the winter months.

b) Effects Analysis: Plan Revision activities that could potentially influence American marten primarily involve timber harvest, road construction/reconstruction, motorized recreation, and Wildland Fire Use.

Alternative A: No Action

Direct/Indirect Effects: The American marten is considered fairly common in suitable primary habitat across the upper elevations of the SJNF in the mid to late successional spruce-fir and cool-moist mixed-conifer forest types (habitat structural stages 4A, 4B, 4C, and 5). Although alterations have occurred due to past timber harvest and road construction, approximately 604,230 acres of suitable marten habitat presently remains on the SJNF. Approximately 447,350 acres (74%) of this consists primarily of spruce-fir while another 156,880 acres (26%) consists of cool-moist mixed-conifer forest. Approximately 80% of the spruce-fir and 65% of the cool-moist mixed-conifer habitat on the SJNF occurs as wilderness, backcountry, and/or other protective land management designations that is expected to maintain high-quality marten habitat.

The primary activity that could potentially influence primary habitat for this species is timber harvest and associated activities such as road construction/use. To a lesser degree, winter motorized (i.e. snowmobile use) and summer recreation may also impact the marten due to increased disturbances within suitable habitat. Although not a planned activity, Wildland Fire Use could also potentially influence the marten if large-scale burns reduce suitable habitat components. Differences in projected outputs by alternative for these activities are displayed below in Table BE-3.

Table BE-3: Activities and Outputs that could Influence the American marten, by Alternative.

Timber Treatment Acres (Suitable Habitat Only)	Alternative A	Alternative B	Alternative C	Alternative D
* Spruce-fir	50 ac. Partial Cut	50 ac. Partial Cut	20 ac Partial Cut	113 ac Partial cut
* Cool-Moist Mix-Con	200 ac. Partial Cut	125 ac. Partial Cut	20 ac. Partial Cut	287 ac. Partial Cut
Road Construction Miles - Timber	3	0	0	3
Road Reconstruction Miles - Timber	7.2	7.6	5.6	8.2
Fuels Treatment Acres (Suitable Cover Types Only)				
* Spruce-fir & Mixed Con	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use
Motorized recreation (Acres, Winter Travel)				
* Roaded natural	696,652 ac.	544,617 ac.	486,765 ac.	644,084 ac.
* Semi-primitive motorized	683,371 ac.	402,285 ac.	232,249 ac.	628,249 ac.
* Semi-primitive non-motorized	440,948 ac.	879,149 ac.	580,347 ac.	556,288 ac.
* Primitive	0 ac.	2,632 ac.	530,865 ac.	0 ac.
* Primitive Wilderness	536, 290 ac.	536,291 ac.	536,291 ac.	536,291 ac.
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.

* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	same as winter	same as winter	same as winter

In regards to activities that could potentially influence the American marten, Alternative A offers approximately 145,700 to 187,500 more acres of active management area than Alternative B and D, respectively, that could potentially alter the habitat components preferred by the species. Alternative D exceeds Alternative A in active management area by approximately 8,300 acres.

As displayed in Table BE-3, the predicted timber harvest output in primary habitat varies from 250 to 400 acres and is very minimal in all alternatives. These amounts represent about 0.04 to 0.07% of the total suitable habitat on the SJNF. The amount of timber harvest in Alternative A is therefore expected to have little, if any, influence on American marten habitat or populations on the SJNF. Construction of new roads and reconstruction of existing roads is estimated to involve 3 miles and 7.2 miles, respectively. Additional fragmentation effects may be associated with these activities but are expected to be minor because of the large amount of unroaded area that remains undeveloped.

Alternative A offers more high-use recreation areas than any of the action alternatives. This difference could potentially allow greater disturbances to the solitude that marten prefer depending upon the type, timing, and scope of the activity. Greater winter travel via snowmobiles could theoretically alter snow conditions and allow low-elevation predators to access more winter habitat due to snow compaction.

Wildland Fire Use is not a planned output. However, it will be utilized as a tool to allow natural disturbances to occur within suitable marten habitat as opportunities arise. It is estimated that all alternatives may allow from 1 to 30,000 acres of Wildland Fire Use. Depending upon fire severity and scale, these outputs could have negative or positive influences on American marten.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-3, there is little difference between no action and Alternative B, C and D in regards to timber harvest outputs. New road construction, however, is not associated with Alternatives B or C. As is consistent with the active management theme, Alternative D offers the greatest amount of projected timber output and greatest amount of area where this activity may occur. However, all alternatives influence suitable marten from 0.04 to 0.07% and are expected to have no detectable affect on American marten.

All action alternatives offer fewer potential disturbances than the no action from both summer and winter motorized recreation because of decreases in the amount of motorized use area. Consistent with their themes, Alternative C offers the fewest motorized while Alternative D offers the highest amount of acreage. Alternative B offers a balance between the two other action alternatives, but also provides more solitude habitat than the no action. Although the marten is not highly sensitive to motorized disturbance, reductions in open motorized areas should decrease the potential for displacement or disturbances.

As with the no action, it is estimated that Wildland Fire Use may be used as a management tool on 1 to 30,000 acres in all action alternatives. Depending upon fire severity and scale, these outputs could have negative or positive influences on American marten.

Cumulative Effects: The single-most influential habitat management action undertaken in potential marten habitat on the SJNF is timber harvesting. Timber management has been shown to affect the quality of marten habitat and has been implicated as a direct cause in reductions in marten populations, particularly where silvicultural techniques such as clear-cutting are used (Buskirk and Ruggiero 1994, Hargis et al. 1999, Buskirk 2002). Timber management activities on the SJNF increased significantly during the mid 1900s and, in habitats preferred by marten, primarily involved clear-cutting. For at least the past 25 years, however, clear-cutting has been replaced by less intensive harvesting approaches in the spruce-fir cover type and the overall extent of timber harvest has decreased. These changes and natural succession patterns have resulted in a slight increase in suitable marten habitat on the SJNF since 1983. The trend in acres of late successional and mature cool-moist mixed-conifer habitat has also essentially been stable during this same time period.

Timber harvests on the SJNF since 1983 have averaged 1.4% per year within the total spruce-fir acreage that is suitable for timber harvest (approximately 1500 acres per year). In the cool-moist mixed-conifer cover type, timber harvests have averaged about 0.4% per year of the total acres suitable for timber harvest (approximately 240 acres). In the latter cover type, however, even-aged silvicultural methods are still frequently used.

A review of management activities and land use designations on the SJNF suggests that a considerable amount of suitable habitat for the marten is available, and should remain available, throughout and beyond the current planning period (10-15 years). Timber management activities may still influence individual martens where it occurs. However, approximately 80% of the spruce-fir and 65% of the cool-moist mixed-conifer habitat on the SJNF occurs as wilderness, backcountry, and/or other protective land management designations that maintain high-quality marten habitat. Although variations occur, most of these protections will be maintained in all action alternatives. The broad distribution and interconnected nature of existing habitat suggests that movement and genetic exchange of dispersal-sensitive species such as marten may not be a concern on SJPL and the greater San Juan Mountains area. Fir example, a recent cumulative effects analysis conducted on the Pagosa Ranger District of the SJNF acknowledged the buffering capacity of the wilderness and backcountry land management designations, particularly in the spruce-fir cover type. At a smaller spatial scale, however, this same analysis found that impacts have occurred on suitable timber lands (McGarigal et al. 2001). The specific implications to connectivity among habitat patches for marten were not investigated.

Natural fire events probably represent the most unpredictable potential influence on marten habitat on the SJNF. Although uncommon in spruce-fir forests, these events can influence marten habitat use patterns when they do occur (Koehler and Hornocker 1977).

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (American marten), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- All alternatives involve projected timber harvest activities in primary habitat types (spruce-fir and cool-moist mixed conifer) that may adversely influence individual marten. However, the projected scope of these activities are very minimal.
- All alternatives involve over-the-snow and summer motorized recreation that may disturb individual marten.
- Extensive late-successional primary habitat occurs on the San Juan National Forest in wilderness and other backcountry designations where natural processes will dominate.

Big Free-tailed Bat (*BLM Sensitive*)

a) Natural History and Background: Big free-tailed bat (*Nyctinomops macrotis)* occurs from the southwestern United States to south-central Mexico (Adams 2003). In the Rocky Mountain States, it occurs from central Utah and Colorado southward throughout Arizona and New Mexico. Recent work by Navo and Gore (2001, cited in Adams 2003) reported the presence of individuals and roost sites in the western canyon country of Colorado, in particular along the Dolores River, Montrose County (Adams 2003).

The species has been reported on BLM lands near Dolores, Colorado where it has been detected using canyon habitat along the Dolores River (K. Nickell, pers. comm.). Roosting habitat is limited to snags given the absence of suitable cliffs.

This species prefers rocky landscapes, roosting high on cliff faces (Adams 2003). It also uses buildings for day roosts and occasionally roosts in tree cavities. Like most molossids, it leaves the roost long after dark, using fast powerful flight and emitting a loud, piercing chatter as it hunts for large moths (Adams 2003). Other prey includes crickets, flying ants, stinkbugs, and leafhoppers. In Colorado, few specimens have been collected, but these individuals were taken mostly in open country at moderate elevations (Armstrong et al. 1994). Maternity roosts have been documented in rock crevices, with long-term use of the crevice reported (Navo 2003). As with other bats human disturbance to roost sites appear to be an important limiting factor. Disturbance to maternity roosts from June through August may be limiting.

b) Effects Analysis: Plan Revision activities that could potentially influence the big free-tailed bat primarily involve fluid minerals development and possibly wildlife management (i.e. abandoned mine closures).

Alternative A: No Action

Direct/Indirect Effects: The big free-tailed bat is currently known to occur sporadically on the far western portion of the SJPL. Its range could therefore overlap planned activities such as oil and gas development planned within the Paradox Basin. Differences in projected outputs for fluid minerals by alternative are displayed below in Table BE-4.

Table BE-4a: Activities and Projected Outputs that could Potentially Influence the Big Free-tailed bat, by Alternative.

Fluid Minerals Acreage Available & Stipulated	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
* Standard Lease Terms	1,377,039	488,591	488,591	502,938
* New Wells Anticipated w/i the Paradox Basin	136	137	137	137
Wildlife Management				
* Install Structures to Maintain Bat Habitat on Mine Closures	As Opportunities Arise	same	same	same

In regards to activities that could potentially influence the big free-tailed bat, Alternative A offers approximately 28,300 more acres open to leasing than any of the action alternatives. Alternative A also offers fewer protective lease stipulations than any of the action alternatives, with approximately 700,000 to 746,000 fewer lease acres stipulated with a No Surface Occupancy (NSO). Under the "no new lease" scenario only the existing lease areas have potential for development under this alternative resulting in fewer acres of potential influence to the species.

Alternative A could theoretically offer a greater risk of impacting the big free-tailed bat because it is associated with greater development, fewer strict protective measures, and the species overlaps where fluid minerals development may occur. Because the big-free tailed bat primarily roosts in rock crevices in high, steep, cliff faces, however, it is unlikely that impacts to primary reproductive or roosting habitat would occur from oil and gas development. Although unlikely, minimal impacts to individuals cannot be completely discounted because the species will also occasionally roost in trees or snags which could be removed during development activities.

It is predicted in the Plan Revision that all alternatives will provide the same wildlife management actions in regards to mine closure gates for bats as opportunities arise. Thus, all alternatives install the same quantity and quality of mine closure bat gates over the life of the Plan. These closures are coordinated with the Colorado Division of Wildlife and the Department of Minerals and Geology and will provide undisturbed habitat for mine-associated bat species while also addressing human safety and health issues. The big free-tailed bat is primarily a cliff roosting species; however, individuals have occasionally clustered in roosts near the mouths of caves or mines so potential benefits cannot be completely discounted.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-2, Alternative B, C and D offer fewer potential impacts from oil and gas development because they offer approximately 28,300 fewer acres of potential lease area. The action alternatives also offer greater protective lease stipulations, with approximately 746,000 more acres stipulated with a NSO in Alternatives B and C, and approximately 700,000 more acres in Alternative D. The fewer amounts of available lease acres and greater amount of protective lease stipulations suggest that fewer potential impacts to bats and/or important habitat structures may be associated with the action alternatives. Still, some potential impacts

such as tree removals during development may still occur and influence habitat components. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

There is no difference among the Plan revision alternatives in regards to implementation of wildlife management activities that may provide bat gates on abandoned mines used by bat species. Although benefits to big free-tailed bats are questionable because it is not closely associated with mines or caves, it has been known to occasionally utilize these structures as roost sites. The same potential benefits are associated with each action alternative.

Cumulative Effects: The Reasonable Foreseeable Development (RFD) scenario for fluid minerals development, by alternative, is displayed below in Table BE-4b.

Table BE-4b: Reasonable Foreseeable Development scenario for oil and gas development on SJPL

Oil & Gas Wells Anticipated to be Drilled Over the Next 15 Years by Areas in the Reasonable Foreseeable Development Scenario (Currently Unleased Lands)				
* San Juan Basin	0	0	0	0
* Paradox Basin	136	137	137	137
* San Juan Sag	30	30	30	30

As displayed in Table BE-4b, the RFD predicts that 166 future wells could be developed under Alternative A and, very similarly, 167 wells under all of the action alternatives. Most (136 to 137) of these would occur in the Paradox Basin area with another 30 in the San Juan Sag. Each well development could affect about 1.5 to 3 acres at well pads and other facilities, and involve linear openings along roads and utility corridors. Linear openings would be about 40 feet wide. All trees and other vegetation in these areas would be removed at well pads. These developments are not expected to alter the high cliff areas utilized by big free-tailed bats for roosting; however, occasional removal of other potential habitat structures such as trees or snags may occur.

There have been approximately 2,300 CBM and conventional gas wells drilled within the cumulative-effects area in the past decade; 2,000 of those are within the boundaries of the Southern Ute Reservation (SUIT). CBM development within the grounds of the SUIT Reservation is expected to increase in the near future. Statistics taken from the SUIT EIS (BLM et al. 2002) indicate that an additional 1,300 conventional gas, CBM methane, and injection wells could be drilled within the bounds of the Reservation over the 25-year life of the project. Activities on SUIT lands are not expected to measurably contribute to cumulative effects for this species because SUIT lands generally lack the canyon lands and rimrock structure that occurs to the north along the Delores River and Paradox Basin.

Fluid minerals activities that could potentially occur on the SJPL and overlap the known range of the big free-tailed bat are not expected to have any measurable cumulative effects on this species because primary habitat areas (i.e. high cliff faces) are unlikely to be impacted. Wildlife management activities that implement bat gates at abandoned mine closures could potentially have a minor positive cumulative effect because the species may occasionally use mines and caves as roost sites.

While Alternatives A through D include both current and projected new leases, the "no new lease" scenario only includes current leases under each of the Alternatives.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (big free-tailed bats), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The big free-tailed bat occurs but is uncommon on most San Juan Public Lands.
- Primary roost habitat is associated with steep canyon walls and high cliff structures that are unlikely to be impacted by Plan activities.
- All potential impacts cannot be completely discounted because oil and gas development activities may occasionally remove lesser-quality habitat structures such as trees or snags.

Minimal benefits are anticipated from wildlife management activities associated with bat gates during abandoned mine closures.

Fringed Myotis *(BLM and FS Sensitive)*

a) Natural History and Background: The fringed myotis (*Myotis thysanodes pahasapensis)* ranges throughout western North America, from British Columbia southward into Mexico (Adams 2003). Records are scattered throughout the mountainous regions of the Rocky Mountain States. Colorado records are scattered at moderate elevations of 1,524-2,438 meters (5,000-8,000 feet) in mountainous parts of the state (Armstrong et al. 1994). The species has been found on the SJPL in an old/abandoned building on the Pagosa Ranger District. Additional known occurrences are from BLM lands near the Dolores River Canyon (K. Nickell, pers. com.).

In Colorado, the fringed myotis ranges across saxicoline brush and Douglas-fir forests on the eastern slope near Boulder (Adams et al. 1993) and in pinyon-juniper and ponderosa pine woodlands in other parts of the state (Armstrong et al. 1994). The diet of this species includes moths (Lepidoptera) and beetles (Coleoptera) that are taken close to the canopy. The species is also known to forage on bees (Hymenoptera) and lacewings (Trichoptera) (Adams 2003). Most foraging activity occurs between one and two hours after sunset, but some activity may continue until 4.5 hours after sunset. The species is particularly susceptible to human disturbances, especially near maternity colonies (O'Farrel and Studier 1980, cited in Adams 2003). Where available, caves, buildings, underground mines, rock crevices in cliff faces and bridges are used for maternity and night roosts, while hibernation has only been documented in building and underground mines (Bradley and Ports 2003). Tree roosting has also been documented in large conifer snags in Oregon, in ponderosa pine snags in New Mexico, and in hollow redwood and giant sequoia trees in California (Bradley and Ports 2003). The species is known to migrate, but to what extent is unclear.

The greatest threat to this bat is thought to be human disturbance of roost sites and especially maternity colonies, through recreational caving and mine exploration (Western Bat Working Group 1998, Arizona Game and Fish Department 1993). June through July is considered the most critical for disturbance. Other threats include closure of abandoned mines, renewed mining at historic sites, toxic material impoundments, pesticide spraying, vegetation conversion, livestock grazing, timber harvest, and destruction of buildings and bridges used as roosts (Western Bat Working Group 1998). It is also threatened by the disturbance or destruction of water sources and riparian habitat (NatureServe, 2007).

b) Effects Analysis: Plan Revision activities that could potentially influence the fringed myotis involve fluid minerals development, wildlife management (i.e. abandoned mine closures) and, possibly fuels treatment and timber management activities. Influences from fuels and timber treatments would be limited to the lower-elevation habitat types where the fringed myotis may potentially occur.

Alternative A: No Action

Direct/Indirect Effects: The fringed myotis bat occurs sporadically over much of the western portion of the SJPL. Its range could therefore overlap planned activities such as oil and gas development in the Paradox Basin, timber management, and fuels management activities. Differences in outputs associated with these activities are displayed below in Table BE-5.

Table BE-5: Activities and Projected Outputs that could Potentially Influence the Fringed Myotis Bat, by Alternative.

Fluid Minerals Acreage Available & Stipulated	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
* Standard Lease Terms	1,377,039	488,591	488,591	502,938
* New Wells Anticiapted w/i the Paradox Basin	136	137	137	137
Wildlife Management				
* Install Structures to Maintain Bat Habitat on Mine Closures	As Opportunities Arise	same	same	same
Timber Treatment Acres (Suitable Habitat Only)				
* Ponderosa Pine	1,000 Restoration 500 ac. Partial Cut	1,000 Restoration 500 ac. Partial Cut	900 Restoration 400 ac Partial Cut	1500 Restoration 500 ac Partial cut
* Warm Dry Mix-Con	250 Restoration 250 Partial Cut	250 Restoration 250 Partial Cut	200 Restoration 225 Partial Cut	200 Restoration 225 Partial Cut
Fuels Treatment Acres (Suitable Cover Types Only)				
* Pinyon/Juniper	1000 Mastication	1000 Mastication	1000 Mastication	1100 Mastication
* Mixed Shrubland	1500 Mastication	1500 Mastication	1500 Mastication	1600 Mastication
* Ponderosa Pine	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire

As noted for other bat species, Alternative A offers approximately 28,300 more acres open to leasing than any of the action alternatives. Alternative A also offers fewer protective lease stipulations than any of the action alternatives, with approximately 700,000 to 746,000 fewer lease acres stipulated with a No Surface Occupancy (NSO). A greater likelihood of impacts may therefore be associated with no action. Under the "no new lease" scenario only the existing lease areas have potential for development under this alternative resulting in fewer acres of potential influence to the species.

Alternative A offers similar timber management treatments as Alternative B and C in dry forest types that may support fringed myotis. Because the fringed myotis is known to day roost in both ponderosa pine and large pinyon-juniper snags, potential impacts to the species could occur if the planned activities result in reductions in these components. This potential affect would be similar across most alternatives. Conversely, restoration activities that include thinning of small dense trees might benefit the foraging patterns of many bat species.

Several Plan components also focus on snag management and retention, and although impacts will occur they are anticipated to be minor.

Alternative A offers similar fuels treatments as the other alternatives in the dry forest types that offer potential habitat for the fringed myotis. Mastication of small underbrush should not have measurable influences on the primary habitat components for this species. However, the fringed myotis also roosts in pinyon-juniper cover types that are also targeted for fuels reduction. Impacts to potential roost sites or individual bats could occur in these locations if large trees and snags are removed. Prescribed fire activity projections are also similar across all alternatives, and vary by only 100 to 200 acres. As with mastication, prescribed fire could negatively influence potential roost structures if snags are fire-hardened, removed, or burned.

Alternative A provides the same wildlife management actions in regards to mine closures with bat gates as opportunities arise. Thus, all alternatives install the same quantity and quality of mine closure bat gates over the life of the Plan. This action could be quite beneficial to the fringed myotis because it readily roosts in abandoned mines.

In general, Alternative A offers a slightly higher risk of negative influences on some potential habitat components for the fringed myotis, such as snags, because it allocates a greater amount of area to active management scenarios. However, potential impacts are expected to be minimal because abandoned mines and cave habitat represent one of the most significant landscape features for this species and all alternatives include active wildlife management goals that target important underground roost sites for closure and protection. Plan Components are also expected to reduce impacts to snags and other vegetation where active management occurs.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-5a, the action alternatives offer fewer potential impacts from oil and gas development because they offer approximately 28,300 fewer acres of potential lease area. The action alternatives also offer greater protective lease stipulations, particularly in regards to a NSO stipulation. The fewer amounts of available lease acres and greater amount of protective lease stipulations suggest that fewer potential impacts to bats and/or important habitat structures may be associated with the action alternatives. As with other bat species, however, some potential impacts such as tree removals may occur during development of oil and gas wells or facilities. Tree removal could be more impacting to the fringed myotis because it frequently day roosts in ponderosa pine and/or pinyon-juniper vegetation. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

The protection of abandoned mines with bat gates could be the single-most important Plan output in regards to conservation of the fringed myotis because it frequently utilizes mines and caves for reproductive habitat. The fringed myotis is also very sensitive to disturbances within these habitats. There is no difference among the Plan revision alternatives in regards to implementation of wildlife management activities that may provide bat gates on abandoned mines used by bat species. The same potential benefits are associated with each action alternative.

Cumulative Effects: In regards to fluid minerals development, the cumulative effects analysis for the big free-tailed bat is expected to accurately portray the Reasonable Future Development (RFD) scenario as associated with potential cumulative effects on the fringed myotis. See Table BE-4b for this information.

In regards to past, current or reasonably foreseeable vegetative changes that may have influenced the fringed myotis, its primary habitat types have most likely been greatly altered from historic conditions. For example, evidence suggests that low-elevation ponderosa pine forest in southwestern Colorado occurred as uneven-aged stands with clumps of even-aged trees scattered throughout. These forests varied in density and age class distribution across the landscape and low-intensity fires were common. Historic reports suggest that large and very large ponderosa pine trees were present that would have offered ample snag habitat for bat species that utilize these components as roost sites. Fire suppression and timber harvest activities have resulted in significant structural changes in ponderosa pine forests as compared to historic conditions, particularly on private lands. It is therefore likely that potential snag roosts have also been reduced.

Although less evident, pinyon-juniper forests have also undergone changes from historic conditions due to heavy use by livestock, significant harvesting, and a decrease in wildfire frequency. In combination, these

factors have allowed pinyon-juniper to establish and dominate new communities and expand to higher and lower elevations, with denser stands and higher canopies (Tausch 1999). Pinyon-juniper woodlands that were once dominated by large trees with openings composed of younger trees and grasses, forbs, and shrubs are now denser, with a corresponding loss of openings. Current evidence suggests that existing pinyon-juniper stands have more dense woodland and less open savanna then occurred historically. The large tree component in many pinyon-juniper stands has also been reduced from firewood gathering, fires, insect agents, and other factors. As with ponderosa pine, much of the older pinyon-juniper has been greatly reduced on private lands, thereby suggesting that potential snag habitat for bats has also been reduced.

Although some management trends on private lands have recently changed, it is likely that the majority of mature stands and habitat values for bats and other wildlife species will remain and occur primarily on public lands. The focus of these lands under all alternatives involves restoration activities such as thinning, fuel reductions, and prescribed fire intended to help return these cover types to a more historic condition. This focus should help buffer the negative cumulative impacts that have occurred on private lands, and maintain habitat conditions on public lands that are more resilient to large-scale fires and other major landscape changes.

While Alternatives A through D include both current and projected new leases, the "no new lease" scenario only includes current leases under each of the Alternatives.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (fringed myotis), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The fringed myotis bat is an uncommon species on San Juan Public Lands that may overlap some Plan activities in lower elevation vegetation types.
- The single-most important habitat element for the fringed myotis on SJPL is most likely suitable mines and caves that provide reproductive habitat. Protection of these features is similarly associated with all alternatives.
- All potential impacts cannot be completely discounted because some Plan activities may occasionally remove potential snag and tree roosts utilized by the species.
- More information on use of pinyon-juniper habitat by this and other species is recommended because of fuels reduction activities that target this vegetation type.

Gunnison's Prairie Dog *(FS sensitive)*

a) Natural History and Background: Gunnison's prairie dogs (*Cynomys gunnisoni)* are distributed from Central Colorado to central Arizona, including southeastern Utah and much of the northwestern half of New Mexico (NatureServe, 2005). In Colorado, the species is restricted to southwestern and south-central Colorado. They range in elevation from 6,000 to 12,000 feet. They are well distributed across SJPL at lower elevations.

Gunnison's prairie dogs inhabit grasslands and semidesert and montane shrublands (Fitzgerald et al. 1994). Habitat use by Gunnison's prairie dogs differs somewhat from the black-tailed prairie dog primarily due to the strikingly different geographical settings within the range distribution of these species. The black-tailed prairie dog is primarily a prairie species, while the Gunnison's prairie dog is associated with intermountain valleys, benches, and plateaus that offer prairie-like topography and vegetation. These intermountain valleys, benches, and plateaus can range from very arid to mesic sites. Gunnison prairie dogs can occupy mesic plateaus and higher mountain valleys, as well as arid lowlands (Knowles, 2002). The species is generally found in groups of several individuals, and often times forming colonies. They dig burrows that are used for raising young, and provide cover from predators.

The species feeds on grasses, forbs, sedges, and shrubs. Insects are of minor importance to its diet. Flowers and other succulent parts of forbs and shrubs are also consumed but the animals do little digging for roots and tubers (Fitzgerald et al. 1994). The species is not known to store food in its burrow. As with all species of prairie dogs and most ground squirrels, they gather grasses and forbs for nesting materials, especially in late summer. Free water is not required (Fitzgerald et al. 1994).

Gunnison's prairie dogs hibernate. In central Colorado around 10,000 feet, individuals entered burrows by October and emerged in mid-April. Hibernation periods at lower elevations are shorter and some individuals may even appear above ground in winter months (Raynor et al. 1987, cited in Fitzgerald et al. 1994).

Predators include badgers, golden eagles, coyotes, bobcats, and red-tailed hawks. Plague and poisoning have caused considerable retraction of the species in parts of Colorado and New Mexico (Fitzgerald et al. 1994). In Colorado, prairie dogs are considered small game species and are provided no protection from harvest. Reproduction occurs May through mid July.

b) Effects Analysis: Plan Revision activities that could potentially influence the Gunnison prairie dog primarily involve fluid minerals development, road construction/reconstruction, summer motorized recreation, and range management activities (i.e. livestock grazing and associated activities).

Alternative A: No Action

Direct/Indirect Effects: The Gunnison prairie dog occurs sporadically over the western portion of the SJPL on both BLM and National Forest Systems land. Its range could therefore overlap planned activities such as oil and gas development, motorized recreation, and possible road construction/reconstruction. Prairie dog colonies also overlap areas utilized by cattle grazing. Differences in outputs associated with these activities are displayed below in Table BE-6.

Table BE-6: Activities and Projected Outputs that could Potentially Influence the Gunnison Prairie Dog, by Alternative.

Fluid Minerals Acreage Available & Stipulated	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
* Standard Lease Terms	1,377,039	488,591	488,591	502,938
* New Rd Construction/ Fluid Minerals (miles)	70	70	70	70
Wildlife Management				
* Install Structures to Maintain Bat Habitat on Mine Closures	As Opportunities Arise	same	same	same
* Livestock Grazing (Cattle AUMs Only)				
* Premitted AUMs (FS)	115,312	115,312	112,554	117,791
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	same as winter	same as winter	same as winter

The primary activities that have influenced Gunnison prairie dogs in Colorado involve intentional poisoning and plague (Fitzgerald et al. 1994). Recreational shooting may also influence local prairie dog populations in some locations. Outbreaks of plague are density-dependent occurrences that are not influenced by any of the Plan Revision alternatives, and poisoning is not permitted without additional analysis. Recreational shooting of prairie dogs is controlled and managed by the Colorado Division of Wildlife and not influenced by the plan alternatives.

The exact locations of fluid minerals development are not known at this time. However, potential development areas do overlap the range of the Gunnison prairie dog, so some influences or impacts could be possible. Although the number of projected well developments is similar under all alternatives, Alternative A offers more acres open to leasing than any of the action alternatives. Alternative A also offers fewer protective lease stipulations than any of the action alternatives, with approximately 700,000 to 746,000 fewer lease acres stipulated with a No Surface Occupancy (NSO). A greater likelihood of influences on prairie dog colonies

may therefore be associated with no action. All alternatives also offer approximately 70 miles of new road construction to access new lease sites. It is possible that potential impacts from this activity could occur to existing prairie dog colonies. Under the "no new lease" scenario only the existing lease areas have potential for development under this alternative resulting in fewer acres of potential influence to the species.

It is likely that winter travel is not a major influence on prairie dogs because the species hibernates while that activity is occurring. In regards to summer motorized travel, Alternative A offers more suitable acres for this activity than in any of the action alternatives. Although summer travel probably causes no direct impacts to prairie dog colonies, motorized travel near the colonies may disturb the species or disrupt their foraging habits.

Alternative A continues the current range management practices under the current respective management plans for both the Forest Service and BLM. Cattle grazing on Forest Service lands are continued at 115,312 AUMs on approximately 655,000 acres. Cattle grazing influences on Gunnison prairie dog are expected to be neutral or perhaps positive because of influences on vegetation growth and composition.

In summary, some impacts to existing prairie dog colonies could be associated with the no action alternative. However, the primary influences on prairie dog persistence are not expected to be associated with any activities authorized under the Plan Revision.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As with Alternative A, the action alternatives will have no influence over the control of plague outbreaks and no additional authority over state actions involving recreational shooting. Poisoning of prairie dogs is not allowed under any alternative without additional analysis.

As displayed in Table BE-6, the action alternatives may offer fewer potential impacts from oil and gas development because they offer approximately fewer acres of potential lease area. There are no lease stipulations specific to the Gunnison prairie dog in any alternative. However, there are energy corridor stipulations that pertain to this species to help meet conservation goals when prairie dog colonies are encountered. The action alternatives also offer greater amount of area protected through NSO stipulations, which could indirectly provide less disturbance to the species. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

The action alternatives offer fewer suitable acres for summer motorized travel. Consistent with the theme of minimizing human influences, Alternative C is the most restrictive. All action alternatives provide potential benefits because of greater controls on off-road travel. Greater indirect benefits to prairie dogs may therefore be associated with the action alternatives.

Changes in permitted livestock in the action alternatives are not expected to have much influence on Gunnison prairie dog because of generally neutral interactions between the two. However, if cattle are providing indirect benefits to prairie dogs because of grazing influences this might be reduced in Alternative C. Overall, however, no detectable differences are expected.

In summary, some potential impacts associated with oil and gas development and motorized travel could be reduced in the action alternatives. Overall, however, the primary influences on prairie dog persistence are not expected to differ under the action alternatives.

Cumulative Effects: Gunnison prairie dog colonies have been greatly reduced from historic numbers because of influences such as intentional poisoning and introduced plague. Recreational shooting has probably impacted localized populations in some area. Intentional poisoning has been greatly reduced over time but still may continue on private lands. On public lands, however, this activity is strictly controlled. Plague outbreaks remain a primary factor influencing Gunnison prairie dogs in Colorado.

Some planned activities on the SJPL may influence existing prairie dog colonies. While Alternatives A through D include both current and projected new leases, the "no new lease" scenario only includes current leases under each of the Alternatives. Overall, however, the SJPL remain a refuge for the prairie dog and planned activities are expected to have little influence on their persistence. Planned activities are not expected to contribute to any negative cumulative effects on the species habitat or populations.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (Gunnison prairie dogs), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- Plague and other influences outside the control of the SJPL are the primary influences on Gunnison prairie dogs.
- Some Plan activities may overlap existing colonies.
- All potential impacts cannot be completely discounted because some Plan activities may have minor influences on the colonies.

North American Wolverine *(FS sensitive)*

a) Natural History and Background: The wolverine (*Gulo gulo)* is the largest member of the family *Mustelidae*, which also includes weasel, fisher, marten, badger and mink. The taxonomic relationship between the North American and Eurasian members of this species has long been debated, with some authorities dividing these groups into two separate species. Currently however, the genus *Gulo* is considered to have only one existing species, *Gulo gulo* (Pasitischniak-Arts and Larivière 1995). Wolverines are found in small numbers throughout their range and appear to require large expanses of wilderness or remote areas.

The wolverine is circumpolar in distribution, occupying the tundra, taiga, and forest zones of North America and Eurasia. Historically, its North America range included Alaska, most of Canada, the Great Lakes region (in small numbers), with peninsular extensions into the northern mid-west (N. Dakota, S. Dakota and Nebraska), the Rocky Mountains as far south as northern New Mexico, and the Pacific coastal ranges through central California. Their current range has contracted significantly, especially in the eastern and southern portions. It has been extirpated from most of its eastern ranges in the Great Lakes states and southern Canadian provinces. It is now found in remote regions of Idaho, Montana, Wyoming, as well as in isolated portions of Washington, Oregon, and California (Banci 1994). The status of the wolverine in Colorado is undetermined, with 22 records representing 25 animals between 1871 and 1919 (Seidel et al. 1998). Since 1979, 12 investigations have been conducted in Colorado with the goal of trying to document wolverine presence in the state (Seidel et al. 1998). After intensive efforts using snow tracking, hair snags, remote cameras, and snares, only 10 sets of tracks were found that appeared to have a high probability of being wolverine (ibid). One of those investigations occurred on National Forest System lands of SJPL but no evidence of wolverine was found. There are historic reports of wolverine occurrence on the Forest, with more recent reports occurring in 1979, 1996 and 2001. These reports could not be confirmed.

Wolverines are now generally restricted to boreal forests, tundra, and western mountains (Banci 1994). There is the perception that wolverines are primarily a high altitude species. However, this may be more a function of their preference for remote areas, which tend to now be concentrated in inaccessible mountain ranges (Banci 1994). Wolverines are a wide-ranging species, and thus use a wide variety of habitats. Researchers have generally concluded "habitat is best defined in terms of year-round food supplies in large, sparsely inhabited wilderness areas, rather than in terms of particular types of topography or plant associations" (Banci 1994). Wolverine reports from parts of their southern range, such as Idaho, Wyoming and Colorado have typically been associated with remote mountainous regions. Habitats fragmented by high road densities, heavy timber management, urbanization, etc. appear to be avoided (Banci 1994).

The wolverine is an opportunistic forager and is both a predator and a scavenger, depending on the time of year. Most of their movements within their home range are related to foraging activities. Wolverines are primarily scavengers during the winter, and rely heavily on large ungulates killed by other predators or that have died from disease or starvation. In Montana, elk and deer constituted 42% of their winter diets (Hornicker and Hash 1981). Winter diets may be supplemented by small mammals such as porcupines, snowshoe hares, squirrels, mice and voles (Peterson 1997). Wolverines are known to prey on larger animals under some conditions, such as deep snow, when these animals are vulnerable (Banci 1994). During the summer, a wide variety of species are taken including marmots, ground squirrels, red squirrels, voles, ptarmigan, porcupines, hares, birds, eggs and insects (Peterson 1997, Banci 1994, Hornicker and Hash 1981). Berries may also be taken during seasons of availability. Surplus food is often cached in holes dug in the ground or snow, or occasionally in trees. Food caching may be

particularly important around natal dens to provide a dependable source of food for the litter (Pasitischniak-Arts and Larivière 1995).

A significant body of evidence suggests that large remote tracts of higher elevation lands are necessary for wolverine populations (Banci 1994, Hornicker and Hash 1981, Seidel et al. 1998). Any activities that increase human presence or result in significant alteration of habitats in and adjacent to these limited areas may degrade their overall ability to support wolverine populations. In addition, linkages between these areas must be maintained if self-sustaining populations of wolverines can persist (Banci 1994). Other limiting factors include low reproductive potential, low density populations, availability of natal and maternal dens, prey availability, predation, trapping, and parasites. Disturbance at any time of year can cause displacement. However, disturbance in proximity to natal sites or disrupting natal activities (January through March) can lead to abandonment of the den (Heinemeyer and Copeland 1999).

b) Effects Analysis: Plan Revision activities that could potentially influence the wolverine primarily involve road construction/reconstruction, motorized and non-motorized recreation, and ski area development.

Alternative A: No Action

Direct/Indirect Effects: The North American wolverine occurred historically in Colorado, including the San Juan Mountains. While probably never common in the state, the Colorado Division of Wildlife believes the species disappeared from Colorado in the early 1900's. However, occasional unverified sightings and circumstantial evidence that a few individuals may still exist. If so, the San Juan Mountains represent perhaps the best potential habitat remaining in the state to detect the species or preserve options for future reintroductions.

This analysis assumes that wolverines may still exist in the remote San Juan Mountains of southern Colorado, and analyzes potential impacts as if the species is present. Based on these assumptions, differences in outputs associated with activities that may influence the species are displayed below in Table BE-7.

Table BE-7: Activities and Projected Outputs that could Potentially Influence the North American Wolverine, by Alternative.

Motorized recreation (Acres, Winter Travel)				
* Roaded natural	696,652 ac.	544,617 ac.	486,765 ac.	644,084 ac.
* Semi-primitive motorized	683,371 ac.	402,285 ac.	232,249 ac.	628,249 ac.
* Semi-primitive non-motorized	440,948 ac.	879,149 ac.	580,347 ac.	556,288 ac.
* Primitive	0 ac.	2,632 ac.	530,865 ac.	0 ac.
* Primitive Wilderness	536, 290 ac.	536,291 ac.	536,291 ac.	536,291 ac.
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	same as winter	same as winter	same as winter
Ski Area Development/ Expansion	Allows expansion of DMR & development of East Fork Ski Areas	Allows expansion of DMR.	Maintains all ski areas in current footprint; no new developments	Allows expansion of DMR & Wolf Crk, and development of East Fork Ski Area

As displayed in Table BE-7, the no action alternative offers a fairly high amount of roaded recreational opportunities, including approximately 847,000 acres for over-the-snow travel. Perhaps more significantly for the wolverine, it also allows for the expansion and/or development of two ski areas. In Alternative A, Durango Mountain Resort (DMR) could expand to the north within the current permitted boundary (MA 8). Because of the significant amount of development and human activity that already occurs at DMR, this expansion would probably be insignificant in regards to conservation and future habitat options for the wolverine. However, it does likely increase human visitor use and lead to a decrease in solitude. Alternative A also allows for the development of the East Fork Ski Area approximately five miles south of the existing Wolf Creek Ski Area. This proposal would most likely offer more potential impacts to the wolverine because it would impact undeveloped habitat that currently may be suitable for the species. Surveys for wolverine and other rare forest carnivores were conducted in this area during 1990-91. Although no wolverine were detected, the area was noted as supporting probable occurrences in the past and contributing to undeveloped habitat that might support the species in the future (Thompson et al. 1992). Fragmentation and disturbance effects would most likely be more pronounced with the new development proposal.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: The action alternatives differ in the amount of solitude and undeveloped terrain potentially available for the wolverine. Alternative D offers the maximum amount of development with the expansion of DMR, the development of East Fork, and the expansion of the existing Wolf Creek Ski Area. In concert with the theme for Alternative C offers, no expansion of existing ski areas or new developments are associated. Alternative C therefore offers the highest probability of maintaining habitat options for species such as the wolverine that depend on solitude, little human disturbance, and undeveloped terrain. In regards to undeveloped habitat, Alternative B is similar to Alternative C in that it only allows for the expansion of DMR

but not the new development of East Fork or the existing Wolf Creek Ski Area. Assuming that the wolverine could potentially still inhabit the San Juan Mountains, Alternative B and C are similar for maintaining options for the conservation of the species.

Cumulative Effects: Although information on wolverine ecology remains sparse, there has been a considerable increase in research and attention concerning this species. Perhaps the most significant new information is the genetic work that displayed a reduced gene flow between the northern populations and those in the lower United States (Kyle and Strobeck 2002). This information suggests that wolverines in the contiguous United States display the characteristics of a fragmented population that, where they still exist, may be significantly at risk. Conversely, however, wolverines appear to have adequate source habitat available if they are able to recolonize it (Rowland et al. 2003). The San Juan Mountains of Colorado may fit these characteristics. Based on work from Idaho (Copeland 1996), a better understanding of denning habitat and the factors that may limit it now exists for the contiguous United States (Heinemeyer 2001, Rowland et al. 2003). Despite all the new information, however, the existence of the wolverine in Colorado remains unconfirmed.

Recent work by McGarigal et al. (2001) in the South San Mountains also mentions the "buffering effect" of the large tracts of Wilderness and other backcountry areas in relationship to more heavily managed areas at lower elevations. However, that analysis primarily evaluated the effects of timber and road management and did not specifically address the great increase in recreational activities in the alpine zone. Thus, although a considerable amount of wilderness and unframented habitat remains in the San Juan Mountains, recreational use on the Forest has increased to a point that previously undisturbed areas are now supporting various types of extreme sports and other recreational pursuits. These activities, as well as ski area expansions associated with some alternatives, have the potential to reduce the amount of solitude habitat available for species such as the wolverine. However, the existence of the species or the possible affects of this remains generally unknown.

The interagency Wolverine Conservation Program Charter finalized in August 2002 is already involved with additional wolverine research in the contiguous United States (Inman et al. 2002). This Charter is expected to provide substantial benefits to the conservation of the wolverine through its stated research and management efforts. If the wolverine still exists on the San Juan National Forest, this information may be of value to maintain habitat options for conservation and/or recolonization of the species in the future.

c) Determination: Assuming occupancy**,** Plan Revision alternatives A and D, "**may adversely impact individuals (wolverines), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** Alternative B and C could be expected to provide a "Beneficial Impact" to the species. The rationale for this determination is as follows:

- Although considered extirpated from the state of Colorado, circumstantial evidence suggests that a remnant population or individuals may still exist.
- The San Juan Mountains offer some of the best remaining options for locating the species, or perhaps undertaking a reintroduction program.
- Alternatives A and D provide for motorized recreational activities and ski area expansions that may further impact the species or reduce options for future reintroductions/recolonizations.
- Alternative B and C decrease the amount of potential disturbance beyond baseline conditions, and does not allow for further ski area expansions or developments.

River Otter *(FS sensitive)*

a) Natural History and Background: The river otter (*Lontra Canadensis)* is an elongate, robust mustelid with a thick, tapering tail. Historic range is throughout most of North America north of Mexico, except the extreme southwestern U.S. Extirpated from large areas of the interior U.S. following European colonization. Has been reintroduced in some parts of the range (e.g., Colorado, Virginia) (NatureServe 2005).They occur in the Colorado, Gunnison, Piedra, and Dolores rivers. Tracks and other sign of otters have also been found in the Poudre and Laramie drainages in Larimer County (NDIS 2005).

Thirteen river otters from Wisconsin were reintroduced into the Piedra River. Between 1988 and 1991, 28 river otters from Alaska, Oregon and California were reintroduced in the Dolores River. Dolores River otters seem to be reproducing and are distributed from the Colorado state line to Rico and on the San Miguel River. During

presence/absence surveys done in 2002 by the CDOW, the Piedra River otters were distributed through the Piedra River from Williams Reservoir to Navajo Reservoir. No otters were found on the Los Pinos River though reproduction was known to occur a few years previous. On the San Juan River, sign of one otter was sited. The Animas River and the Florida River are known to have otters but were not surveyed (Wait 2002). No methods for estimating populations have been successfully developed, and therefore no estimates of population numbers have been made.

The river otter inhabits streams, lakes, ponds, swamps, marshes, estuaries (in some areas), beaver flowages, exposed outer coast (Pacific Northwest, Alaska). When inactive, it occupies hollow logs, space under roots, log, or overhang, abandoned beaver lodge, dense thicket near water, or burrow of other animal; such sites also are used for rearing young. River otters may travel long distances overland, particularly in snow (NatureServe 2005). River otters inhabit riparian habitats that traverse a variety of other ecosystems ranging from semidesert shrublands to montane and subalpine forests. The species requires permanent water of relatively high quality and with an abundant food base of fish or crustaceans. Generally, streams of 10 CFS or higher are required to provide suitable habitat. Other habitat features that may be important include the presence of ice-free reaches of stream in winter, water depth, stream width, and suitable access to shoreline (NDIS 2005).

River otters feed opportunistically on aquatic animals, particularly fishes (mostly slow-moving, mid-size species), frogs, crayfish, turtles, insects, etc., sometimes birds and small mammals. In coastal waters eats marine species (Bowyer et al. 1995). Local/regional declines were caused by unregulated trapping and degradation of riverine/riparian habitat.

b) Effects Analysis: Plan Revision activities that could potentially influence the river otter primarily involve water management activities (i.e. water diversions, deletions), and wildlife management activities (i.e. watershed, riparian, and aquatic habitat improvements). Acid Rock Drainage from historic mining activities may also be limiting river otters in the higher portions of some drainages.

Alternative A: No Action

Direct/Indirect Effects: The northern river otter has been reintroduced into several river systems on SJPL. As evidenced by the continued expansion of river otters in southwestern Colorado, all activities that could influence wetlands or riparian habitats on the SJNF are managed in a manner intended to maintain or improve habitat conditions and water quality. Thus, the most influential activities on river otters probably involve private and/or inter-ownership activities such as human developments, acid rock drainage, and water management activities.

Water management activities such as water depletions authorized through special use permits may influence water quality and therefore river otter habitat. These activities are expected to continue in a similar manner under all alternatives and are managed in a manner to minimize influences of water quality. Reclamation of acid rock drainage areas is on-going and will also continue in a similar manner under all alternatives.

Wildlife management activities that improve watershed, riparian, and aquatic habitat may also benefit the river otter depending upon location. Planned outputs for these activities are similar for alternatives.

Although differences between alternatives are difficult to evaluate in regards to potential influences on river otters, it is possible that Alternative A does not provide as much potential habitat protection for the species as the Alternative B and C because it allows more indirect influences that could potentially influence water quality. Alternative A also does not identify as many water bodies for additional protections under special areas designations such as Wild and Scenic River corridors that may better control some human-associated impacts. Overall, however, otters continue to expand and the effect from all alternatives is expected to be secondary to other factors such as drought and private water management activities.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: All action alternatives are expected to allow the continued expansion of river otters into potential habitat on SJPL. However, alternative B and C allow for additional protective measures above baseline conditions that may indirectly benefit the river otter. Examples of these include better control of potential erosion from motorized vehicle use and more potential protection of riverine habitat from special area designations. Although continued expansion of river otters is also expected under Alternative D, this alternative may require more site-specific mitigation measures because it allows more active management.

Wildlife management activities that improve watershed, riparian, and aquatic habitat for the river otter is similar between the action alternatives. Similar benefits are therefore expected.

Cumulative Effects: Water management activities at locations such as McPhee Reservoir are recognized as an influential factor on river otters and their aquatic prey in the lower Dolores River system (Fitzgerald et al. 2004). These influences are probably more acute during drought conditions and autumn periods when water flows can be reduced below 10 cfs. However, otters continue to occupy the lower river system, navigate around the dam and through the reservoir, and have expanded their range to the headwaters of the upper Dolores River. Continued cooperation between state, private, and federal agencies concerning water management and reservoir operations is expected to reduce potential cumulative impacts from these activities on river otters and other aquatic species.

Acid rock drainage is recognized as a hazard to water quality and aquatic life in several places within the Colorado Mineral Belt which encompasses the Southern Rocky Mountains. Although this may occur naturally due to hydrothermal alteration, abandoned mine features contribute significantly to acidity and heavy metals at about 900 features on National Forest Systems land in Colorado (Sares et al. 2005). The headwaters of the Animas River are recognized as one of the priority areas in the state for remediation and reclamation, and interagency efforts are underway to correct these problems. However, complete reclamation of some sites will take many years to complete and/or be difficult to accomplish, and natural acid rock drainage may continue to limit otters in some stream reaches. Continued cooperation with other state and federal agencies and private land owners will be needed to alleviate these influences and further improve habitat conditions in some locations.

The river otter was also probably common in all the major river drainages in Colorado but was extirpated or nearly extirpated from the state by the early 1900's due to trapping and influences on habitat and water quality. From 1976-1991 about 115 river otters were reintroduced into Colorado, with 41 of these occurring in river systems on the SJNF. The persistence and distribution of otter sign provides evidence that river otters have greatly expanded since that time and have re-established populations. The increasing trend and distribution led the CDOW to downlist the river otter from a state endangered status to a threatened status in 2003. The status of the river otter has also improved throughout most of its range within the United States, with populations reported as stable in 19 states, increasing in 29 states, and unknown in 4 states.

Habitat conditions in most of the smaller perennial streams on the SJNF have continued to improve over time and now support increased populations of closely associated species such as beaver. The restoration and expansion of beaver has most likely resulted in an increasing trend in potential river otter habitat due to the close association between these species. Acid rock drainage and water management activities are probably the most influential activities to otters that remain in some locations on the SJNF. Overall, the habitat trend for river otters on the SJNF has most likely improved in most of the smaller stream systems while the larger water bodies and major river systems have remained static or changed individually since the initial reintroduction occurred in 1976. The continued expansion of the species suggests that no negative cumulative effects are occurring.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (river otters), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The northern river otter continues to expand in suitable riverine systems on SJPL since its initial reintroduction from 1976-1991. Additional population supplements are not needed.
- The primary activities influencing river otters revolve around water management and natural factors such as drought.
- Water management activities are managed to reduce impacts on aquatic species; however, reduced water flows have direct and indirect influences on prey species and habitat conditions.

Rocky Mountain Bighorn Sheep *(FS sensitive)*

a) Natural History and Background: Rocky Mountain bighorn sheep (*Ovis canadensis Canadensis)* is the only bighorn species occurring on National Forest System lands within SJPL. A herd of desert bighorn sheep are

located on the Dolores Field Office on BLM lands within SJPL and are not a BLM sensitive species. Rocky Mountain bighorns are distributed throughout the mountainous regions of western North America from British Columbia and Alberta south to northern New Mexico and central Arizona (Fitzgerald et al., 1994). Colorado has the largest number of bighorn sheep in the United States. In Colorado herds are widely scattered throughout the mountains and foothills of the State. Although classified as secure in Colorado, many regional sheep herds are vulnerable because they consist of small numbers (< 100 animals), are isolated from adjacent sheep populations, threatened by disease transmission from domestic livestock. National Forest System lands on SJPL include 5 herds S 15, S16, S28, S31, and the Animas Canyon herd all of which are considered at medium-risk of extirpation (Beecham et al., 2007).

Bighorn sheep are adapted to a wide variety of habitats across western North America ranging in elevation sea level to over 4,300 m. Current distribution is confined to scattered populations in open or semi-open, often precipitous, terrain characterized by a mix of steep or gentle slopes, broken cliffs, rock outcrops, and canyons and their adjacent river benches and mesa tops. Visibility is an important habitat variable for bighorn sheep, so much so that the structure and height of vegetation are probably more important than composition of plant species because high visibility facilitated the detection of predators. Key elements of winter range include low snow depth and wind-swept areas with sufficient forage and adjacent escape terrain for eluding predators (Beecham et al., 2007) In Colorado, mountain sheep prefer high visibility habitat dominated by grass, low shrubs, and rock cover, areas near open escape terrain, and topographic relief (Fitzgerald et al., 1994).

The bulk of its diet is grasses and grass-like plants, browse, and some forbs. At lower elevations browse appears to be the staple in winter. At higher elevations grasses and grass-like plants may dominate both summer and winter diets. Seasonally, mountain sheep may make relatively short migrations from summer to winter ranges, typically 5 to 15 km. Many populations affect this migration through a series of deliberate, short-distance moves using favored habitat along the way.

Mountain sheep breed in November and December in Colorado. Most young are born in May or June, peaking in mid-June (Fitzgerald et al., 1994). Escape terrain is critical for ewes during lambing to the extent they will sacrifice high quality forage for security (Beecham et al., 2007).

A variety of factors threaten the long-term viability of bighorn sheep in Region 2. Limiting factors to bighorn sheep herds include: deadly epizootics as a result of disease transmission from domestic goats and sheep and between bighorn herds during translocation projects; the loss of genetic variability in small herds; habitat deterioration, loss and fragmentation, human disturbance on critical winter and lambing ranges, competition for forage and space with livestock and other ungulate species; and cougar predation on adult female sheep in remnant or recently reintroduced herds (Beecham et al., 2007).

b) Effects Analysis: Plan Revision activities that could potentially influence the Rocky Mountain bighorn sheep primarily involve range management activities (i.e., domestic sheep grazing), and wildlife management activities (i.e. big game winter range improvements).

Alternative A: No Action

Direct/Indirect Effects: As of 2005, several different herds that supported an estimated 415 Rocky Mountain bighorn sheep occurred on the San Juan National Forest. There are several natural factors that could influence habitat conditions for bighorn sheep. However, a primary issue involves their high susceptibility to a wide variety of diseases and parasites, many of which have been contracted from domestic sheep (Geist 1971). Bacteria, primarily *Pasturella spp.*, (and resultant pneumonia) is the primary culprit that leads to bighorn sheep mortality in all age groups. The risk of disease transmission is impossible to eliminate when bighorn and domestic sheep occupy the same range area because male bighorns are attracted to domestic ewes and/or they utilize the same foraging or watering areas. Contacts between wild and domestic sheep have frequently resulted in massive die-offs of bighorns that represent a loss of many years of costly efforts to restore the species to its former range. The loss of genetic diversity and herd memory of historical migration routes may also be irreplaceable when attempting to restore bighorns after a massive die-off. Currently, there are no documented bighorn sheep die-offs on SJPL from contact with domestic sheep.

This analysis of bighorn sheep focuses on potential influences on bighorn sheep from domestic sheep grazing and efforts to maintain and improve their habitat. Differences in outputs associated with activities that may influence the species are displayed below in Table BE-8.

Table BE-8: Activities and Projected Outputs that could Potentially Influence the Rocky Mountain Bighorn Sheep, by Alternative.

Wildlife Management	Alternative A	Alternative B	Alternative C	Alternative D
* Restore or enhance big game winter range	2,000 ac.	2,000 ac.	2,000 ac.	2,000 ac.
* Livestock Grazing (Sheep AUMs Only)				
* Premitted AUMs (FS)	8,754	8,754	6,456	21,783
* Suitable Acres on Active Allotments (FS)	87,858	87,858	73,113	239,280

As displayed in Table BE-8, Alternative A and all action alternatives continue to allocate allotments to domestic sheep grazing. Alternative A maintains the same permitted numbers and area as Alternative B, currently set at 8,754 AUMs and 87,858 acres. Currently, there is some overlap between bighorn range and stocked sheep allotments. However, many of the historic domestic sheep allotments that overlap bighorn herd ranges have been maintained as vacant allotments for at least a decade, thereby reducing the probability of disease transmittal. It is possible that these vacant allotments could be filled under Alternative A. Although there is no documented case of disease transmittals from domestic sheep to bighorns on the PLC, it is possible that a risk would remain for such an event. Plan components and conservation measures to prevent these occurrences in Alternative A are similar in all action alternatives.

Wildlife habitat management to improve big game winter range is projected to occur on 2,000 acres during the life of the Plan Revision. This projection includes elk and other big game species as well as potential projects for bighorn sheep. Benefits can be expected on a site-specific basis.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-8, Alternative B maintains the same permitted numbers and area for domestic sheep as Alternative B, currently set at 8,754 AUMs and 87,858 acres. The exception to this would involve closures of several small allotments that are difficult to manage administratively. No difference in risk or protective measures concerning potential bighorn/domestic sheep interactions would occur as these closures are not directed at further minimizing potential conflicts.

Alternative C reduces sheep numbers and allotment area to 6,456 AUMs and 73,113 acres. This alternative would permanently close several sheep allotments, in part to further avoid potential conflicts with bighorn sheep. Although the risk of future contact between domestics and bighorn would not be completely eliminated, this alternative reduces the potential for a disease transmittal event.

Alternative D allows more livestock grazing than any other alternative, and increases sheep numbers and allotment area to 21,783 AUMs and 239,230 acres. All currently vacant sheep allotments could be filled under this alternative. Alternative D would therefore require more management attention to assure that domestics and bighorns do not intermix. However, this is difficult to achieve because both species will wander and could potentially come in contact.

As in Alternative A, wildlife habitat management to improve big game winter range is projected to occur on 2,000 acres during the life of the Plan Revision. This projection includes elk and other big game species as well as potential projects for bighorn sheep. Benefits can be expected on a site-specific basis.

Cumulative Effects: Both domestic and bighorn sheep have used SJPL for several decades. Currently, there are no documented cases of disease transmittals from domestic sheep to bighorns on the PLC. Management of bighorn sheep and domestic sheep in order to avoid physical interactions is often complex and potentially volatile issue. It is important that separation of the two species is maintained at all times; however, the distance needed to attain this can be different in each situation, and collaboration between all parties is needed to achieve this. Currently, the SJPL is working with other state, federal, and local partners to better identify where bighorns occur, where they wander, and how they might interact with other herds and domestics. In managing both domestic sheep and bighorns, the SJPL is using a nationally recognized collaborative process

for resolving bighorn/domestic sheep management conflicts. The approach outlined in the process has been incorporated into the management of domestic and bighorn sheep through the Plan design criteria and Plan components. It is anticipated that this approach will help Forest Service range and wildlife specialists work with interested individuals and organizations to develop site-specific solutions to potential conflicts amongst the species. This effort is expected to help reduce potential cumulative effects to bighorn sheep on SJPL. In all Plan Revision alternatives it is recognized that there is a need to avoid contact between domestic and bighorn sheep, and that this could result in the removal of domestic sheep and grazing allotment closures to domestic sheep use.

c) Determination: Based on this analysis**,** it is determined that Plan Revision alternatives A, B and D, "**may adversely impact individuals (bighorn sheep), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** Alternative C could be expected to provide a **"Beneficial Impact"** to the species. The rationale for this determination is as follows:

- Bighorn and domestic sheep ranges overlap on SJPL, therefore a risk of disease transmittal occurs in all alternatives.
- To date, there is no documented case of disease transmittals from domestics to bighorns on the SJPL. However, there is no known "safe distance" between the two species so the risk of a future transmittal cannot be discounted.
- All alternatives include similar conservation measures to reduce the risk of contact and disease transmittal.
- Alternative C may decrease the risk of contact between domestic and bighorn sheep because it specifically closes some sheep allotments to avoid potential conflicts.

Spotted Bat *(BLM and FS sensitive)*

a) Natural History and Background: The spotted bat (*Euderma maculatum)* occurs from south central British Columbia to southern Mexico. In Colorado, spotted bats occur in the western semidesert canyonlands (Armstrong et al. 1994). There is no information available on population trends for spotted bats at the Region, State, or Unit level (USDA Forest Service 2004f). They are generally found in such low abundances that reliable detection is problematic, much less the accurate estimates of trends. Spotted bats have been found on BLM lands near the Dolores River Canyon (K. Nickell, pers. com.).

The spotted bat is a desert specialist most often occupying rough, rocky, semiarid terrain (Adams 2003). It is often captured in open ponderosa pine woodlands (Adams 2003). Rocky cliffs are necessary to provide suitable cracks and crevices for roosting, as is access to water (Fitzgerald et al. 1994). The species roosts by day in rock crevices located on high cliffs (Watkins 1997, cited in Adams 2003). Specific characteristics of the roost are not known, however (Western Bat Working Group 1998). The dependency of rock-faced cliff roosting habitat limits the spotted bat to very small geographic areas with specific geologic features (Luce 2003). Foraging begins about one hour after dark and ends just before sunrise, and this species tends to forage 10-15 meters (33-50 feet) above the ground at or above treetops. Foraging has been observed in forest openings, pinyon-juniper woodlands, large riverine/riparian habitats, riparian habitat associated with small to mid-sized streams in narrow canyons, wetlands, meadows, and agricultural fields (Western Bat Working Group 1998). Its diet appears to consist of moths, but grasshoppers, beetles, katydids, and perhaps smaller insects may be taken (Fitzgerald et al. 1994).

The wintering habits of the spotted bat in the northern part of its range are not well understood. Specimens taken in September and October may indicate post-breeding wandering but could be elevational movement towards winter range (Luce 2003). Very little is known of reproductive patterns in this bat. Judging from lactation records, young are born from mid-June until early July in Arizona (Hoffmeister 1986, cited in Adams 2003).

Historically, the spotted bat has endured little impact from human disturbance because its roosts are remote, but creation and subsequent flooding of reservoirs may eliminate suitable roosting habitat. Recreational rock climbing also may disturb bats in local situations (Luce 2003). Large-scale pesticide programs to control Mormon crickets and grasshoppers could affect this species by reducing the availability of prey (Luce 2003). Loss of foraging habitats because of activities such as livestock grazing may also affect this bat (Fitzgerald et al. 1994). Disturbance to hibernacula in the winter months during temperature extremes could be limiting.

b) Effects Analysis: Plan Revision activities that could potentially influence the spotted bat primarily involve fluid minerals development and, possibly, range management activities (i.e., water developments). Non-motorized recreation (i.e. rock climbing) could theoretically influence the species if climbing activities happened to disturb roosting individuals within rock crevices. However, there is no information that rock climbing is a risk to the species and assessing that activity would be purely speculative at this time.

Alternative A: No Action

Direct/Indirect Effects: The spotted bat is a desert species that is currently known to occur sporadically on the far western portion of the SJPL. Its range could therefore overlap planned activities such as oil and gas development in the Paradox Basin. This overlap would primarily involve activities planned within the Paradox Basin. Differences in projected outputs for fluid minerals by alternative are displayed below in Table BE-9.

Table BE-9: Activities and Projected Outputs that could Potentially Influence the Spotted Bat by Alternative.

Fluid Minerals Acreage Available & Stipulated	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
* Standard Lease Terms	1,377,039	488,591	488,591	502,938
* New Rd Construction/ Fluid Minerals (miles)	70	70	70	70
* New Wells Anticiapted w/i the Paradox Basin	136	137	137	137
* Livestock Grazing (Cattle AUMs Only)				
* Premitted AUMs (FS)	115,312	115,312	112,554	117,791

In regards to activities that could potentially influence the spotted bat, there is little difference between alternatives in regards to the projected amount of new well developments within the Paradox Basin. However, Alternative A offers fewer protective lease stipulations than any of the action alternatives, with approximately 700,000 to 746,000 fewer lease acres stipulated with a No Surface Occupancy (NSO). More surface disturbance may therefore be associated with the no action. Under the "no new lease" scenario only the existing lease areas have potential for development under this alternative resulting in fewer acres of potential influence to the species.

As with other cliff/rock associated bat species, Alternative A could theoretically offer a greater risk of impact because it is associated with greater development and fewer restrictive protective measures. Because the spotted bat primarily roosts in rock crevices in high cliff faces, it is unlikely that impacts to primary reproductive or roosting habitat would occur. If overlaps did occur, however, there may be a greater risk of impact to this species because it appears to reuse tradition rock crevice roost sites regularly (Wai-Ping and Fenton 1989). Use of tress and other vegetation as roost sites appears to be avoided by spotted bats. The species also does not appear to utilize mines or caves.

Benefits to this species could occur from water pond developments associated with livestock grazing. This activity has the potential to create valuable drinking water sites important to many bat species. Potential benefits are expected to be similar in all alternatives.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-9, Alternative B, C and D offer fewer potential impacts from oil and gas development because, although the number of wells does not decrease, they offer fewer acres of potential lease area across SJPL. Most significantly, however, the action alternatives offer greater protective lease stipulations, particularly NSOs. The greater amount of protective lease stipulations suggest that fewer potential impacts to rock and cliff-associated bats may be associated with the action alternatives. Because of this species rarity, however, all potential impacts are expected to be minimal. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

Cumulative Effects: The Reasonable Foreseeable Development (RFD) scenario for fluid minerals development across SJPL, by alternative, is displayed in Table BE-4b. The reader is referred to that table as potential cumulative effects on the spotted bat are expected to be similar as those described for the big free-tailed bat. While Alternatives A through D include both current and projected new leases, the "no new lease" scenario only includes current leases under each of the Alternatives.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (spotted bat), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The spotted bat is an uncommon to rare species on San Juan Public Lands that may overlap some Plan activities in lower elevation vegetation types.
- Most potential impacts on this species are probably unlikely because of its roosting behavior. However, all potential impacts cannot be completely discounted because roost sites are not known and some Plan activities could disturb rocky areas.
- More information on use of pinyon-juniper habitat by this and other species is recommended because of fuels reduction activities that target this vegetation type.

Townsend's big-eared bat *(BLM and FS sensitive)*

a) Natural History and Background: The Townsend's big-eared bat (*Corynorhinus townsendii)* occurs throughout much of western North America, with some isolated populations in the eastern United States (Adams 2003). It occurs in all the Rocky Mountain States, but does not occur in north-central and northeastern Montana. In Colorado, populations are restricted to the western, central, and southeastern parts of the state (Armstrong et al. 1994). Although overall trends for Townsend's big-eared bat are not known, there are a number of reports of declines or complete extinctions at historic sites throughout the western range of the species (Pierson et al. 1999).

One of the largest winter roost sites in Colorado was found in the early 1990s at a patented mine on the Mancos-Dolores District of the SJPL. CDOW biologists currently monitor the site. Elsewhere, CDOW volunteers conducted exit counts and trapped bats at various abandoned mines in La Plata Canyon during the early 1990s. No Townsend's big-eared bats were recorded during these surveys, nor have there been any other confirmed reports of this species elsewhere on the SJPL.

Increasing human activity at natural cave sites and closure of mines through the Inactive Mines Program indicates a decreasing trend in available habitat for the species (USDA Forest Service 2004g). There is no population trend information available at the Region, State, or Unit level.

In Colorado, this species is known predominately from abandoned mines, and it occurs in saxicoline brush, sagebrush, semidesert scrub, pinyon-juniper woodlands, ponderosa pine woodlands, and montane forests (Adams 1990 cited in Adams 2003, and Armstrong et al. 1994). Physical habitat, especially the presence of caves or mines suitable for day and night roosting and for hibernation, is probably more important than the vegetative characteristics (Armstrong et al. 1994). Roosting habitats consist most frequently of caves and abandoned mines, but also include buildings, bridges, rock crevices, and hollow trees. They do not move long distances from

hibernacula to summer roosts nor do they move or forage far from their day roosts. During the summer, single individuals may be encountered hanging in cracks of cliffs.

The bat breeds in late fall and winters in colonies ranging in size from a single individual to several hundred (Fitzgerald et al. 1994). Females assemble into nursery colonies of a few to several hundred individuals, forming dense clusters to take advantage of shared metabolic heat. Warm nursery sites are essential for reproductive success (Humphrey and Kunz 1976 cited in Fitzgerald et al. 1994). At summer roosts, individuals do not hide in cracks or crevices, but rather hang exposed from the roof or walls of the chamber, taking flight if disturbed.

During hibernation, this species is sensitive to fluctuations in temperature and humidity and moves in response to them (Fitzgerald et al. 1994). The availability of hibernacula with the appropriate stable temperature and humidity appears to be a limiting factor for this bat. Furthermore, they are easily disturbed and will leave caves or mines where human harassment occurs.

This species is a moth specialist, with more than 90 percent of its diet composed of moths (Western Bat Working Group 1998). Caddis flies also appear to be a staple of their diet (Freeman 1984). This species often forages over water, along the margins of vegetation, and over sagebrush (Fitzgerald et al. 1994).

The primary threat is disturbance or destruction of roost sites caused by recreational caving, mine reclamation, and renewed mining in historical districts. This species is sensitive to disturbance and has been documented to abandon roost sites after human visitation. Disturbance to hibernacula in the winter months during temperature extremes may be critical. Both roosting and foraging habitats may be affected by timber harvest practices. In addition, pesticide spraying in forested and agricultural areas may affect the prey base (Western Bat Working Group 1998).

b) Effects Analysis: Plan Revision activities that could potentially influence Townsend's big-eared bat primarily involve fluid minerals development and wildlife management (i.e. abandoned mine closures). Although big-eared bats may occasionally utilize some trees as day roosts, it is primarily a cave-dwelling bat and this analysis will focus on that important habitat component.

Alternative A: No Action

Direct/Indirect Effects: Direct/Indirect Effects: Townsend's big-eared is uncommon on SJPL but occurs sporadically at lower elevations. Undisturbed cave and mine habitat is the primary limiting factor for this species. Because natural caves could occur in rock formations, it is possible that potential habitat could overlap planned activities such as oil and gas development. Differences in projected outputs for fluid minerals by alternative are displayed below in Table BE-10.

Table BE-10: Activities and Projected Outputs that could Potentially Influence Townsend's big-eared Bat, by Alternative.

Fluid Minerals Acreage Available & Stipulated	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
* Standard Lease Terms	1,377,039	488,591	488,591	502,938
Wildlife Management				
* Install Structures to Maintain Bat Habitat on Mine Closures	As Opportunities Arise	same	same	same

In regards to activities that could potentially influence Townsend's big-eared bat, Alternative A offers more acres open to leasing than any of the action alternatives across SJPL. Alternative A also offers fewer protective lease stipulations than any of the action alternatives, with approximately 700,000 to 746,000 fewer lease acres stipulated with a No Surface Occupancy (NSO). Under the "no new lease" scenario only the existing lease areas have potential for development under this alternative resulting in fewer acres of potential influence to the species.

Alternative A could theoretically offer a greater risk of impacting Townsend's big-eared bat because it is associated with greater development and fewer restrictive protective measures. It is possible that rock formations which function as natural caves could be disturbed by this activity. However, most caves and mines are obvious features on the landscape and conservation measures are in place to protect them. Minimal influences on Townsend's big-eared bat are therefore expected.

It is predicted in the Plan Revision that all alternatives will provide the same wildlife management actions in regards to mine closure gates for bats as opportunities arise. Thus, all alternatives install the same quantity and quality of mine closure bat gates over the life of the Plan. These closures are coordinated with the Colorado Division of Wildlife and the Department of Minerals and Geology and will provide undisturbed habitat for mine-associated bat species while also addressing human safety and health issues.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-10, Alternative B, C and D offer fewer potential impacts from oil and gas development because they offer fewer acres of potential lease area across SJPL. The action alternatives also offer greater protective lease stipulations, such as NSO's. The lesser amount of available lease acres and greater amount of protective lease stipulations suggest that fewer potential impacts to bats and/or natural cave features may be associated with the action alternatives. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

There is no difference among the Plan revision alternatives in regards to implementation of wildlife management activities that may provide bat gates on abandoned mines used by bat species. This activity is expected to provide the highest benefit to Townsend's big-eared bats because they commonly reuse traditional roost and hibernacula.

Cumulative Effects: The Reasonable Foreseeable Development (RFD) scenario for fluid minerals development, by alternative, is displayed below in Table BE-4b. Readers are referred to that table for potential cumulative effects dealing with fluid minerals. While Alternatives A through D include both current and projected new leases, the "no new lease" scenario only includes current leases under each of the Alternatives. Mine closures such as those coordinated through the Bats and Inactive Mines Program (BIMP) will continue to provide the highest benefits for this species and reduce cumulative impacts.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (Townsend's big-eared bats), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The single-most important habitat element for the Townsend's big-eared bat on SJPL is most likely suitable mines and caves that provide reproductive habitat. Protection of these features is similarly associated with all alternatives.
- All potential impacts cannot be completely discounted because some Plan activities may occasionally disturb natural cave sites or impact other habitat features.

Yuma Myotis *(BLM sensitive)*

a) Natural History and Background: The Yuma myotis (*Myotis yumanensis)* occurs from southwestern British Columbia through the western United States and into central Mexico. In the Rocky Mountain region, it lives throughout Arizona and New Mexico, in south-central Colorado in a southwest-north-central band across Utah, as well as in parts of western and central Montana and across much of Idaho (Adams 2003).

The species has been reported on BLM lands near Dolores, Colorado where it has been detected using canyon habitat along the Dolores River (K. Nickell, pers. comm.). Roosting habitat is limited to bridges, buildings, and snags given the absence of cliffs, caves, and mines on BLM lands.

Yuma myotis, no matter the habitat, occur where there is open water, and often in areas that are treeless (Adams 2003). The species diet includes beetles and soft-bodied insects such as flies, termites, moths, and mayflies. Foraging occurs over the surface of streams and ponds. In Colorado, the Yuma myotis occurs in riparian woodlands, semidesert shrub, and pinyon-juniper woodlands (Armstrong et al. 1994). The species roosts in bridges, building, cliff crevices, caves, mines, and trees (Bogan et al. 2003).

Maternity colonies are formed in buildings, caves, and mines, and under bridges, sometimes in abandoned cliff-swallow nests, and are abandoned quickly if disturbed (Adams 2003). A single young is born in late May to July (Fitzgerald et al. 1994). Winter habitats are poorly documented, but the animals may hibernate near their summer range (Fitzgerald et al. 1994).

As with many other bat species, human disturbance to roost sites appear to be an important limiting factor. Disturbance to maternity roosts from May through July may be limiting.

b) Effects Analysis: Plan Revision activities that could potentially influence the Yuma myotis bat primarily involve fluid minerals development, wildlife management (i.e. abandoned mine closures), range management (i.e. livestock grazing, water developments) and, possibly fuels treatment activities.

Alternative A: No Action

Direct/Indirect Effects: The yuma myotis bat occurs sporadically over much of the western portion of the SJPL. Its range could therefore overlap planned activities such as oil and gas development within the Paradox Basin and possibly fuels management activities. Water developments associated with livestock grazing may also be beneficial to the species. Differences in outputs associated with these activities are displayed below in Table BE-11.

Table BE-11: Activities and Projected Outputs that could Potentially Influence the Yuma Myotis Bat, by Alternative.

Fluid Minerals Acreage Available & Stipulated	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
* Standard Lease Terms	1,377,039	488,591	488,591	502,938
* New Wells Anticiapted w/i the Paradox Basin	136	137	137	137
Wildlife Management				
* Install Structures to Maintain Bat Habitat on Mine Closures	As Opportunities Arise	same	same	same
Fuels Treatment Acres (Suitable Cover Types Only)				
* Pinyon/Juniper	1000 Mastication	1000 Mastication	1000 Mastication	1100 Mastication
Livestock Grazing (Cattle AUMs Only)				
* Premitted AUMs (BLM)	22,101	22,100	16,530	22,290

As noted for other bat species, Alternative A offers more acres available to leasing across SJPL than any of the action alternatives. Alternative A also offers fewer protective lease stipulations than any of the action alternatives, with approximately 700,000 to 746,000 fewer lease acres stipulated with a No Surface Occupancy (NSO). A greater likelihood of impacts may therefore be associated with no action. Under the "no new lease" scenario only the existing lease areas have potential for development under this alternative resulting in fewer acres of potential influence to the species.

Alternative A offers similar fuels treatments as the other alternatives in the pinyon-juniper forest types that are most often utilized by the yuma myotis. However, the yuma myotis uncommonly uses trees and snags for day roosts, and mastication of small underbrush sis not expected to have any measurable influences on the primary habitat components for this species.

Alternative A provides the same wildlife management actions in regards to mine closures with bat gates as opportunities arise. Thus, all alternatives install the same quantity and quality of mine closure bat gates over the life of the Plan. As with over cave-dwelling bat species, this action could be quite beneficial to the yuma myotis because it readily roosts in abandoned mines. Alternative A also retains livestock grazing areas that may contribute to drinking areas through pond developments.

In general, Alternative A offers a slightly higher risk of negative influences on some potential habitat components for the yuma myotis because it allocates a greater amount of area to active management. However, potential impacts are expected to be minimal because abandoned mines and cave habitat represent

one of the most significant landscape features for this species and all alternatives include active wildlife management goals that target important underground roost sites for closure and protection. Plan Components are also expected to reduce impacts to snags and other vegetation where active management occurs.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-5a, the action alternatives offer fewer potential impacts from oil and gas development because they offer fewer acres of potential lease area across SJPL. The action alternatives also offer greater protective lease stipulations, particularly in regards to a NSO stipulation. The fewer amounts of available lease acres and greater amount of protective lease stipulations suggest that fewer potential impacts to bats and/or important habitat structures may be associated with the action alternatives. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species. As with other bat species, however, some potential impacts such as tree removals may occur during development of oil and gas wells or facilities. Tree removal may affect individual yuma myotis bats, but is not expected to be a major impact to the species because of its affinities for rocks and caves.

The protection of abandoned mines with bat gates could be the single-most important Plan output in regards to conservation of the yuma myotis because it frequently utilizes mines and caves for reproductive habitat. There is no difference among the Plan revision alternatives in regards to implementation of wildlife management activities that may provide bat gates on abandoned mines used by bat species. The same potential benefits are associated with each action alternative.

The action alternatives vary in the amount of livestock AUMs permitted, with no change in Alternative B, a slight increase in Alternative D, and a decrease in Alternative C. It is assumed that all alternatives offer similar potential for water developments within the range of the yuma myotis.

Cumulative Effects: In regards to activities that could potentially influence the yuma myotis, the cumulative effects analysis for the big free-tailed bat and the fringed myotis most accurately portray this information. Please refer to these species for this information. The overall cumulative effects to this species are expected to be minimal because it is not as strongly associated with dry forest vegetation for roost sites. Cave and abandoned mine management are expected to be the most significant management activities for the conservation of this species.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (yuma myotis bats), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The yuma myotis is most commonly associated with semi-desert shubland and rock canyon areas that are not subject to intensive management.
- The yuma myotis has a weak affinity for pinyon-juniper vegetation for day roosts, but may occasionally utilize snag habitat within these forest types.
- Cave management may be the most important factor in regards to conservation of this species.

Birds

American Bittern *(FS sensitive)*

a) Natural History and Background: The American bittern (*Botaurus lentiginosus)* is a migratory species that breeds in North America and winters in the southern U.S and Mexico. The American bittern breeds in freshwater wetlands throughout the middle and northern portion of the United States, and most of Canada, wintering in the Southern United States and Mesoamerica (Gibbs and Reid 1992). Its breeding range is from the southern Northwest Territories, concentrates in Canada, and extends south through the Great Plains through northern Utah, Nevada, and south-central California. On the east coast of the United States it extends from Maine to South Carolina (National Geographic Society 1987 *fr*. Dechant et al 2001). It is not common in Colorado (less than five documented sightings per year as noted by Dechant et al 2001), and due to lack of overall data on this species, and perhaps because of its secretive nature, accurate population distribution is difficult to substantiate.

The San Juan National Forest has performed no formal surveys for this species, but it is considered rare here. The Durango Bird Club (1988 *fr*. Andrews and Righter 1992) noted the American bittern was reported to have nested at Durango, Colorado in La Plata County, but it is rarely observed there. Unconfirmed vocalizations were detected on two separate occasions in 2000 in the wetlands below Turtle Lake in the Falls Creek area on the Columbine District.

American bitterns prefer the edges of freshwater shorelines with tall, emergent vegetation (Gibbs and Reid 1992, Yanishevsky and Petring-Rupp 1998). Throughout their breeding habitat and migratory range, they prefer marshes and wetlands. They have been found in wetlands of all sizes ranging from 0.1-1,000 hectares (Gibbs and Reid 1992, BCME 1998), but they prefer larger wetlands (Gibbs and Reid 1992) and tend to prefer shallow water, less than approximately four inches, so that they can stand (Yanishevsky and Petring-Rupp 1998). Foraging habitat is often vegetation fringes and shorelines, and stands of older, dense, or dry vegetation are seemingly avoided (Gibbs and Reid 1992).

The American bittern, a solitary forager, stalks wetlands for its most common foods, which are generally any small animal found in a marsh. These include insects, frogs, fish, snakes, meadow mice, and salamanders (Yaeger 1998, Gibbs and Reid 1992). Adults usually swallow their prey whole, but will crush larger vertebrates and crustaceans (ibid), or remove dorsal fins and pectoral spines of fish prior to swallowing (Forbush 1927 *fr*. Gibbs and Reid 1992).

The loss of wetlands disrupts breeding grounds and foraging habitat. Reduced size of wetlands also substantially alters habitat because the American bittern prefers large wetlands to small ones (Gibbs and Reid 1992) and habitats that are not isolated from other wetland habitats (Dechant 2001). The main cause of population declines has undoubtedly been the loss of habitat (ibid). Habitat fragmentation, pollution, and degradation can result in habitat loss. Other factors may include weather, nest predation, nest parasitism, human disturbance, and hunting.

b) Effects Analysis: Plan Revision activities that could potentially influence the American bittern river primarily involve water management and wildlife management activities (i.e. watershed, riparian, and aquatic habitat improvements).

Alternative A: No Action

Direct/Indirect Effects: No direct or indirect effects on the American bittern are expected from the no action alternative because occurrence of the species is considered incidental to rare. Suitable habitat is for this species on National Forest System lands is limited, with no breeding or local populations confirmed on NFS lands within the planning area.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: No direct or indirect effects on the American bittern are expected from implementation of any of the action alternatives because occurrence of this species is considered incidental to rare. Suitable habitat is for this species on National Forest System lands is limited, with no breeding or local populations confirmed on NFS lands within the planning area.

Cumulative Effects: No specific plan components have been developed for the American bittern because it is not known to occur on the San Juan National Forest. Plan components and regulations specific to the management of wetlands for other species is expected to alleviate any potential cumulative effects and contribute to favorable habitat conditions for any individual bitterns that may happen upon SJPL.

c) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the American bittern or its primary habitat. The rationale for this determination is as follows:

- The American bitter is considered accidental or extremely rare on SJPL.
- Limited habitat occurs on SJPL.
- Wetland habitats utilized by species such as the American bittern are protected by numerous laws, Plan components, and conservation measures.

American Peregrine Falcon *(BLM and FS sensitive)*

a) Natural History and Background: The Peregrine falcon (*Falco peregrinus anatum)* is a grayish, medium sized raptor with characteristics common to most other falcons, including conspicuously toothed and notched bill, pointed wings and narrow tail. The male approximates the size of an American crow while the female is more comparable in size to the Common raven (OSU 2001). It is distinguished from the similarly sized prairie falcon by its typically slate gray color and its heavy "sideburns" or "moustache", as well as its uniformly barred and spotted light underbody and wings (Peterson 1990). The prairie falcon tends to be sandy in color with a light stripe over the eyes, much narrower moustache, and blackish "underarms" when viewed in flight (ibid.).

The peregrine falcon breeds on every continent excluding Antarctica (Hickey 1969, Craig 1986). The three subspecies occurring in North America occupy relatively distinct geographical regions. The North American tundra species (*Falco peregrinus tundruis*) breeds in the artic tundra then migrates as far as Argentina during the winter (Craig 1986). *F.p. pealei* resides in the Pacific coastal regions from the Aleutian Islands to northern Washington. This subspecies is generally non-migratory during the winter. *F.p .anatum* (that found on the San Juan National Forest) has the most extensive breeding range of the subspecies in North American, extending from the taiga south through the eastern and western United States to northern Mexico. Its historic breeding range excludes the central and extreme southeast portion of the U.S, as well as much of central Canada. It exhibits similar migrational habits as that of the tundra species with the exception of the central Rocky Mountain population, which only distributes to central Mexico (ibid). *F.p. anatum* residing in the Southwest and southern California tend to remain sedentary year-round or only move relatively short distances from their breeding grounds.

The species was nearly extirpated from the state of Colorado in the late 1970's, but has since to recovered to more than 100 known breeding pairs. There are 14 breeding pairs known to occur on or near the San Juan Public Lands, with many of these sites having been continually occupied since the mid-1980's.

In the western U.S. breeding grounds for the peregrine falcon most commonly occur in mountainous areas near water sources (USDI 1977). Peregrines prefer sites within 400-1000 m. (1300-2300 ft.) of perennial or ephemeral water (Pagel 1995). The preference for water features in proximity to nest sites is probably associated with the peregrine's prey base (Johnsgard 1990). Cliff structures are most often chosen for nest sites and cliffs are the only sites known in Colorado, but ground nesting has been commonly documented in most arctic areas. On the SJPL and throughout Colorado, breeding territories are found almost exclusively on high on the walls of tall cliffs in river gorges and along mountainsides (Craig 1986). Typical nesting locations in Colorado range from 4,500-9,000 feet (CPIF 2002) but, on the SJPL exceed 10,500 feet at several sites. A definite preference is noted for southern facing, inaccessible cliffs with multiple ledges, which are used for nesting, roosting, eating, and food transfer (USDI 1977). The preference for a southern exposure tends to increase with increasing latitude (ibid). Vertical rise on cliff faces generally exceed 100 feet with typical cliffs ranging between 200-300 feet (ibid.), but on the SJNF cliff faces average greater than 300 feet and exceed 600 feet at a number of sites. Preferred cliffs generally rise high above the adjacent landscape and offer a good vantage point for prey and predators.

The peregrine hunts over a variety of habitat types and uses large hunting territories, extending to a radius of 12 to 18 miles from its nest site (Craig 1986). However, its hunting range is often skewed to favor watercourses (Towry 1984). Preferred hunting habitats include meadows and large open parks, river bottoms, marshes, lakes, cropland and other features that attract abundant bird life (USDI 1977). Foraging habitat often includes lookout perches on cliffs or tall trees and snags (Craig 1986). Suitable breeding habitat for the peregrine falcon is present on all Districts of the Forest, and occupied sites occur on nearly all the major drainages (Dolores, Animas, Pine, Piedra, and San Juan Rivers).

Peregrine falcons are primarily aerial hunters of a wide variety of avian species (USDI 1977). Although small to medium size passerines make up the primary diet of peregrines, they may also occasionally take larger prey such as waterfowl (NatureServe 2005). In addition to avian prey, peregrines may rarely take small mammals, such as bats and small rodents, and even lizards (ibid.). Young recently out of the nest may occasionally prey on insects, and migrating falcons are often observed catching and eating migrating dragonflies.

Limiting factors include limited suitable nesting habitat, prey availability, fragmentation of hunting territories, limited recruitment of young into the population, weather, predation, competition, sensitivity to pesticides,

parasites and disease, and sensitivity to human disturbance. Breeding sites on the SJPL are usually occupied March through August.

b) Effects Analysis: Plan Revision activities that could potentially influence the peregrine falcon primarily involve motorized and non-motorized recreation (i.e. rock climbing). Riparian management activities could potentially improve prey habitat for the falcon.

Alternative A: No Action

Direct/Indirect Effects: The peregrine falcon was recently removed from the list of federally Threatened and Endangered species. Its recurring occupancy of cliff structures as nest sites on the SJPL suggests that local populations could be considered secure. Although nest sites are generally inaccessible to humans, potential disturbance at nest sites are possible. Differences in outputs associated with these activities are displayed below in Table BE-12.

Table BE-12: Activities and Projected Outputs that could Potentially Influence the peregrine falcon, by Alternative.

Motorized recreation (Acres, Summer Travel)	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	same as winter	same as winter	same as winter
Riparian & Watershed Improvements	152 ac.	152 ac.	410 ac.	179 ac.

Existing conditions have recovered the peregrine falcon to the point that it has been delisted from the Endangered Species Act. Alternative A is expected to continue this trend because most nest sites are inaccessible to human impacts. However, it is possible that Alternative A provides a higher risk of disturbance to individuals because there is more "suitable opportunity" land for motorized travel. A higher amount of travel and human activity area could potentially disturb peregrine falcons while they are nesting.

Rock climbing activities also have the potential to disturb falcons if the activity occurs near nest sites. Although rock climbing is a popular sport on SJPL, there is no evidence to suggest that it is currently influencing nest productivity or causing disturbances.

Both Alternative A and B offer the same amount of riparian habitat improvement over the life of the Plan. These activities may benefit prey species if it occurs in areas where falcons forage. Alternative A does not provide as many acres of watershed improvement as Alternatives C and D.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: All action alternatives reduce potential impacts from motorized travel in a similar manner, with most road access restricted to current routes and trails. Although travel impacts to individual falcons may still occur, it is likely that these travel management actions will reduce potential disturbances to nesting falcons.

Potential influences from rock climbing are not expected to be different under the action alternatives. Site-specific management and protection of nest sites will occur.

Alternative C and D offer slightly more acres of watershed and riparian improvement activities than Alternative B. This could potentially have a slightly greater benefit to prey species if the actions occur near falcon nest sites.

Cumulative Effects: The At least 31 peregrine eyries were known to occur historically in Colorado (U.S. Fish and Wildlife 1984). Dramatic population decreases in the United Sates led the U.S. Fish and Wildlife Service to list the American peregrine falcon as endangered in October of 1970. This listing was primarily due to decreased reproduction caused by eggshell thinning from DDE metabolized from avian prey contaminated by DDT (USDI Fish and Wildlife Service 2003). By 1974, Enderson and Craig (1974) estimated that there had been a 50 percent reduction in nesting peregrine falcons in the state. By 1998, however, peregrines in Colorado occupied 90 of 107 known nesting sites. Seventy-six of the sites were occupied by breeding pairs that produced 157 young (USDI Fish and Wildlife Service 2003).

The peregrine falcon was delisted on August 25, 1999 as a result of reintroduction efforts and a comeback after the banning of DDT (USDI Fish and Wildlife Service 2003). From 1999 through 2001, peregrine falcons were known to occupy 134 territories in Colorado at least once (USDI Fish and Wildlife Service 2003). A post-delisting monitoring plan has been developed that will monitor at least 72 of these territories every three years to determine occupancy, nest success, and, if feasible, productivity (USDI Fish and Wildlife Service 2003). Some of these sites occur on SJPL. Recovery of the peregrine falcon is expected to continue with no cumulative effects identified from activities planned on SJPL.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (peregrine falcons), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- Persistent populations of the peregrine falcon occur on the SJNF and the species has been declared recovered throughout the contiguous United States.
- Minimal influences from human disturbances are expected because of nest site inaccessibility.
- All potential impacts to individuals cannot be completely discounted because of some planned activities such as motorized travel, rock climbing, and other recreational pursuits.

American Three-toed Woodpecker *(FS sensitive)*

a) Natural History and Background: The American three-toed woodpecker (*Picoides dorsalis)* is a medium-sized white and black woodpecker that inhabits boreal and montane forests of North America and Europe (Leonard 2001). It is the only woodpecker that is common to both the Old and New Worlds and is the most northward occurring woodpecker (ibid.). As its name implies, it has three rather than the usual four toes, a characteristic it shares with the black-backed woodpecker, a closely related species (Bock and Bock 1974). It can be distinguished from other black and white woodpeckers by a relatively large yellow crown patch.

The three-toed woodpecker occurs in North America from northwestern Alaska to Newfoundland, south locally to southeastern Oregon, northern New England, and in the Rocky Mountains to south-central New Mexico and central Arizona. It is an uncommon year-round resident of southwestern Colorado (Durango Bird Club 1992). Schultz (2002, pers. comm.) considers this species to be well distributed at low densities across the higher elevations in mature spruce-fir forest types of the San Juan National Forest.

The three-toed woodpecker is known to be opportunistic and abundant during and after bark beetle outbreaks, but is usually uncommon and relatively inconspicuous (Bock and Bock 1974). Bent (1939) reported it as not common anywhere nor evenly distributed throughout its range and confined to certain limited and favorable localities. The numerical response of this species to beetle infestations exceeds all other sympatric woodpeckers (Koplin 1969). The TTW is a year-round resident in the mountains of Colorado. Across its range, and seasonally, the TTW inhabits a variety of habitats. However, it appears to be strongly associated with spruce forests throughout much of its range, including Colorado and the SJPL (Bock and Bock 1974, Andrews and Righter 1992). Although it is primarily an inhabitant of spruce-fir forests in Colorado, it may also occur in ponderosa pine, mixed conifer and lodgepole pine forests, especially in response to high insect populations resulting from disturbances, such as fire, disease or windthrow. It may also occasionally be found in aspen forests. Its summer elevational range is 8,000 feet to treeline, but in winter it may be found at slightly lower elevations.

Approximately 75 percent of the summer diet consists of insects, especially beetles and wood-boring larvae, while the winter diet is 99 percent insects, primarily larvae of the spruce beetle (Towry 1984). Other foods include ants, insect larvae, fruits, mast, and cambium. They may require at least 1,200 to 2,200 larvae per day in winter to

satisfy their caloric needs when air temperatures are at freezing (Koplin 1969). They primarily feed by scaling bark rather than pecking, which accounts for their preference for conifers with scaly bark.

This species depends on snags or diseased live trees for nesting, roosting, and an adequate source of food such as bark beetles or woodborers. Larvae of the spruce beetle are a critical source of food during the winter. When substantial numbers of bark beetles are not available, the three-toed woodpecker is uncommon throughout its range, particularly in intensively managed forests.

Snags suitable for cavitation are an important component of suitable TTW habitat. Recently dead and declining trees are considered critical for foraging (Leonard 2001). Other factors include habitat fragmentation, low productivity, weather, predation, and competition.

b) Effects Analysis: Plan Revision activities that could potentially influence the American three-toed woodpecker primarily involve timber harvest and Wildland Fire Use activities.

Alternative A: No Action

Direct/Indirect Effects: The American three-toed woodpecker is considered uncommon to fairly common in suitable primary habitat across the upper elevations of the SJNF, primarily in the mid to late successional spruce-fir and cool-moist mixed-conifer forest types. Although alterations have occurred due to past timber harvest, approximately 604,230 acres of late-successional habitat presently remains on the SJNF. Approximately 447,350 acres (74%) of this consists primarily of spruce-fir while another 156,880 acres (26%) consists of cool-moist mixed-conifer forest. Approximately 80% of the spruce-fir and 65% of the cool-moist mixed-conifer habitat on the SJNF occurs as wilderness, backcountry, and/or other protective land management designations that is expected to maintain high-quality habitat for the woodpecker.

The primary activity that could potentially influence primary habitat for this species is timber harvest. Although not a planned activity, Wildland Fire Use could also potentially influence the three-toed woodpecker because of its affinity for burned areas. Differences in projected outputs by alternative for these activities are displayed below in Table BE-13.

Table BE-13: Activities and Projected Outputs that could Potentially Influence the American Three-toed Woodpecker, by Alternative.

Timber Treatment Acres (Suitable Habitat Only)	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Spruce-fir	50 ac. Partial Cut	50 ac. Partial Cut	20 ac Partial Cut	113 ac Partial cut
* Cool-Moist Mix-Con	200 ac. Partial Cut	125 ac. Partial Cut	20 ac. Partial Cut	287 ac. Partial Cut
Fuels Treatment Acres (Suitable Cover Types Only)				
* Spruce-fir & Mixed Con	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use

In regards to activities that could potentially influence the three-toed woodpecker, Alternative A offers approximately 145,700 to 187,500 more acres of active management area than Alternative B and D, respectively, that could potentially alter the habitat components preferred by the species. Alternative D exceeds Alternative A in active management area by approximately 8,300 acres.

As displayed in Table BE-13, the predicted timber harvest output in primary habitat varies from 250 to 400 acres and is very minimal in all alternatives. These amounts represent about 0.04 to 0.07% of the total suitable habitat on the SJNF. The amount of timber harvest in alternative A is therefore expected to have little influence on American three-toed woodpecker habitat or populations on the SJNF.

Wildland Fire Use is not a planned output. However, it will be utilized as a tool to allow natural disturbances to occur in high-elevation forest types as opportunities arise. It is estimated that all alternatives may allow from 1 to 30,000 acres of Wildland Fire Use. All Fire Use activities can be expected to provide benefits to the three-toed woodpecker because of its affinity for bark beetle attracted to burn areas.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-13, there is little difference between no action and Alternative B, C and D in regards to timber harvest. As is consistent with the active management theme, Alternative D offers the greatest amount of projected timber output. However, all alternatives influence preferred three-toed woodpecker habitat from 0.04 to 0.07% and are expected to have no detectable affect on the species. The large amount of backcountry and wilderness remaining on SJPL in all alternatives can be expected to provide dead and dying trees that are primary food for the woodpecker.

As with the no action, it is estimated that Wildland Fire Use may be used as a management tool on 1 to 30,000 acres in all action alternatives. Benefits can be expected from any Fire Use activities that permit wildfires to occur.

Cumulative Effects: Both the American and northern three-toed woodpecker are considered species of conservation concern in many portions of their range in North America and Eurasia (Finch 1992, Wisdom et al. 2000, Hoyt and Hannon 2002, Pakkala et al. 2002). This concern is due to its rarity, its dependence on snags, its relationship to fire and old-forest disturbance processes, and its selection of large stands of old-forest conifers that are susceptible to commercial harvesting. In the managed boreal forests of Finland, for example, Pakkala et al. (2002) found that territory occupancy was significantly related to territory quality, landscape quality, and the quality of the connected habitat. In this case, three-toed woodpeckers were found to be highly aggregated into the remaining high-quality fragments of older forest. This pattern suggests that threshold values exist in terms of the quality of the core territory as well as for the larger landscape for maintenance of three-toed woodpecker populations (Pakkala et al. 2002). A recent analysis of the Interior Columbia Basin found that source habitats for American three-toed woodpeckers have increased in 38 percent of the watersheds and decreased in 54 percent (Wisdom et al. 2000). This decline was most significant in the Northern Rocky Mountains, and suggests a potential decline in the key components of a shifting food and nesting resource characterized by natural wildfires, bark beetle outbreaks, and decay processes related to disease and heart rot.

A review of management activities and land use designations on the SJNF suggests that a considerable amount of suitable habitat for the three-toed woodpecker is available, and should remain available, throughout and beyond the current planning period (10-15 years). Timber management activities may still influence individual woodpeckerss where it occurs. However, approximately 80% of the spruce-fir and 65% of the cool-moist mixed-conifer habitat on the SJNF occurs as wilderness, backcountry, and/or other protective land management designations that maintain high-quality woodpecker habitat. Although variations occur, most of these protections will be maintained in all action alternatives. High-quality woodpecker habitat is expected to increase over time as stands age. No cumulative effects are expected. Natural fire events will only improve habitat conditions.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (American three-toed woodpeckers), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- All alternatives involve projected timber harvest activities in primary habitat types (spruce-fir and cool-moist mixed conifer) that may adversely influence individual woodpeckers However, the projected scope of these activities are very minimal.
- Extensive late-successional primary habitat occurs on the San Juan National Forest in wilderness and other backcountry designations where natural processes will dominate.
- Planned Wildland Fire Use activities will provide benefits to the American three-toed woodpecker.

Bald Eagle *(FS sensitive)*

a) Natural History and Background: The bald eagle is a large bird of prey with a wingspan of approximately 6-7 feet. It is brown in color except for the white head and tail. Found throughout the U.S. and Canada primarily near large bodies of water or larger streams and rivers. Nesting occurs wherever adequate fish are available. The

winter range of the bald eagle includes most of its breeding range, however most eagles winter from southern Alaska south to Arizona, New Mexico and Colorado (USDI 1998).

Bald eagle nesting sites can be found in mature forest stands or in large individual trees. Optimum nest sites are typically found in close proximity to water. Bald eagles typically migrate from their breeding areas to their winter habitat between September and December. Winter habitat characteristics include areas of open water, adequate food sources, and sufficient diurnal perches and roosts (USDI 1998). Wintering bald eagles congregate in large numbers at communal roosts. However, roosts located in less populated areas may be used by fewer individuals or individual birds. Food availability is the single most important factor affecting winter eagle distribution (USDI 1998). On the SJPL there have been 5 confirmed nest sites within the National Forest boundary and a number of communal winter roost sites on BLM lands on the Dolores Field Office. One nest is actually on private property immediately adjacent to the Forest along the Animas River. Some potential nesting lakes on the Forest include McPhee Reservoir, Lemon Reservoir, Electra Lake, Williams Creek Reservoir, and Vallecito Reservoirs. The larger rivers on the San Juan including the San Juan, Piedra, Los Piños, and Animas all have the potential to contain bald eagle nests now or could provide future nesting habitat. Both the larger lakes/reservoirs and rivers on the National Forest System lands provide fall, winter and spring habitat for migrating bald eagles. Winter roosts are not necessarily associated with riverine sites. Wintering eagles are opportunistic in winter diet and often rely on carrion and other available prey than fish for wintering on SJPL on BLM and Forest lands.

Bald eagles feed primarily on fish they catch or take from other fish eating birds. They will feed on waterfowl and other birds, carrion, small to medium sized mammals, and turtles. They are opportunistic feeders (USDI 1998). Bald eagles will feed on big game animals that have died on their winter ranges. This carrion provides an important source of food during the winter. Waterfowl, particularly dead or crippled individuals, are an important source of food when fish are not readily available (USDI 1998).

Loss of habitat and prey sources could reduce populations. The bald eagle is also susceptible to poaching and human disturbance during nesting. The species is recovering from habitat degradation and pesticide related problems. Bald eagles, like the peregrine falcon are very sensitive to disturbance from the initiation of courtship to young fledging. This time period is roughly from mid-December to mid or late June. During this time period it is extremely sensitive to human disturbance activities and nest abandonment and desertion of long established territories may occur.

b) Effects Analysis: To some degree, there are numerous activities and programs that might influence the bald eagle if they occur in nesting areas or within important winter concentration habitat. However, a closer focus indicates that only a few primary activities need to be analyzed in detail. For example, timber havest activities could certainly affect a bald eagle nesting pair if it involved a nest tree or occurred in vicinity of one. All bald eagle nest trees occur near water bodies and are protected and "buffered" from disturbances associated with a well-controlled activity such as timber harvest. Other activities are controlled as well but may have some indirect influence on bald eagles or the prey species that they depend upon. These activities are the focus of this analysis.

Alternative A: No Action

Direct/Indirect Effects: Several bald eagle nests occur near water-bodies that offer a dependable food suppy on the SJNF. Winter concentrations also occur on or adjacent to the SJNF. The primary activities that could potentially influence primary habitat or prey species for the bald eagle include motorized and non-motorized recreation, fluid minerals development, and wildlife management activities. Differences in projected output for these activities by alternative are displayed below in Table BE-14.

Table BE-14a: Activities and Projected Outputs that could Potentially Influence the Bald Eagle, by Alternative.

Motorized recreation (Acres, Winter Travel)				
* Roaded natural	696,652 ac.	544,617 ac.	486,765 ac.	644,084 ac.
* Semi-primitive motorized	683,371 ac.	402,285 ac.	232,249 ac.	628,249 ac.
* Semi-primitive non-motorized	440,948 ac.	879,149 ac.	580,347 ac.	556,288 ac.
* Primitive	0 ac.	2,632 ac.	530,865 ac.	0 ac.
* Primitive Wilderness	536, 290 ac.	536,291 ac.	536,291 ac.	536,291 ac.
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	same as winter	same as winter	same as winter
Fluid Minerals Acreage Available & Stipulated				
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
* Standard Lease Terms	1,377,039	488,591	488,591	502,938
Wildlife Management				
* Restore or enhance big game winter range	2,000 ac.	2,000 ac.	2,000 ac.	2,000 ac.
Riparian & Watershed Improvements	152 ac.	152 ac.	410 ac.	179 ac.

Potential habitat for breeding and wintering bald eagles on the SJNF is primarily limited to the vicinity of water bodies such as reservoirs and river corridors. Suitable potential habitat is also present on adjacent private lands, as well as lands administered by other state and federal agencies. However, much of the potential habitat on non-federal lands receives a considerable amount of human use, which may affect the suitability of these areas for bald eagles. While an increasing trend in nesting pairs may continue in portions of Colorado where unoccupied habitat

occurs, the recruitment of additional breeding pairs on the SJNF will most likely be limited by the lack of suitable water bodies, high elevations, and dependable food supplies. The establishment of new bald eagle nest sites on the SJNF is therefore expected to level off or grow more slowly in the future than in other locations, with the Forest continuing to provide a minimal contribution to the overall status of the statewide breeding population.

The SJNF primarily provides habitat for bald eagles during the non-breeding (winter) period. These eagles have migrated from their northern breeding grounds in search of food supplies such as fish, waterfowl, or carrion. Although numbers may vary depending upon winter severity and local food supplies, wintering eagles on the SJNF primarily occur along five major river corridors that have been identified as bald eagle winter concentration areas by the Colorado Division of Wildlife. The location and acreages of National Forest Systems land within these concentration areas varies and is described below in Table BE-14b. These winter concentration areas extend for a one-mile width along each side of the identified river corridors.

Table BE-14b: Bald eagle winter concentration areas on the San Juan National Forest.

Name of Winter Concentration Area	Total Acres of Habitat Provided on the SJNF	Total Acres of Habitat On all Land Ownerships	Percent of Habitat on NFS Lands	Percent of NFS Habitat
Animas/Florida River	2,058	48,275	4.3	5.7%
Dolores River	10,338	37,999	27.2	28.4%
Pine/Piedra River	19,895	97,514	20.4	54.7%
Rio Blanca/Navajo	2,714	9,054	30.0	7.5%
San Juan River	1,379	24,979	5.5	3.8%

In regards to activities that could potentially influence the bald eagle, Alternative A offers approximately 145,700 to 187,500 more acres of active management area than Alternative B and C, respectively. Because the bald eagle is such an opportunistic forager whose prey species can be influenced by several factors, it is probable that Alternative A has a higher possibility of influencing some aspect of the natural history needs of bald eagles moreso than Alternative B or C. Alternative D exceeds Alternative A in active management area by approximately 8,300 acres.

Disturbance from motorized and non-motorized recreation can be an impact on bald eagles at nest sites and in winter concentration areas. As displayed in Table BE-14a, Alternative A offers more high-use recreation areas than any of the action alternatives. This difference could potentially allow greater disturbances to bald eagles depending upon the type, timing, and scope of the activity. Greater winter travel via snowmobiles could theoretically disturb eagles in winter concentration areas and/or while they are roosting or foraging. Uncontrolled summer motorized activities could add to disturbances around nest sites or summer foraging sites where fish are the primary prey species.

In regards to fluid minerals development, Alternative A offers approximately 28,300 more acres open to leasing than any of the action alternatives. Alternative A also offers fewer protective lease stipulations than any of the action alternatives, with approximately 700,000 to 746,000 fewer lease acres stipulated with a No Surface Occupancy (NSO). Alternative A could theoretically offer a greater risk of impacting the bald eagles because it is associated with greater development and fewer strict protective measures. Although direct overlap is unlikely, minimal impacts to individuals cannot be completely discounted because the species may roost or forage near development areas. Under the “no new lease” scenario only the existing lease areas have potential for development under this alternative resulting in fewer acres of potential influence to the species.

Wildlife habitat management to improve big game winter range is projected to occur on 2,000 acres in all Alternatives during the life of the Plan Revision. This projection includes elk and other big game species that may be an important winter food source for bald eagles in some localized areas. Benefits can be expected on a site-specific basis.

Both Alternative A and B offer the same amount of riparian habitat improvement over the life of the Plan. These activities may benefit prey species for the bald eagle if it occurs in areas where fish or waterfowl species will benefit from the actions. Alternative A does not provide as many acres of watershed improvement as Alternatives C and D.

Action Alternatives: Alternative B-D

All action alternatives offer fewer potential disturbances than the no action from both summer and winter motorized recreation because of decreases in the amount of motorized use area. Consistent with their themes, Alternative C offers the fewest motorized while Alternative D offers the highest amount of acreage. Alternative B offers a balance between the two other action alternatives, but also provides more solitude habitat and less potential disturbances than the no action. Reductions in open motorized areas during winter and summer should decrease the potential for displacement or disturbances to bald eagles during the nesting and wintering periods.

As displayed in Table BE-14a, Alternative B, C and D offer fewer potential impacts from oil and gas development because they offer fewer acres of potential lease area. The action alternatives also offer greater protective lease stipulations, with approximately 746,000 more acres stipulated with a NSO in Alternatives B and C, and approximately 700,000 more acres in Alternative D. The fewer amounts of available lease acres and greater amount of protective lease stipulations include additional protections for bald eagles, and suggest that fewer potential impacts may be associated with the action alternatives in a similar manner. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

As in Alternative A, wildlife habitat management to improve big game winter range is projected to occur on 2,000 acres in all of the action alternatives during the life of the Plan Revision. This projection includes elk and other big game species that may be important food sources for bald eagles, particularly during the winter period. Benefits can be expected on a site-specific basis.

Alternative C and D offer slightly more acres of watershed and riparian improvement activities than Alternative B. This could potentially have a slightly greater benefit to prey species if the actions occur near falcon nest sites.

Cumulative Effects: The occurrence and expansion of reproductive sites for bald eagles on the SJNF is naturally limited due to available water bodies, elevation, and summer food resources. The SJNF primarily supports bald eagles that have migrated to southwestern Colorado during the winter period. Most of the winter eagle population is aggregated along specific river corridors that have been identified as bald eagle winter concentration areas. As with the summer breeding population, persistent use of other water bodies by wintering bald eagles is also prohibited by the small amount of area that remains unfrozen or provides predictable food supplies during the winter periods.

Approximately 36,384 acres of bald eagle winter concentration areas are located on the SJNF. In the past twenty years, these areas have displayed a stable trend or slightly shifted towards more mature stand conditions that are favorable to bald eagles. Current analysis suggests that ample habitat exists to support the existing or increasing populations of wintering bald eagles that occur on or in the vicinity of the SJNF. Food availability and winter severity are the primary factors that influence the number of bald eagles that occur in any given year in most wintering areas in the United States (Steenhof et al. 2002), and these factors are also believed to play a key role in the inter-year variability that is reflected in the data from southwestern Colorado.

The national mid-winter bald eagle counts confirm other findings that bald eagle populations are increasing across the United States (Steenhof et al. 2002). These increases are highest in the east, northeast and upper midwest and least in the southwest. This geographic variation could be due to several factors including increasingly warmer winters, past DDT exposure levels by geographic area, and more rapid human population growth in the west and southwest. The fact that that mid-winter counts of adults increased at almost twice the rate of immatures suggests that the overall trend may reflect past increases in recruitment and that recruitment may be stabilizing (Steenhof et al. 2002). Although minor disturbances to individual bald eagles on the SJNF may occur, no cumulative effects have been identified and the population may be stabilizing to the available habitat and food supply.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (bald eagles), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- Both winter and summer populations of bald eagles occur on the San Juan National Forest. However, winter is the primary time of use in concentration areas around river drainages.

- All alternatives involve activities that may influence bald eagle or their primary prey species.
- Impacts are expected to be minimal and localized to individuals.

Black Swift *(FS sensitive)*

a) Natural History and Background: The black swift (*Cypseloides niger)* is the single representative of the nine species in the genus Cypeseloides to occur north of Sinaloa, Mexico (Chantler and Dressens 1995). The sub-specification in this portion of its range is described as C.n. borealis (ibid.). It is sparsely distributed in isolated colonies over western North America with Colorado populations representing a relatively large proportion of the known world population for this species (Boyle 1998). Within the state, the San Juan Mountains have been identified as having the most concentrated occurrences of black swift. This species has the unique characteristic of nesting in colonies on cliffs in close association with mountain waterfalls, often within the spray zone of rushing water. Although this species was first identified in Colorado in 1881 near Silverton, Colorado (Knorr 1961) breeding in the state was not confirmed until 1949 (Knorr and Lang 1950). Chantler and Driessens (1995) describes the breeding range of C.n. borealis as "Extensive neartic, occurring in North America south from southeast Alaska through northwestern and central British Columbia and southwest Alberta, south through the western seaboard states to southern California, northwestern Montana, Colorado, central Utah and north-central New Mexico." Within the state, the San Juan Mountains have been identified as having the most concentrated occurrences of black swift.

Although the black swift primarily occurs in mountain regions in its continental range it has also been identified in the western coastal cliff regions on the Pacific in California (Chantler and Driessens 1995). In its mountainous habitats it forages over a range of habitats but is highly specific in its breeding site preference. Nest sites are almost always located on precipitous cliffs near or behind waterfalls (Knorr 1961, Hunter and Baldwin 1962). Knorr (1961 & 1993) identified seven requirements of nesting habitat for this species:

Water: Black swifts nest in close proximity to water "varying in degree from a rushing torrent to a mere trickle, although the former seems to be preferred." "Nest are placed within the spray zone or directly behind sheets of falling water."(Knorr 1961).

High Relief: Nest sites have a commanding position above surrounding terrain enabling birds to automatically attain feeding altitude by flying out of nest horizontally.

Inaccessibility: Nests are almost always inaccessible to terrestrial predators.

Darkness: Nests are almost always placed in positions where the sun rarely shines directly upon it. Additionally, nests are typically placed in darker recesses if available.

Unobstructed Flyways: Black swifts appear to choose sites, which allow them to fly to and from the nest without flying through a "maze" of branches.

Presence of Niches in Rock for Nests: Apparently sites with rock that offer no "pockets, crannies, ledges or shelves" for nest placement appear to be avoided.

Moss Availability: Black swifts build their nest primarily from mosses that grow in the wet environments around the nesting site (Knorr 1993).

Nest sites range in elevation from sea level in California to roughly 11,000 feet in Colorado (Bailey and Niedrach 1965) and occur within a wide range of surrounding habitats. The San Juan National Forest (SJNF) has identified nine nesting sites across the Forest and a number of potential sites have been identified but have not been adequately surveyed.

The black swift is an aerial forager and apparently consumes a wide variety of small flying insectivorous prey. They appear to be attracted to swarms or "blooms" of some insect species.

Limiting factors include changes to microsite characteristics of suitable breeding habitat. Other limiting factors include small colony size, small clutch size, low regional populations, reproductive success, predation, human harassment and pesticides. Breeding occurs June through mid-September.

b) Effects Analysis: Plan Revision activities that could potentially influence the black swift primarily involve non-motorized recreation (i.e. rock climbing and ice climbing).

Alternative A: No Action

Direct/Indirect Effects: Black swift nesting habitat occurs behind perennial waterfalls, often in remote locations. Although rock and/or ice climbing within the spray zone of the waterfall could potentially influence the microsite conditions important to nesting, there is no information that is occurring at any locations. Most nest sites remain highly inaccessible to human alterations. Therefore, no measurable effect is anticipated from the no action alternative.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: None of the action alternatives provide additional access to black swift nest sites. The protection offered by their unique nesting habits are expected to continue to discourage any measurable impacts from Plan Revision activities. No effect from any of the action alternatives is anticipated.

Cumulative Effects: The unique nesting habits of the black swift make them practically invulnerable to predators or human disturbance. The young remain protected behind the waterfalls during the day while the adults spend most of the daylight hours on-the-wing foraging high above the forest canopies. Measurable cumulative effects from human activities are therefore unlikely.

c) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the black swift or its primary habitat. The rationale for this determination is as follows:

- Most if not all black swift nesting sites are inaccessible to human impacts. Although rock and/or waterfall climbing could possibly impact the microsite, there is no evidence that this has ever occurred on SJPL.
- Adults are invulnerable to human disturbance because they spend most of their day foraging on high mountain thermals.
- Young remain protected behind the waterfalls while adults are foraging. Adults return just before dark when most human activities are subsiding.
- The Plan revision alternatives provide for additional protection of waterfall sites if needed to protect watershed and wildlife values.

Black Tern *(BLM sensitive)*

a) Natural History and Background: The black tern (*Chlidonias niger)* has a holartic distribution. In North America, black terns breed locally from the northern U.S. through central Canada. Breeding is sparse and patchy in the northeast and along the southern edge of the range. They winter along the Pacific and Caribbean coasts from Mexico to northern South America. Although it still occupies most of its former range in the U.S., it is now extirpated as a breeder from Missouri and Kentucky and nearly extirpated from Indiana and Pennsylvania (Naugle, 2004). The tern is less abundant and found in isolated pockets within Colorado. Occurrence on BLM lands of SJPL is considered incidental to rare. No breeding records exist for SJPL (Kingery, 1998).

Habitat for black terns consists of reservoirs and lakes for breeding and coastal marine habitats during winter. Aquatic habitats with extensive stands of emergent vegetation and large areas of open water are required for summer. The black tern nests in shallow, highly productive wetlands with emergent vegetation. Nests are commonly built on mats of floating emergent vegetation or platforms such as muskrat mounds. Nest wetlands occur most commonly in open grassland landscapes, but may be located in forested systems at elevations between 1220 and 2000 m (Naugle, 2004).

The black tern feeds primarily upon insects (grasshoppers, locusts, dragonflies, etc.), to include various aquatic and land insects, worms, amphibians (frogs, tadpoles), small fish, grubs, and marine animals (small mullusks, crustaceans) (USDA 1991, and DeGraff et al 1991). Breeding birds nest in large cattail marshes adjacent to open water (Andrews and Righter 1992). Black terns are primarily insectivorous on the breeding grounds at or near the water surface, but fish comprise a large part of the diet in some habitats. In winter, black terns in the marine environment are largely piscivorous (Nagule, 2004).

Loss of remaining wetland habitats to agriculture or other development is the greatest threat to black tern conservation (Nagule, 2004). This loss of breeding habitat may explain the decline in black tern populations (Carroll 1988, Hands et al. 1989). Grazing does not seem to have a major effect on the habitat of black terns

unless wetlands, marshes, and riparian areas are breached or destroyed by trampling or overgrazing. Other factors affecting habitat use would be filling or destroying wetland areas. Population decline likely is associated with the loss of wetlands suitable for breeding (Delehanty and Svedarsky, 1993).

b) Effects Analysis: Plan Revision activities that could potentially influence the black tern primarily involve water management and wildlife management activities (i.e. watershed, riparian, and aquatic habitat improvements).

Alternative A: No Action

Direct/Indirect Effects: No direct or indirect effects on the black tern are expected from the no action alternative because occurrence of the species is considered incidental to rare. Suitable habitat is for this species on BLM lands is limited, with no breeding or local populations confirmed on BLM lands within the planning area.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: No direct or indirect effects on the black tern are expected from implementation of any of the action alternatives because occurrence of this species is considered incidental to rare. Suitable habitat is for this species on BLM lands is limited, with no breeding or local populations confirmed on BLM lands within the planning area.

Cumulative Effects: No specific plan components have been developed for the black tern because it is not known to occur on BLM lands managed by the San Juan Public Lands Center. Plan components and regulations specific to the management of wetlands for other species are expected to alleviate any potential cumulative effects and contribute to favorable habitat conditions for any tern species that may happen upon SJPL.

d) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the black tern or its primary habitat. The rationale for this determination is as follows:

- The black tern is considered incidental or extremely rare on SJPL, with no breeding populations known to occur.
- Wetland habitats utilized by species such as the black tern are protected by numerous laws, Plan components, and conservation measures.

Boreal Owl *(FS sensitive)*

Natural History and Background: The boreal owl (*Aegolius funereus)* is a small forest owl found circumboreally in boreal and subalpine forest habitats. There are seven recognized subspecies of boreal owl, one of which occurs in North America *(A.f. richardsoni)* (ibid.). Although it has been well studied in Scandinavia, where it is the most abundant forest owl, its biology in North America has been less thoroughly examined (Hayward and Hayward 1993).

In North America, the boreal owl is a year-round resident through Canada's boreal forest from the Yukon to Newfoundland. Scattered populations occur in northern Minnesota, the Cascade ranges, and south in the Rocky Mountains into north-central New Mexico (Ryder 1998). In the Rocky Mountains, Blue Mountains and Cascade ranges they are restricted to subalpine forests (Hayward and Hayward 1993). They are considered probable inhabitants of the mountains of Utah, northern California, and northern New England (ibid.).

This species was considered rare to uncommon in the mountains of Colorado until relatively recently, due to its secretive behavior and to a general lack of survey effort (Yanishevsky and Petring-Rupp 1998, Andrews and Righter 1992, Palmer 1986). It was not confirmed occurring on National Forest System lands of SJPL until 1993 (Schultz 1996a). However, recent investigations confirm that the species is more prevalent than previously thought through out southwest Colorado (Schultz 1996a, Holland and Schultz 1994, Holland and Schultz 1993, Palmer 1986).

In the Rocky Mountains the boreal owl is most closely associated with dense, mature and late successional (>150 yr.) coniferous forest (Ryder 1998). This association with older forests may be at least partly due to the presence of available nest cavities. It appears to prefer mature and old growth spruce-fir forests but is also known to

occasionally frequent lodgepole pine, Douglas fir and aspen forests and may migrate to other lower elevational forest types during periods of nomadism (Palmer 1986, Ryder 1998, Hayward 1994). In Colorado, this species also exhibits a strong preference for mature spruce-fir forest over other forest types (Palmer 1986, Schultz 1996a). Owls in the state are generally found above 2700m (8,856 ft.) in elevation (Palmer 1986, Ryder et al. 1987). Breeding locations are most often found above 3,050m (10,000 ft.) (Palmer 1986).

In Idaho and Montana, nest sites had an average of 57 trees/acre > 15 inches in diameter (dbh), an average basal area of approximately 190 ft.²/acre, and supported a snag density (>15 inches) of 9 snags/ha or roughly 4 snags/acre (Hayward and Hayward 1993). Even though the overall density of the nest stand is high, canopy cover at the nest tends to be more open and averaged 30% crown closure (ibid.).

Recent studies on the San Juan and GMUG National Forests (Schultz 1995 and 1996a, Holland and Schultz 1993) suggests that mature spruce-fir forests are preferred breeding habitat for local populations of boreal owls in southwest Colorado. However, in this and other regions, younger stands and mature aspen may occasionally be used if cavities are present (Hayward and Hayward 1993, Schultz 2001, pers. comm.). In a six-year census study in Colorado, Palmer and Ryder (1984 *fr*. Palmer 1986), found that active territories were most often located in high elevation forests (9,100-10,800 feet), and that lower elevational mixed-forest (presumably below 9,000 feet) were only used during years of owl abundance. Their study suggests that high elevational spruce-fir provides optimum habitat and that individuals "radiate outward from the center of best adaptation" only when more optimal habitat niches are filled (Palmer 1986). Owls do not appear to roost in cavities, but instead rest on limbs near the bole of the tree. Roost trees in Idaho and Colorado appear to be almost exclusively conifers (Hayward et al. 1993, Palmer 1986).

The affinity of the boreal owl in Colorado to closed canopy mature subalpine spruce-fir forest may be a direct relationship to its preferred prey (southern red-backed vole), which also occurs at its highest density in the state within similar forest habitats (Schultz 1996a). Prey is primarily small mammals, especially the red-backed vole, which makes up 25-50% of their diet (Hayward and Hayward 1989). They are opportunistic hunters, and their summer diet is varied, including insects, jumping mice, chipmunks, birds, pocket gophers, shrews, deer mice and voles.

Studies in North America and Europe indicate that owl productivity and population demographics (clutch size, hatching rate, fledging rate, number of breeding pairs, adult survival) are directly related to prey availability (Hayward and Verner 1994). Hayward (1997) states "Cavity availability and prey availability likely interact to influence boreal owl population growth. Tree cavities occur non-randomly across the landscape, as do small mammal populations. The spatial arrangement of cavities and prey (relative to one another) are important in determining boreal owl abundance. The conservation status of boreal owls will be intimately tied to the interaction of these resources."

Thermal stress likely limits the elevational distribution of this species (Hayward 1997). Therefore, the availability of cool microsites, which often occur in mature forest may be a significant limiting factor in some regions (ibid.). The boreal owl is vulnerable to predation by several species. American marten is probably the most important predator at the nest, preying on both owlets and nesting females (Hayward and Hayward 1993). Winter and spring are critical time periods for boreal owl survival and annual productivity. Overwinter survival is an important factor in determining population abundance, and female body condition in spring is correlated with female reproductive output the following summer (Hayward et al. 1993).

b) Effects Analysis: Plan Revision activities that could potentially influence the boreal owl primarily involve timber harvest and Wildland Fire Use activities.

Alternative A: No Action

Direct/Indirect Effects: Based on recent surveys, the boreal owl is considered fairly common in suitable primary habitat across the upper elevations of the SJNF, primarily in late successional spruce-fir forest types. Although alterations have occurred due to past timber harvest, approximately 447,350 acres of primary spruce-fir habitat for the boreal owl occurs on the SJNF. Approximately 80% of the spruce-fir cover type on the SJNF occurs as wilderness, backcountry, and/or other protective land management designations that is expected to maintain high-quality habitat for the boreal owl.

The primary activity that could potentially influence primary habitat for this species is timber harvest. Although not a planned activity, Wildland Fire Use could also potentially have negative influences on the

boreal owl because of reduced forest cover, snags, and food resources. Differences in projected outputs by alternative for these activities are displayed below in Table BE-15.

Table BE-15: Activities and Projected Outputs that could Potentially Influence the boreal owl, by Alternative.

Timber Treatment Acres (Suitable Habitat Only)	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Spruce-fir	50 ac. Partial Cut	50 ac. Partial Cut	20 ac Partial Cut	113 ac Partial cut
Fuels Treatment Acres (Suitable Cover Types Only)				
* Spruce-fir & Mixed Con	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use

As displayed in Table BE-15, the predicted timber harvest output in primary boreal owl habitat varies from 50 to 113 acres and is very minimal in all alternatives. These amounts represent less than 1% of the total suitable habitat on the SJNF. The amount of timber harvest in alternative A is therefore expected to have little influence on the boreal owl or populations on the SJNF.

Wildland Fire Use is not a planned output. However, it will be utilized as a tool to allow natural disturbances to occur in high-elevation forest types as opportunities arise. It is estimated that all alternatives may allow from 1 to 30,000 acres of Wildland Fire Use. All Fire Use activities can be expected to have negative influences on the boreal owl because of a decrease in habitat components preferred by the species. However, these influences would vary significantly depending upon the size and severity of a wildfire.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-15, there is little difference between no action and Alternative B, C and D in regards to predicted timber harvest outputs. As is consistent with the active management theme, Alternative D offers the greatest amount of projected timber output. However, all alternatives influence less than 1% of primary boreal owl habitat and are expected to have no detectable affect on the species. The large amount of backcountry and wilderness remaining on SJPL in all alternatives can be expected to provide the late-successional habitat conditions preferred by the species.

As with the no action, it is estimated that Wildland Fire Use may be used as a management tool on 1 to 30,000 acres in all action alternatives. Influences are expected to vary depending upon fire severity and size.

Cumulative Effects: A recent cumulative effect analysis was also conducted on a large area of the San Juan National Forest (McGarigal et al. 2001). This analysis investigated the magnitude of change that has occurred in the spruce-fir zone and other forest types in the San Juan Mountains since the onset of timber harvest activities in the 1950's. This analysis concluded that, at a larger scale, limited cumulative effects have occurred due to the buffering capacity of large, undeveloped areas such as Wilderness. Much of the undeveloped area occurs in forest types that are preferred by the boreal owl. This analysis found that road development was the primary landscape impact and had increased three-fold from 1950 to 1993 (McGarigal et al. 2001). Roads are not a major factor that influences the boreal owl. No cumulative effects on the boreal owl are anticipated because of the minimal amount of activities projected to occur in primary habitat and the large amount of undeveloped area that will remain on the Forest well into the future.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (boreal owls), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- All alternatives involve projected timber harvest activities in primary habitat types (spruce-fir) that may adversely influence individual boreal owls. However, the projected amount of these activities is very minimal.

- Extensive late-successional primary habitat occurs on the San Juan National Forest in wilderness and other backcountry designations where natural processes will dominate and provide excellent habitat for the boreal owl.

Brewer's Sparrow *(FS sensitive)*

a) Natural History and Background: The Brewer's sparrow (*Spizella breweri breweri*) is concentrated in the Great Basin from the eastern half of Washington and southern British Columbia to southwestern Saskatchewan (Smith 1996), and most of Montana, except portions of the northwest and northeast of the state. It is also found in the southern sections of Idaho through eastern Oregon, eastern California, and the northern sections of the Mojave Desert (Small 1994). This subspecies extends through all of Nevada, Utah, Wyoming, northern Arizona, northwestern New Mexico, and western, central, and eastern Colorado (Hubbard 1978, Andrews and Righter 1992).

The Brewer's sparrow is an obligate of sagebrush communities (Braun et al. 1976, Paige and Ritter 1999). Throughout most of the Brewer's sparrow's breeding range it is most closely associated with landscapes dominated by big sagebrush (*Artemisia tridentata*) (Wiens and Rotenberry 1981, Rotenberry et al. 1999) with an average canopy height of less than 1.5 m (Rotenberry et al. 1999). It also occurs in shrubby openings in pinyon-juniper (*Pinus edulus-Juniperus* spp.) and mountain mahogany (*Cercocarpus* spp.) woodlands (Sedgwick 1987) and large shrubby parklands within coniferous forests (Rotenberry et al. 1999). Sagebrush in Colorado occurs at elevations of approximately 1,200 to 3,050 m (4,000 to 10,000 ft) and exists in a variety of climatic conditions, including low-elevation semi-desert habitats and moist, cool, mountainous areas. Perhaps 30 percent of Colorado's sagebrush was altered between 1900 and 1974 (Braun et al. 1976), and the ecological integrity of Colorado's sagebrush shrublands has been compromised by the invasion of exotic (e.g., cheatgrass) or native (e.g., pinyon-juniper) plant species, conversion to agricultural, residential, and other developed land types, and changes in natural fire regimes (Biedleman 2000). It is thought to occur in the suitable lower elevation sagebrush types on National Forest System lands of SJPL. Indication of abundance is unknown at present.

In spring and summer Brewer's sparrow consumes many insects (e.g., alfalfa weevils, aphids, beet leafhoppers, caterpillars, beetles). In fall and winter it feeds on seeds. Brewer's sparrows forage mainly on the ground. They drink free water when available and will bathe in standing water; but adapted to arid environments and can physiologically adjust to water deprivation, obtaining water from foods (Dawson et al. 1979; Rotenberry et al. 1999).

The declines in Brewer's sparrow breeding populations are likely linked to extensive alteration of sagebrush (*Artemisia* spp.) shrub steppe habitats. Though widespread, this habitat constitutes one of the most endangered ecosystems in North America due to extensive, ecologically transformative influences of livestock grazing, followed by alteration of natural fire regimes and invasion by exotic plant species, especially cheatgrass (*Bromus tectorum*). Loss and fragmentation of habitat due to agricultural, urban, suburban, energy, and road development also threaten the species.

b) Effects Analysis: Plan Revision activities that could potentially influence the Brewer's Sparrow primarily involve fuels treatment activities and livestock grazing.

Alternative A: No Action

Direct/Indirect Effects: The Brewer's sparrow is a species of conservation concern across much of its western range because of declines in sagebrush habitat and breeding populations. Most suitable habitat on SJPL occurs on lower-elevation BLM lands. However, the species does breed on National Forest Systems land in mixed shrublands, particularly where sagebrush is available. Differences in projected outputs by alternative that could potentially influence Brewer's sparrow are displayed below in Table BE-16.

Table BE-16: Activities and Projected Outputs that could Potentially Influence Brewer's Sparrow, by Alternative.

Fuels Treatment Acres (Suitable Cover Types Only)	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
* Mixed Shrubland	1500 Mastication	1500 Mastication	1500 Mastication	1600 Mastication
Livestock Grazing (Cattle AUMs Only)				
* Premitted AUMs (FS)	115,312	115,312	112,554	117,791
* Suitable Acres on Active Allotments (FS)	654,837	654,837	626,722	694,321

The Brewer's sparrow occurs most commonly where sagebrush densities are high and contiguous. Even minor declines in sagebrush cover have been shown to result in a similar reduction in breeding pair densities (Holmes 2007). Sagebrush species occur on approximately 16,580 acres of the SJNF. Activities that influence the quality and quantity of sagebrush cover on the SJNF may also have negative influences on this species.

In regards to activities that may influence Brewer's sparrow, Alternative A provides similar fuels treatments in mixed-shrublands as the action alternatives. These treatments primarily involve hydro-mowing and crushing of mixed shrublands to reduce fuels hazards associated with mature, high-density shrublands. These shrublands are dominated by Gambel oak. Sagebrush may also be affected on a site-specific basis when it co-exists with Gambel oak; however it is not a target species for fuels reduction on National Forest Systems land. Potential impacts to Brewer's sparrow from fuels reduction activities on the SJNF are expected to be minor but cannot be completely discounted.

Livestock grazing is a dominant land-use practice across much of the summer range of the Brewer's sparrow (Knick et al. 2003). This activity may have negative indirect influences on sagebrush habitat for species such as Brewer's sparrow. Cattle grazing on the SJNF is likely to overlap potential habitat for the Brewer's sparrow. As displayed in Table BE-15, the permitted amount and area for cattle grazing does not differ between Alternatives A and B. These activities are therefore predicted to have potential negative influences on individual breeding pairs of Brewer's sparrows where activities and habitat overlap. On National Forest Systems land, however, these activities are expected to be minor because of the small amount of acreage involved and the conservation measures developed to minimize potential impacts. These conservation measures are similar across alternatives.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: All action alternatives provide for a similar amount of fuels treatment in mixed-shrubland, with a slight increase in Alternative D. Because sagebrush is not a target species for fuels reduction of National Forest Systems land, potential influences on Brewer's sparrow and other sage-associated species are expected to be similar to Alternative A.

Alternative B provides for the same amount of livestock grazing as Alternative A. There is a slight reduction in AUMs and area in Alternative C, and a slight increase in Alternative D. The decrease in grazing area and stocking rates in Alternative C may provide some secondary benefits to species such as the Brewer's sparrow, while the increase in Alternative D may be associated with a higher degree of habitat impacts to the species. Overall, however, potential impacts are expected to be similar and based on site-specific areas where conservation measures are available to alleviate identified problems. The conservation measures are similar across all alternatives.

Cumulative Effects: Land-use practices, invasion by exotic plants, disrupted ecosystem processes, and altered disturbance regimes have impacted and continue to impact sagebrush ecosystems across the western United States (Knick et al. 2003). A recent habitat evaluation of sagebrush distribution on the SJNF indicates that sagebrush has remained static but that stand densities have increased and aged, reducing the grass/forb understory. Sagebrush is not well distributed across the SJNF, and occurs on approximately 16,580 acres. The

sagebrush type is in poor and declining conditions because of stand age.. There are some areas where significant encroachment by pinyon-juniper into the low elevation sagebrush will result in conversion of those areas to woodlands. Some sagebrush is occasionally lost to wildfire.

There is little to no management activity that occurs in sagebrush on the Forest, except for grazing. Although sagebrush has a limited distribution across the forest, livestock grazing effects have occurred where grazing activities occur within active allotments. Fuels management may occur in areas, which include small stands of sagebrush but otherwise are dominated by other vegetation types. Management actions are conducted in sagebrush grasslands on the adjacent BLM lands where the objectives include opening up decadent stands to improve the grass/forb understory, to increase the age class diversity, to improve forage conditions, and habitat improvement. Overall, little influence or cumulative effects on sagebrush-associated species is expected on National Forest Systems land or SJPL as a whole because of limited activities in this habitat type.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (Brewer's sparrows), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

Columbian Sharp-tailed Grouse *(FS sensitive)*

a) Natural History and Background: The Columbian (*Pediocetes phasianellus columbianus)* has the smallest population size and most restricted distribution of the 6 subspecies of sharp-tailed grouse in North America (Hoffman 2001). The native range of the Columbian sharp-tailed grouse is western Colorado, northeastern Utah, western Wyoming, extreme western Montana, northern Nevada, northwestern California, eastern Oregon, eastern Washington, Idaho, and southeastern British Columbia (Spomer 1987). This sub-species currently occupies less than 10% of its former range.

This grouse does not currently occur on the SJPL, and has not been documented on the planning area for more than 30 years (Giesen and Braun 1993). Some suitable habitat may still exist on the SJNF, all on the western part of the Forest on the Dolores Ranger District. In 2004, Colorado Division of Wildlife reintroduced the species to private lands west of Dolores. Subsequent augmentations to this reintroduction have occurred. It is unknown weather a population will establish from these efforts. Currently, no occurrence is recorded on National Forest System lands.

The species requires native bunchgrass and shrub-steppe communities with high species diversity and high structural diversity (Spomer 1987). Deciduous shrubs are critical for winter food and escape cover (Rogers 1969, Saab and Marks 1992, Giesen 1997). Bunchgrasses and perennial forbs are important components of nesting and brood-rearing habitat (ibid). Leks sites are important for mate selection and breeding, and typically are adjacent to nesting and brood-rearing areas. Leks are typically located on knolls, ridge-tops, or benches that are higher than surrounding topography, sites that typically have sparse vegetation (Rogers 1969, Giesen 1997). Nest sites are dominated by mixed-species shrub and bunchgrass communities, with clumps of taller and denser shrubs grasses at the nest site (Rogers 1969, Giesen and Connelly 1993). Habitat requirements appear narrower in winter than in summer, and winter distribution is usually in close proximity to mountain shrub and riparian habitats (Giesen and Connelly 1993).

Insects constitute a major portion of chick diet. Adult diets in spring and summer encompass a variety of vegetative material including grass seeds and leaves and insects, and agricultural crops, especially wheat where it is available (Rogers 1969, Giesen and Connelly 1993). Winter foods include fruits and buds of deciduous trees and shrubs (ibid).

Populations of Columbian sharp-tailed grouse have declined drastically through out their range since the early 1900's. Increased agricultural development and grazing by domestic livestock are major factors influencing abundance and distribution (Meints et al. 1992, Hoffman 2001). Winter dependence on deciduous trees and shrubs for food and cover may limit grouse within sagebrush-steppe habitat (Giesen and Connelly 1993).

Leks are a focal point in management of grouse because disturbances may result in regional population declines (Rogers 1969, Giesen and Connelly 1993). Winter is a critical time period because habitats sufficient for overwintering grouse populations are thought to be limited (Meints et al. 1992).

b) Effects Analysis: Plan Revision activities that could potentially influence the Columbian sharp-tailed grouse primarily involve fuels treatment activities and livestock grazing.

Alternative A: No Action

Direct/Indirect Effects: The Columbian sharp-tailed grouse has been reintroduced to private lands near the SJPL. Although the species is not believed to occur on the Forest, it historically migrated to and utilized Forest lands for summer habitat. As populations recover, it is expected that the grouse will re-occupy some habitats on the National Forest. Differences in outputs associated with activities that could potentially influence the grouse are displayed below in Table BE-17.

Table BE-17: Activities and Projected Outputs that could Potentially Influence the Columbian Sharp-tailed Grouse, by Alternative.

Fuels Treatment Acres (Suitable Cover Types Only)				
* Mixed Shrubland	1500 Mastication	1500 Mastication	1500 Mastication	1600 Mastication
* Ponderosa Pine	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire
Livestock Grazing (Cattle AUMs Only)				
* Premitted AUMs (FS)	115,312	115,312	112,554	117,791
* Suitable Acres on Active Allotments (FS)	654,837	654,837	626,722	694,321

In regards to activities that may influence sharp-tailed grouse, Alternative A provides similar fuels treatments in mixed-shrublands and ponderosa pine forest as the action alternatives. These activities are expected to be beneficial to the Columbian sharp-tailed grouse due to a reduction in shrub cover that promotes forage plants such as forbs and grasses that support high insect densities for broods. As displayed in Table BE-16, these benefits are expected to be similar across all alternatives.

Livestock grazing is similar across alternatives A and B. These activities may currently be negatively influencing potential grouse habitat because of influences on forage species, insect densities, and other factors. The need to address livestock management on potential sharp-tailed grouse habitat has been identified in the revised Forest Species Assessment for this species (USDA Forest Service 2006). Conservation measures to address these issues are similar across alternatives.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: All action alternatives provide for a similar amount of potential benefits from fuels treatment activities on potential grouse habitat. Benefits are therefore expected to be similar to Alternative A.

Alternative B provides the same amount of livestock grazing as Alternative A. There is a slight reduction in AUMs in Alternative C, and a slight increase in Alternative D. Although conservation measures are expected to be similar across all alternatives, Alternative C may provide some additional benefits because livestock grazing objectives are identified as being secondary to biodiversity and species objectives.

Cumulative Effects: In 2004, the Colorado Division of Wildlife reintroduced 40 male sharp-tailed grouse onto private land in southwestern Colorado. The reintroduction area involves former agricultural land that is now part of the Conservation Reserve Program (CRP). In April 2005, 40 females were also brought from northwestern Colorado and released at lek sites that the males had established.

The reintroduced grouse successfully reproduced during the 2005 breeding season, with 14 successful nests out of 17 attempts documented. All of the nests were located in residual grasses on private CRP lands. As of January 2006, eight females and males (16 birds total) were still being tracked via the transmitters. An additional supplement of mostly females is planned for the spring of 2006. The goal of the CDOW's Columbian sharp-tailed grouse conservation plan is to establish a breeding population in southwestern Colorado and an additional population on the Uncompahgre Plateau. All populations will be tracked by the CDOW to provide trend information gathered at the leks.

The San Juan National Forest provides some lower-elevation habitats that most likely provided historic sharp-tailed grouse habitat and will be utilized again by the reintroduced population. Currently, the birds primarily use private CRP lands but adjacent habitats on the Forest may become more important to the success of the reintroduction program as the species becomes reestablished. The primary habitat types of importance to the reintroduced sharp-tailed grouse involve mountain shrublands and sagebrush, although mountain grasslands and riparian habitats are also utilized. Historic habitat near the current release site is suspected to encompass 15 to 20 square miles (9,600-12,800 acres) in "The Glades" area east of Dolores Canyon.

The total acres of mountain shrubland, sagebrush, mountain grassland, and riparian habitats on the SJNF have remained static since 1983 and are anticipated to provide suitable habitat to support the sharp-tailed grouse reintroduction effort. However, the quality of habitat on the SJNF could potentially be improved by reintroducing fire into mountain shrubland and evaluating the current livestock grazing strategy. Conservation measures and habitat improvements on these lands are expected to help support grouse populations and minimize any cumulative effects that may be associated with supporting the reintroduced population on historic summer range.

c) Determination: Based on this analysis**,** it is determined that Plan Revision alternatives A, B and D, "**may adversely impact individuals (bighorn sheep), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** Alternative C could be expected to provide a **"Beneficial Impact"** to the species. The rationale for this determination is as follows:

- Columbian sharp-tailed grouse have been reintroduced to southwest Colorado and currently occupy private lands. They are expected to reoccupy historic habitat on SJPL as the population recovers.
- Habitat improvements are planned outputs that are expected to improve grouse habitat over time.
- Some impacts that influence habitat conditions may be associated with the current livestock grazing strategy. In all alternatives, Plan components and conservation measures are included in the Plan Revision to address these problems.
- Alternative C may provide a higher degree of benefit to sharp-tailed grouse because livestock grazing has been identified as a problem and the activity is secondary to species objectives in this alternative.

Ferruginous Hawk *(BLM and FS sensitive)*

a) Natural History and Background: The ferruginous hawk (*Buteo regalis)* breeds from eastern Washington, southern Alberta, and southern Saskatchewan south to eastern Oregon, Nevada, northern and southeastern Arizona, northern New Mexico, north-central Texas, western Oklahoma, and Kansas (DeGraaf et al. 1991). The species winters primarily from the central and southern parts of breeding range south to Mexico. In Colorado it is a fairly common to common winter resident on eastern plains and uncommon to rare in western valleys and mountain parks (Andrews and Righter 1992, Preston 1998). It is an uncommon fall and winter resident in southwestern Colorado (Durango Bird Club 1992). The SJPL is out of the breeding portion of the species range (NatureServe, 2007). Overwintering on SJPL occurs but is considered uncommon to rare in this portion of the species' range.

Ferruginous hawks primarily inhabit grasslands and semidesert shrublands, and are rare in pinon-juniper woodlands (Andrews and Righter 1992, Preston 1998). This species nests in trees and bushes, and on ledges, large rocks, riverbanks, and hillsides (Finch 1992, Dechant et al. 2003). Ferruginous hawks forage on native grasslands where nest sites are scarce, and as a consequence, individuals reuse nest sites until the structures are sometimes over 3 feet in height. Ferruginous hawks hunt from a perch, while soaring, during low, rapid flight over open country, or while systematically searching and hovering at 40 to 60 feet (ibid). They feed primarily on rabbits, ground squirrels and prairie dogs, but will also take mice, rats, gophers, birds, snakes, locusts, and crickets (Dechant et al. 2003).

Ferruginous hawks are limited by nest site and prey availability (Dechant et al. 2003). On the SJPL, its occurrence during the non-breeding season is limited to more open areas that are suitable for hunting and that contain sufficient densities of small mammal prey, such as prairie dogs and ground squirrels, during snow-free seasons. Fall and spring (i.e. during snow-free periods of the non-breeding season) are the most likely time periods this hawk might occur on the SJPL.

b) Effects Analysis: Plan Revision activities that could potentially influence the Ferruginous hawk primarily involve motorized and non-motorized recreation, and possibly livestock grazing.

Alternative A: No Action

Direct/Indirect Effects: The ferruginous hawk is a migratory species with individuals that occur sporadically during the winter period. No breeding or nesting pairs are known to occur. Potential affects to this species are therefore most likely limited to possible disturbances from motorized vehicles or recreational activities.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: Potential effects from the action alternatives are expected to be similar to the no action. Potential affects to this species are expected to be limited to possible disturbances from motorized vehicles or recreational activities on migratory non-breeding individuals.

Cumulative Effects: The ferruginous hawk has suffered habitat loss and negative effects throughout much of its range in the western United States. However, all of the alternatives associated with the Plan revision are expected to have no cumulative effects on this species because SJPL do not measurably contribute to the conservation of the species. All individuals are migratory with no important breeding habitats known.

c) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the ferruginous hawk or its primary habitat. The rationale for this determination is as follows:

- The ferruginous hawk is a migratory species that is not known to breed locally.
- Although localized disturbances may occur to migratory individuals, there is no measurable effect on the reproductive output or overall conservation status of the species.

Flammulated Owl *(FS sensitive)*

a) Natural History and Background: The Flammulated owl (*Otus flammeolus)* is perhaps the most common raptor in montane pine forests of the western United States (McCallum 1994). It is a Neotropical migrant that winters in Mexico, casually north to southern California (DeGraaf et al. 1991). It is a western mountain species that breeds locally from southern British Columbia, southern Idaho, and northern Colorado south to southern California, southern Arizona, southern New Mexico, western Texas, and from Mexico south to Guatemala (Hayward and Verner 1994, DeGraaf et al. 1991). In Colorado the flammulated owl is an uncommon to common summer resident in foothills and lower mountains, and is most common in western and southern Colorado (Winn 1998). They have been found and confirmed to nest National Forest System lands of all Ranger Districts on SJPL and appear to be reasonably abundant and widespread on the Forest during the breeding season. This species shows very high fidelity to breeding sites in Colorado (Reynolds and Linkhart 1987a, 1992).

The flammulated owl is a tiny obligate secondary cavity nester that is entirely insectivorous (McCallum et al. 1994). Winn (1998) states "they depend on tree cavities for nesting, open forests for catching insects, and brush or dense foliage for roosting." They are associated with mature/old growth ponderosa pine and mixed conifer, and mature aspen (Reynolds and Linkhart 1992, Winn 1998). As an obligate secondary cavity nester, they depend on the presence of snags and decaying trees of sufficient diameter to contain nest cavities, and the presence of woodpeckers to construct suitable nest cavities. Male foraging, territorial defense, resting, and day roosting were restricted to a home range that averages 33-acres (Reynolds and Linkhart 1987). Flammulated owls forage intensively near the nest, and open vegetation is preferred for foraging (Reynolds and Linkhart 1987). In contrast to foraging habitat, which includes numerous interior edges, preferred roosting habitat appears to be dense vegetation (McCallum et al. 1994).

Flammulated owls appear to be opportunistic insectivores (McCallum et al. 1994). During cold spring and early summer nights, the owls feed almost entirely on the only insects available, adult lepidoptera such as noctuids (Reynolds and Linkhart 1992). Noctuids are large cold-hardy moths that are abundant in spring and fall (McCallum et al. 1994). As summer progresses and other arthropods become available, lepidopteran larvae, grasshoppers, spiders, crickets, and beetles are added to their diet (ibid).

The flammulated owl, though widespread and locally abundant, is a habitat specialist with low and unvarying fertility (McCallum et al. 1994). Its range and abundance are functions of the range and abundance of its preferred

habitat, not its own ecological amplitude or adaptability. Availability of suitable nest cavities in close proximity to suitable foraging habitat may limit the distribution and/or abundance of this species.

b) Effects Analysis: Plan Revision activities that could potentially influence the flammulated owl primarily involve timber harvest, fuels treatments, and wildlife management activities.

Alternative A: No Action

Direct/Indirect Effects: The flammulated owl commonly occurs in suitable ponderosa pine habitat on the SJPL. Differences in outputs associated with activities that could potentially influence this species are displayed below in Table BE-18.

Table BE-18: Activities and Projected Outputs that could Potentially Influence the Flammulated Owl, by Alternative.

Fuels Treatment Acres (Suitable Cover Types Only)	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
* Ponderosa Pine	1500 ac. mechanical restoration	1500 ac. mechanical restoration	1500 ac. mechanical restoration	2000 ac. mechanical restoration
* Ponderosa Pine	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire
Timber Treatment Acres (Suitable Habitat Only)				
* Ponderosa Pine	1000 ac. restoration 500 ac. partial cut	1000 ac. restoration 500 ac. partial cut	900 ac. restoration 500 ac. partial cut	1500 ac. restoration 500 ac. partial cut
* Warm Dry Mix-Con	250 ac. Restoration 250 Partial Cut	250 ac. Restoration 250 Partial Cut	200 ac. Restoration 225 Partial Cut	200 ac. Restoration 225 Partial Cut
* Aspen	400 ac. clearcut	500 ac. clearcut	400 ac. clearcut	600 ac. clearcut
Wildlife Mgmt Acres (Suitable Habitat Only)				
* Ponderosa Pine	2000 ac. restoration	2000 ac. restoration	2000 ac. restoration	2000 ac. restoration

The flammulated owl is primarily associated with mature to old growth ponderosa pine on the SJNF. Open canopy forest with ample snag habitat is preferred by the species. Approximately 230,878 (96%) of the 241,602 acres of ponderosa pine cover type is currently in a mature to older habitat structural stage on the SJNF. However, only about 15,000 acres (6%) of this occurs as late-successional habitat while another 106,670 acres (44%) occurs in a partially-closed to closed canopy condition. The late-successional stands most likely represent some of the best quality habitat for the flammulated owl because of the large tree structure and associated snag habitat. Habitat quality for the flammulated owl often decreases as the forest canopy becomes more closed. These stands are also more susceptible to high-intensity wildfire that may significantly decrease habitat quality if wildfires are severe. Snag habitat is also lacking in many ponderosa pine systems that have been previously harvested (USDA Forest Service 2004).

As displayed in Table BE-18, the predicted timber harvest output in primary flammulated owl habitat varies from 1,400 to 2,000 acres and is very fairly similar in all alternatives. Restoration treatments intended to restore the ponderosa pine cover type closer to historic conditions is the primary treatment in Alternative A and similar in all action alternatives. These treatments may cause some temporary impacts to flammulated owls, but are expected to be beneficial in the mid to long-term. Treatments in warm-dry mixed-conifer stands are also expected to be beneficial to the flammulated owl, particularly where restoration treatments occur. Alternative A is very similar to the action alternatives in this cover type. Treatments in aspen are also similar across alternatives, but may impact individual owls because of the type of treatment.

The use of prescribed fire is expected to help restore habitat conditions for the flammulated owl and maintain the open-canopy, large-tree structure preferred by the species. The use of prescribed fire will occur in ponderosa pine cover types only and does not vary across alternatives.

Wildlife management activities in ponderosa pine systems in Alternative A do not vary from the action alternatives. These activities are intended to help restore ponderosa pine closer to historic conditions by understory thinnings and other activities that should be beneficial to the flammulated owl

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-18, there is little difference between no action and Alternative B, C and D in regards to predicted outputs and restoration activities in ponderosa pine. As is consistent with the active management theme, Alternative D offers the greatest amount of projected activities in all cover types that may be utilized by the flammulated owl. However, all alternatives are expected to have similar influences as the no action. Temporary impacts may occur to individual owls in the short-term, with long-term benefits anticipated.

The use of prescribed fire and wildlife management for restoration in ponderosa pine does not vary from the no action alternative. Similar benefits and influences are expected.

Cumulative Effects: Ponderosa pine comprises 13% of the SJNF. Over the last 100+ years, humans have played a key role in the status and structural composition of ponderosa pine across the SJNF. Numerous land-use practices (timber harvest, livestock grazing, fire suppression) have influenced the current condition of ponderosa pine stands on the Forest. Over the last 20 years, there has been a stable trend in the early-, mid-, and late-successional ponderosa pine forests. There has been a significant decreasing trend (81.8%), however, in mature stands with relatively high canopy closures (structural stage 4C). Most mid-successional ponderosa pine stands continue to maintain relatively high canopy closures and are classified as 4B. In terms of wildlife habitat quality for the flammulated owl, this trend has most likely decreased preferred habitat conditions for the species. Perhaps the largest effect on the flammulated owl, however, has been the loss of large ponderosa pine snags in localized areas associated with timber harvest and fuelwood gathering.

Assuming that the current trends in ponderosa pine forest structure and composition continue (primarily increasing stand densities), there will be greater risk of high-intensity wildfires and more widespread insect and disease outbreaks. Since wildlife habitat needs are directly related to forest stand structure and composition, continued changes in both will continue to affect the amount of habitat available to wildlife. Ponderosa pine treatments that manage for pre-Euro-American conditions should continue to improve habitat for numerous species of wildlife, including the flammulated owl. These restoration activities are expected to help minimize and alleviate cumulative effects that may have occurred to the species since European settlement.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (flammulated owls), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

Gunnison Sage-grouse *(BLM sensitive)*

a) Natural History and Background: The sage-grouse is the largest species of grouse in Norh America. Sage-grouse were believed to be a single species until the Greater and Gunnison (*Centrocercus minimus)* were identified as distinct species in 2000. Life histories and habitat requirements of the two species are similar. Gunnison sage-grouse is thought to have historically occurred in southwestern Colorado, northwestern New Mexico, northeastern Arizona, and southeastern Utah. Currently this species occur in what has been considered 8 widely scattered and isolated populations in Colorado and Utah. Two populations range over portions of BLM lands on SJPL (Dove Creek and San Miguel Basin populations). The Dove Creek population shares some genetics traits with the Monticello population in southeastern Utah and are considered 2 subpopulations of a single population. There are 6 subpopulations within the San Miguel Basin population: Dry Creek Basin, Hamilton Mesa, Miramonte Reservoir, Gurley Reservoir, Beaver Mesa, and Iron Springs. Land ownership patterns and involved Federal, State and local Agency responsibilities within these areas are quite diverse and complex and require careful planning by all parties under the Gunnison Sage-grouse Rangewide Conservation Plan (2004). The Colorado Division of Wildlife conducts annual lek counts on the Colorado populations.

Sage-grouse use extensive landscapes throughout the year and can move great distances or have annual migratory patterns. Sage-grouse are wide ranging because they require a diversity of seasonal habitats, and have special dietary requirements. Sage-grouse may use small portions of many different landscape types during different life

stages and movements between small seasonal ranges may be extensive. Habitat requirements may be segregated into requirements for 4 seasons: breeding habitat, summer – late brood-rearing habitat, fall habitat, and winter habitat. In some situations, fall and summer – late brood-rearing habitats are indistinguishable. The breeding habitat category includes leking, pre-laying female, nesting, and early brood-rearing habitat. Summer – late brood-rearing habitat includes male, non-brooding female and brood habitats. Fall habitat consists of transition range from late-summer to winter, and can include a variety of habitats used by males and females. Winter habitat is used by segregated flocks of males and females. All habitat types must be present in sufficient quantity and quality to sustain sage-grouse populations.

Sage-grouse require sagebrush throughout the year for food and cover. The sage-grouse does not possess a muscular gizzard and lacks the ability to grind and digest seeds. With exception of insects in the summer, the year-round diet of the adult sage-grouse consists of leafy vegetation. Forbs dominate the summer diet and sagebrush leaves are used the rest of the year. Chicks are precocial and leave the nest with the hen shortly after hatching. The availability of food and cover are key factors related to chick and juvenile survival. During the first three weeks after hatching, insects (beetles, ants, grasshoppers) are the primary food. Diets of 4 to 8 week old chicks have more plant material. Succulent forbs are predominant in the diet until chicks exceed 3 months of age, at which time sagebrush becomes a major dietary component.

Each population has been analyzed for influential activities, threats, and conservation management needs within the Gunnison Sage-grouse Rangewide Conservation Plan (2004). In general threats influence the risk of permanent sage-grouse habitat loss through urban development, potential habitat linkages among populations, population viability, population augmentation options, population size in relation to the amount of available habitat, and population targets. These threats include agricultural conversion, disease and parasites, fire management, genetics of isolation, grazing, hunting, lek viewing, mining, energy development, human community infrastructure, noxious weed invasion, pesticides, predation, and recreational activity.

b) Effects Analysis: Plan Revision activities that could potentially influence the Gunnison sage-grouse primarily involve fuels treatment activities, fluid minerals development within the Paradox Basin, livestock grazing, and motorized and non-motorized recreation.

Alternative A: No Action

Direct/Indirect Effects: The Gunnison sage grouse occurs in two disjunct populations of BLM lands in the far west (Paradox Basin) portion of the SJPL. Its range could therefore overlap several planned activities. Wildlife habitat improvements intended specifically for sage-grouse could also influence the species. Differences in outputs associated with these activities are displayed below in Table BE-19a.

Table BE-19a: Activities and Projected Outputs that could Potentially Influence the Gunnison Sage-Grouse, by Alternative.

Fluid Minerals Acreage Available & Stipulated	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
* Standard Lease Terms	1,377,039	488,591	488,591	502,938
* New Wells Anticiapted w/i the Paradox Basin	136	137	137	137
Wildlife Management				
* Habitat improvements specifically for sage grouse	200 ac. 3 sites	900 ac. 3 sites	900 ac. 3 sites	300 ac. 2 sites
Fuels Treatment Acres (Suitable Cover Types Only)				
* Pinyon/Juniper	1000 Mastication	1000 Mastication	1000 Mastication	1100 Mastication
Livestock Grazing (Cattle AUMs Only)				
* Premitted AUMs (BLM)	22,101	22,100	16,530	22,290
Motorized recreation (Acres, Winter Travel)				
* Roaded natural	696,652 ac.	544,617 ac.	486,765 ac.	644,084 ac.
* Semi-primitive motorized	683,371 ac.	402,285 ac.	232,249 ac.	628,249 ac.
* Semi-primitive non-motorized	440,948 ac.	879,149 ac.	580,347 ac.	556,288 ac.
* Primitive	0 ac.	2,632 ac.	530,865 ac.	0 ac.
* Primitive Wilderness	536, 290 ac.	536,291 ac.	536,291 ac.	536,291 ac.
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.

There are many challenges associated with the management and continued persistence of Gunnison sage-grouse. The primary threat, however, is the permanent loss and associated fragmentation of sagebrush (Gunnison Sage-grouse Rangewide Steering Committee 2005). These threats are amplified by land ownership patterns where the risk or urban expansion and/or habitat conversion is high in some locations. Currently, the majority of the occupied habitat occurs on private land and the amount of conservation benefit provided by lands administered by the PLC is minimal for most subpopulations. In the Dove Creek area, for example, private lands comprise roughly 87% of the occupied habitat while BLM lands provide approximately 13%. The amount of PLC lands is even smaller for the Miramonte and Hamilton Mesa subpopulations, where BLM lands comprise about 2% and 4% of the occupied habitat, respectively. In the Dry Creek area, however, most (57%) of the occupied habitat occurs on BLM lands and the PLC may therefore have more of a management influence on the subpopulation. As of 2004, there were no breeding leks associated with any lands administered by the PLC for any of the subpopulations and all available habitat was utilized for other seasonal habitat values.

Oil and gas developments are not currently mentioned as a conservation concern for any Gunnison's sage-grouse population or sub-population associated with SJPL (Gunnison Sage-Grouse Rangewide Conservation Plan 2005). As displayed in Table BE-18, however, 136 new well developments are anticipated in the Paradox Basin under the life of the Plan Revision (approximately 15 years). At this time, the exact location of where these wells may occur is unknown and potential impacts cannot be fully assessed. Under Alternative A, approximately 56% more of the new well developments in the Paradox Basin would occur under standard lease stipulations that offer fewer protective measures for sage-grouse and other sensitive wildlife species. If new wells are developed within or near current sage-grouse populations, it is therefore possible that greater impacts could occur. Under the "no new lease" scenario only the existing lease areas have potential for development under this alternative resulting in fewer acres of potential influence to the species.

Approximately 1,000 acres of fuels treatment activities could occur in pinyon-juniper cover types in Alternative A. This activity consists primarily of hydromowing or other mechanical treatments to reduce juniper densities. This activity could be expected to benefit sage-grouse if it occurs in occupied habitat because it can reduce post-fire suppression juniper expansion and promote forage species. Alternative A also proposes to implement wildlife management activities intended to improve sage-grouse habitat on 200 acres within three occupied sites. This activity could be associated with additional juniper treatments, sagebrush treatments, riparian habitat improvements, or other activities that would benefit sage-grouse some portion of their life cycle. These wildlife management activities are expected to improve sage-grouse habitat to a lesser degree than the action alternatives because Alternative A involves fewer treatment acres.

Livestock grazing can have negative influences on Gunnison sage-grouse if they overlap occupied habitat. Impacts to riparian areas and understory forage plants are of particular concern because of their importance to breeding hens and new broods. Livestock grazing is not noted as an activity of conservation concern for the populations on SJPL in the Rangewide Conservation Plan. As displayed in Table BE-18a, however, Alternative A, B, and D maintain the highest permitted forage allocation to livestock and are therefore assumed to have a potential for negative impacts to sage-grouse if the activities overlap.

Motorized and non-motorized recreation is not noted as an activity of conservation concern for the populations on SJPL in the Rangewide Conservation Plan. However, it is possible that Alternative A provides a higher risk of impact to individual sage-grouse because there is more "suitable opportunity" land for motorized travel in areas administered by the Dolores Field Office. A higher amount of travel and human activity area could potentially disturb grouse or their broods and/or damage soils, understory plants, or other habitat components utilized by the species.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: In regards to fluid minerals activities, all action alternatives are expected to have fewer potential impacts on sage-grouse than Alternative A because they all involve more restrictive lease stipulations designed specifically for the species. These stipulations are displayed below in Table BE-189.

Table BE-19b: Fluid Minerals Lease Stipulations for Gunnsion Sage-Grouse, by Alternative.

Lease Stipulation	Alternative A	Alternative B	Alternative C	Alternative D
No Surface Occupancy – w/I 0.6 mi. of known lek sites	N/A	1,900 ac.	1,900 ac.	1,932 ac.
Timing Limitation – applied from 3/1 to 6/1, 0.6 to 4.0 mi. of a lek site	N/A	72,900 ac.	72,900 ac.	72,886 ac.

As displayed in Table BE-19b, all action alternatives are expected to have similar potential effects on sage-grouse because they all involve similar lease stipulations. Currently, however, there are no known lek sites on SJPL. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

As in Alternative A, approximately 1,000 acres of mechanical fuels treatment activities could occur in pinyon-juniper cover types in all of the action alternatives. Similar effects and benefits are therefore anticipated if these activities occur in association with occupied sage-grouse habitat. All action alternatives also propose to implement wildlife management activities designed specifically for sage-grouse habitat improvement. Alternative B and C are associated with the greatest amount of habitat improvement on three occupied sites while Alternative D decreases this amount similar to Alternative A. The greatest benefits are expected to be associated with the most amount of treatment on the most sites.

As displayed in Table BE-18a, livestock grazing activities in Alternatives B and D are similar to Alternative A and maintain a high amount of permitted forage allocation to livestock. Potential effects from livestock grazing in these alternatives are therefore expected to be similar. Alternative C reduces the amount of permitted livestock AUMs by about 25%. Some benefits may therefore be expected. However, the overall influence of livestock grazing is not expected to differ from the other action alternatives because grazing is not noted as a current concern to the sage-grouse populations on SJPL.

All action alternatives reduce potential impacts to sage-grouse from motorized travel in a similar manner. All alternatives tighten the boundaries on the amount of "suitable opportunity" land for motorized travel on lands administered by the Dolores Field Office. Travel is restricted to areas that already have existing and desirable motorized routes, and identify areas without existing routes as unsuitable. It is likely that these travel management actions will reduce the amount of conflict that could potentially occur to sage-grouse and their important habitat components.

Cumulative Effects: Gunnison sage-grouse currently occupy a small fraction of their historical range, and have been extirpated from much of their presumed historical distribution due to habitat conversion (Gunnison Sage-grouse Rangewide Steering Committee 2005). Although their distribution was probably always somewhat fragmented, the amount of fragmentation has been greatly increased because of habitat loss. As of 2004, the total population of this species was estimated at approximately 3,200 breeding birds in seven populations, 75% of which occurred in the Gunnison Basin. The Gunnison sage-grouse remains a species of conservation interest on San Juan Public Lands because two small populations occur on lands administered by the BLM and because of continued habitat and population viability concerns.

The Gunnison Sage-Grouse Rangewide Conservation Plan was completed in early 2005 to supplement the information in the local conservation plans and provide a rangewide perspective regarding the conservation on Gunnison sage-grouse. The SJPL is committed to assisting and participating in this plan through a formal Conservation Agreement signed by both the Forest Service and the BLM in April 2005. Conservation efforts for the Gunnison sage-grouse on the SJPL will continue through the opportunities identified in these plans and through local partnerships as opportunities arise. While cumulative effects have been occurring and will most likely continue to occur to these small populations of sage-grouse, the species is a priority for conservation action on SJPL. These actions are anticipated to minimize potential cumulative effects on public lands ands assist in the recovery of the species.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (Gunnison sage-grouse), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- Two small populations of Gunnison sage-grouse occur on BLM administered lands on SJPL. Most of the habitat for one population is associated with private lands. The BLM administers approximately 57% of the land occupied by one population.
- The primary threats to sage-grouse populations associated with the SJPL involve habitat conversions and activities on private lands.
- Some Plan Revision activities could overlap occupied sage-grouse habitat and have negative influences on the species.
- The SJPL is a co-signer to a statewide Conservation Agreement intended to conserve and recover the Gunnison sage-grouse.
- The SJPL adheres to the Rangewide Conservation Plan for Gunnison sage-grouse and is taking action to maintain and improve habitat conditions.

Lewis' Woodpecker *(FS sensitive)*

a) Natural history and Background: The Lewis' woodpecker (*Melanerpes lewis)* breeds from southern British Columbia to southwestern South Dakota and northwestern Nebraska south to south-central California, central Arizona, southern New Mexico, and eastern Colorado. It winters from northern Oregon, southern Idaho, central Colorado, and south-central Nebraska south irregularly to northern Baja California, northern Mexico, southern New Mexico, and west Texas (Degraaf et al. 1991). In Colorado, the Lewis' woodpecker breeds in foothills, valleys, plains and mesas in the southern part of the state, and along the front range from Wyoming to New Mexico. In eastern Colorado, it inhabits cottonwood communities in close proximity to ponderosa pine or pinyon-juniper woodlands (Andrews and Righter 1992, Kuenning 1998, Yanishevsky and Petring-Rupp 1998). It seems to be especially common in the Durango area and La Plata County (Andrews and Righter 1992). The Durango Bird Club (1992) considers this species a common year-round resident in southwest Colorado. This species occurs on National Forest System lands of all Districts on SJPL and is relatively common and locally abundant in suitable habitats across the Forest (Schultz 1996b).

The Lewis' woodpecker has unique characteristics that set it apart from other North American woodpeckers. It is opportunistic in its feeding habits, eating mostly insects in summer and switching in winter to acorns and other nuts, which are cached during the non-winter months (Bock 1970, Tobalske 1997, Abele et al. 2004). It is adept at capturing insects aerially through a variety of complex maneuvers, and, although it may glean from the surfaces and crevices of tree bark, it seldom excavates for wood-boring insects (ibid).

Bock (1970) described the major breeding habitat of the Lewis' woodpecker as ponderosa pine throughout its range. However, they are now found in riparian habitats at a higher frequency than in upland conifer and woodland habitats (Kuenning 1998). Some researchers have suggested an elevational relationship in which ponderosa pine forests are preferred at higher elevations and open riparian forests at low elevations (Tobalske 1997). Although the Lewis' woodpecker uses a variety of habitats that are found on the San Juan National Forest, primary habitats are open, mature ponderosa pine and deciduous riparian woodland (cottonwood/box elder) communities during the breeding season, and mature oak woodlands during the non-breeding season (Schultz 1996b). Canopy closures of 30% are considered optimal for this species and closures greater than 75% are considered unsuitable (Yanishevsky and Petring-Rupp 1998). Nest sites are associated with the presence of abundant free-living insects, open canopy forests or tree clusters, standing dead trees, and dense ground cover in the form of downed material, grasses and shrubs (Tobalske 1997, Abele et al. 2004). Burned ponderosa pine forest may represent ideal habitat for nesting, although suitability may vary with numbers of years after fire and the intensity of the burn (Bock 1970, Raphael and White 1984, Linder 1994).

Snags are important to the Lewis' woodpecker as nesting sites and as perching sites from which to hawk insect prey. Populations are positively correlated with snag density and at least one living or dead snag/acre is required to maintain fully occupied territories (Yanishevsky and Petring-Rupp 1998). A shrub crown cover of 50% is

considered optimal and habitat featuring no shrub cover is considered unsuitable (Yanishevsky and Petring-Rupp 1998). The shrub component is apparently significant in providing an abundance of insect prey. However, shrubby understories appear to be of less importance in riparian areas and oak woodlands (ibid.).

The diet of the Lewis' woodpecker varies with seasonal abundance of food items. It focuses its foraging efforts on locally and temporarily abundant insect populations during spring and summer, and on ripe fruits and mast during fall and winter (Bock 1970, Abele et al. 2004). Insects taken are primarily free-living (not wood-boring) insects, principally post-larval ants, bees and wasps, beetles, and grasshoppers. Insects are captured through aerial foraging (80%), gleaning on tree trunks and branches, and hunting in bushes and on ground. Snags, telephone poles, fence posts, and other locations with open views are used for perching when fly-catching (Bock 1970). Although most insects are captured in flight by hawking from a perch, the Lewis' woodpecker also engages in nonspecific or direct long-duration foraging flights, sometimes amid swallows and swifts (Tobalske 1997).

Acorns make up an important part of their winter diet (Abele et al. 2004). Other foods include wild succulent fruit, including apples, cherries and peaches, serviceberry, hawthorn, dogwood, elderberry, and sumac (ibid). Acorns, nuts and berries are taken from branches of trees and shrubs rather than from the ground. In fall and winter, single birds, or less frequently pairs of birds, develop and defend mast stores, which form a primary contribution to their diet until spring when non-wood-boring insects become abundant (Bock 1970). Cache sites are vigorously defended against both conspecifics and those of other species (ibid.).

The Lewis' woodpecker requires specific structures and characteristics in its habitat, including relatively high snag densities with well decomposed snags to provide existing cavities or in which to construct new cavities. Their restricted ability to construct cavities may result in limited nest-site availability in some populations (Abele et al. 2004). They also require low-medium crown closures, well-developed shrub cover to supply insect prey, mast and berries, and caching sites. Broad-scale population declines and reductions in distribution have been attributed to declining availability of suitable trees for nesting and mast storage (Tobalske 1997). Competition for native mast may regulate wintering populations (Abele et al. 2004). Reductions in primary habitat have occurred through the loss of mature stands of ponderosa pine and in declining stands of riparian cottonwood forests. Most of the ponderosa pine forest type on the SJPL is outside its historic range of variation from fire suppression, grazing, logging and snag removal or loss (Romme et al. 1997). The availability of burned forests, which appear to be important habitat for this species, has probably declined as a result of fire suppression. Cottonwood riparian habitats, which serve as both breeding and wintering habitat, have also declined through grazing, clearing for pasture and agriculture, exotic shrub invasion and water diversion (Tobalske 1997, Abele et al. 2004). They are competitive with the European starling for nest sites and high rates of territorial encounters with starlings may reduce reproductive success, even if the woodpecker dominates the interaction (Tobalske 1997). The most critical time period on the SJNF is likely to be during winter for overwinter survival.

b) Effects Analysis: Plan Revision activities that could potentially influence Lewis' woodpecker primarily involve timber harvest and fuels treatment activities.

Alternative A: No Action

Direct/Indirect Effects: The Lewis' woodpecker occurs primarily in ponderosa pine forest on SJPL. Differences in outputs associated with these activities that may influence the species are displayed below in Table BE-20.

Table BE-20: Activities and Projected Outputs that could Potentially Influence Lewis' Woodpecker, by Alternative.

Fuels Treatment Acres (Suitable Cover Types Only)				
* Ponderosa Pine	1500 ac. mechanical restoration	1500 ac. mechanical restoration	1500 ac. mechanical restoration	2000 ac. mechanical restoration
* Ponderosa Pine	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire
Timber Treatment Acres (Suitable Habitat Only)				
* Ponderosa Pine	1000 ac. restoration 500 ac. partial cut	1000 ac. restoration 500 ac. partial cut	900 ac. restoration 500 ac. partial cut	1500 ac. restoration 500 ac. partial cut
Wildlife Mgmt Acres (Suitable Habitat Only)				
* Ponderosa Pine	2000 ac. restoration	2000 ac. restoration	2000 ac. restoration	2000 ac. restoration

There are no projected outputs for riparian-associated habitats such as cottonwood groves that may be used by Lewis' woodpecker. These areas are protected as riparian areas and are assumed to provide suitable habitat for the species. The focus of this evaluation will therefore be associated with ponderosa pine, which provides the primary breeding habitat for Lewis' woodpecker on SJPL. The presence of large ponderosa pine snags is particularly valuable to this species.

As displayed in Table BE-20, the predicted timber harvest output in ponderosa pine varies from 1,400 to 2,000 acres and is very fairly similar in all alternatives. Restoration treatments intended to restore the ponderosa pine cover type closer to historic conditions is the primary treatment in Alternative A. These treatments are similar in all alternatives, and help restore large snag habitat over time.

The use of prescribed fire is expected to help restore habitat conditions for Lewis' woodpecker and maintain the large-tree structure preferred by the species. The use of prescribed fire is projected to occur on approximately 4,000 acres and does not vary across alternatives.

Wildlife management activities in ponderosa pine systems in Alternative A do not vary from the action alternatives. These activities are also intended to help restore ponderosa pine closer to historic conditions by understory thinnings and other activities that should be beneficial to Lewis' woodpecker.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-20, there is little difference between no action and Alternative B, C and D in regards to predicted outputs and restoration activities in ponderosa pine. As is consistent with the active management theme, however, Alternative D offers a slightly greatest amount of projected outputs in ponderosa pine. However, the difference between the action alternatives is minor and all alternatives are expected to have similar influences as the no action. Temporary impacts such as snag felling may occur due to safety reasons and pose additional impacts to individual woodpeckers. However, long-term benefits are anticipated due to the restoration activities intended to move the structure and composition of ponderosa pine forests closer to historic conditions .

The use of prescribed fire and wildlife management for restoration in ponderosa pine does not vary from the no action alternative. Similar benefits and influences are expected.

Cumulative Effects: Ponderosa pine comprises 13% of the SJNF. Over the last 100+ years, humans have played a key role in the status and structural composition of ponderosa pine across the SJNF. Numerous land-use practices (timber harvest, livestock grazing, fire suppression) have influenced the current condition of ponderosa pine stands on the Forest. Over the last 20 years, there has been a stable trend in the early-, mid-, and late-successional ponderosa pine forests. There has been a significant decreasing trend (81.8%) in mature

stands with relatively high canopy closures (structural stage 4C). Most mid-successional ponderosa pine stands continue to maintain relatively high canopy closures and are classified as 4B. In terms of wildlife habitat quality for Lewis' woodpecker, this trend has most likely maintained suitable habitat conditions for the species. As with species such as the flammulated owl, however, the largest influence on Lewis' woodpecker has most likely been the loss of large ponderosa pine snags in localized areas associated with timber harvest and fuelwood gathering.

Assuming that the current trends in ponderosa pine forest structure and composition continue, there will be greater risk of high-intensity wildfires and more widespread insect and disease outbreaks. Since wildlife habitat needs are directly related to forest stand structure and composition, continued changes in both will continue to affect the amount of habitat available to wildlife. Ponderosa pine treatments that manage for pre-Euro-American conditions should continue to improve habitat for numerous species of wildlife, including Lewis' woodpeckers. Conservation measures intended to protect available snag habitat while also providing opportunities for fuelwood harvest are expected to help alleviate the effects of past management activities. While some cumulative effects to Lewis' woodpeckers is likely to continue, planned restoration activities and the gradual ageing of ponderosa pine stands is expected are to help minimize negative effects on this species.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (Lewis' woodpecker), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The San Juan National Forest provides habitat that supports Lewis' woodpecker populations.
- Impacts to some important habitat features, such as snags, has occurred in the past and are likely to continue on a controlled basis.
- The restoration focus on ponderosa pine on the SJNF is expected to provide long-term benefits for the species.

Loggerhead Shrike *(FS sensitive)*

a) Natural History and Background: The loggerhead shrike (*Lanius ludovicianus)* is a small avian predator that inhabits open country with scattered or clustered shrubs or small trees. It occupies a distinctive position in avian communities by preying on reptiles, mammals, and other birds, as well as invertebrates. It occurs across the U.S., from central Washington, the Canadian prairies and Virginia in the north, to the southern states and central plains (except for heavily forested higher mountains and higher portions of the desert) (Yosef 1996). The southern range extends to Baja California and Mexico, at elevations of 4,920-7,880 ft. The southern states and central plains, not including eastern Colorado, support the highest densities (Carter 1998a). The northern populations are migratory, where as the southern populations tend to be resident (Yosef 1996). They winter from Nevada and Virginia to southern Mexico. Despite its wide distribution, the loggerhead shrike is one of the few North American passerines whose populations have declined continent-wide in recent decades (Yosef 1996). In Colorado, there are distinct concentrations of loggerhead shrikes in the eastern portion of the state, and a few breeding pairs in isolated pockets in the south-central, western and northwestern regions of the state (Carter 1998a). Populations on the Colorado's eastern plains appear to be increasing, but those on the western slope may be declining (ibid). No shrike nests have been documented on National Forest System lands of the SJPL and suitable breeding habitat appears to be rare on the Forest. It is unlikely to winter on the Forest due to normally deep snows and lack of prey.

Non-breeding habitat is the more open country from prairies and agricultural lands to montane meadows. Nesting habitat includes sagebrush, desert scrub, pinyon-juniper woodlands, and woodland edges (Dechant et al. 2001b). Breeding birds are usually near isolated trees or large shrubs. They nest earlier than most other passerines. Nests are bulky, cup-shaped, and located in trees or large shrubs 3 to 30 feet high (ibid). Nests are well below the crown in a crotch or large branch and are typically well hidden.

The shrike has adapted to the problem of eating large prey by hunting from perches and impaling its prey on sharp objects. The diet of the loggerhead shrike is composed mostly of insects (83 percent), with the remainder made up of small mammals, birds, and reptiles. Sometimes it hawks for aerial insects, but it takes most of its prey as it dives to the ground from elevated perches such as fence posts or utility lines (Dechant et al. 2001b). It may pursue birds in rapid, sustained flight, knocking them to the ground with a blow from the beak (DeGraaf et al. 1991).

Loggerhead shrikes prefer open habitat characterized by grasses interspersed with bare ground and shrubs or low trees for nesting and perching (Dechant et al. 2001b). Habitat loss is considered to be a major factor limiting shrike populations throughout the U.S. (Carter 1998a, Yanishevsky and Petring-Rupp 1998). Conversion of grasslands to agricultural land, removal of trees or hedgerows, and urbanization have significantly reduced nesting and foraging habitat. Food limitation resulting in brood reduction (cannabilism) has been observed in shrikes, leading to suggestions that food limits reproductive output in some populations (Yosef 1996). The nesting season (May through August) is the most critical time period on the National Forest as they are absent from the Forest during late fall, winter and early spring.

b) Effects Analysis: In occupied habitat, Plan Revision activities that could potentially influence loggerhead shrikes primarily involve fuels treatment activities and, possibly, fluid minerals development.

Alternative A: No Action

Direct/Indirect Effects: No direct or indirect effects on the loggerhead shrike are expected from Alternative A because the species is not known to nest on the National Forest Systems portion of SJPL. Suitable habitat for the loggerhead shrike is limited, with no breeding or local populations confirmed on Forest lands within the planning area.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: No direct or indirect effects on the loggerhead shrike are expected from implementation of any of the action alternatives because occurrence of this species is considered incidental to rare. Suitable habitat is for this species on Forest lands is limited, with no breeding or local populations confirmed on Forest lands within the planning area.

Cumulative Effects: No cumulative effects are expected because of lack of suitable nesting habitat.

c) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the loggerhead shrike or its primary habitat. The rationale for this determination is as follows:

- The loggerhead shrike is considered incidental or extremely rare on SJPL, with no breeding populations known to occur.

Northern Goshawk *(BM and FS sensitive)*

a) Natural History and Background: The goshawk (*Accipiter gentiles)* is holarctic in distribution. In North America, it occurs from central California, Arizona, northern New Mexico, north and northeast through New Mexico, Colorado, and South Dakota east across the southern Lake States and south into the Appalachian Mountains to North Carolina (Braun et al. 1996, Kennedy 2003). In Colorado, the northern goshawk is considered an uncommon resident in foothills and mountains within the western portion of the state (Andrews and Righter 1992, Barrett 1998b). It is considered to be a winter resident through out its range, but some individuals winter outside their breeding areas and undertake short-distance migrations (Kennedy 2003). Breeding territories have been found on all Ranger Districts/ Field Offices of the SJPL, and in all forested habitat types. Foraging individuals are regularly seen in a wide variety of habitat types across the SJPL.

The goshawk has often been described as an old-growth species (Kennedy 2003), but this status has been heavily debated. Several reviews have concluded that while goshawks frequently use mature or older forests for nesting, they appear to be a forest generalist in terms of the types and ages of forest used for foraging and during the fledgling-dependency period (Reynolds et al. 1992, U.S. Fish and Wildlife Service 1998). These reviews note that goshawks seldom use young dense forests, likely due to insufficient space in and below the canopy to facilitate flight and prey capture.

Goshawks exhibit high breeding territory fidelity from year to year (Kennedy 2003). All montane forest types are used for nesting (Barrett 1998, ibid). Nest areas have a relatively high tree canopy cover and a high density of large trees. Nests are typically located on shallow slopes with northerly exposures or in drainages or canyon bottoms protected by such slopes and are usually within close proximity to water (Reynolds et al. 1992, Barrett 1998). Nest trees are often the largest trees in the stand and are frequently situated adjacent to breaks in the canopy such as old logging trails or openings created by fallen trees (Hennessy 1978, Shuster 1980, Reynolds et al. 1992, Kennedy 2003). Shuster (1980) also noted a relatively low level of understory vegetation in the general area of the nest site. Goshawks may select nest sites based on stand structural features, then select an appropriate nest tree

(Kennedy 2003). Winter habitat use by goshawks is described as "a variety of vegetation types, such as forests, woodlands, shrub lands, and forested riparian strips" (ibid).

Goshawks prey primarily on medium-sized forest birds and mammals. The majority of the important prey species reside mainly on the ground and in the lower portions of the tree canopy (Reynolds et al. 1992). Frequently noted prey species include cottontail rabbit, tassel-eared squirrel, Steller's jay, red squirrel, snowshoe hare, black-tailed jackrabbit, northern flicker, American robin, band-tailed pigeon, blue grouse, chimpmunks, hairy woodpecker, mantled ground squirrel, mourning dove, red-naped sapsucker and Williamson's sapsucker.

Prey availability and predation limit goshawk reproduction and recruitment (Kennedy 2003). Density-dependant territoriality may regulate population growth rate (ibid). Prey availability affect populations in at least two different ways. First, low prey availability can reduce reproductive output or cause total nest failure (Boal and Mannan 1994). Low prey availability may also result in larger territories, thereby limiting the total number of territories within a given landscape of suitable habitat (Kennedy et al. 1994, Crocker-Bedford 1998). Clonal aspen stands within ponderosa pine and other conifer forest types are often used for nesting, and may be important areas for foraging due to higher concentrations and diversity of prey species (Shuster 1994, Joy 1990). Aspen inclusions within pine and conifer forest types used for nesting by goshawks have been lost from the SJPL because of stand aging and lack of disturbance or subsequent regeneration due to fire suppression, and in some cases, browsing by domestic and native ungulates. During winter, prey abundance and not habitat per se may be an important factor in determining goshawk habitat use (Kennedy 2003). The nesting season (April through August) is likely to be the most critical time period for goshawks on the SJPL.

b) Effects Analysis: Plan Revision activities that could potentially influence the northern goshawk primarily involve timber harvest, fuels treatments, and wildlife management activities. Motorized and non-motorized recreation could possibly influence nesting in some locations.

Alternative A: No Action

Direct/Indirect Effects: The northern goshawk is considered a forest generalist that nests primarily in ponderosa pine forest on SJPL. However, it also utilizes aspen and other forest types. Differences in outputs associated with these activities that may influence the species are displayed below in Table BE-21.

Table BE-21: Activities and Projected Outputs that could Potentially Influence the Northern Goshawk, by Alternative.

Fuels Treatment Acres (Suitable Cover Types Only)				
* Ponderosa Pine	1500 ac. mechanical restoration	1500 ac. mechanical restoration	1500 ac. mechanical restoration	2000 ac. mechanical restoration
* Ponderosa Pine	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire	4000 Prescribed Fire
* Warm Dry Mixed Conifer	500 ac. mechanical restoration; 500 adc. Prescribed fire	500 ac. mechanical restoration; 500 ac. prescribed fire	500 ac. mechanical restoration; 500 ac. prescribed fire	600 ac. mechanical restoration; 500 ac. prescribed fire
* Spruce-fir	50 ac. Partial Cut	50 ac. Partial Cut	20 ac Partial Cut	113 ac Partial cut
* Cool-Moist Mix-Con	200 ac. Partial Cut	125 ac. Partial Cut	20 ac. Partial Cut	287 ac. Partial Cut
Timber Treatment Acres (Suitable Habitat Only)				
* Ponderosa Pine	1000 ac. restoration 500 ac. partial cut	1000 ac. restoration 500 ac. partial cut	900 ac. restoration 500 ac. partial cut	1500 ac. restoration 500 ac. partial cut
* Warm Dry Mixed Conifer	250 ac. restoration 250 ac. partial cut	250 ac. restoration 250 ac. partial cut	200 ac. restoration 225 ac. partial cut	500 ac. restoration 250 ac. partial cut
* Aspen	400 ac. clearcut	500 ac. clearcut	400 ac. clearcut	600 ac. clearcut
Wildlife Mgmt Acres (Suitable Habitat Only)				
* Ponderosa Pine	2000 ac. restoration	2000 ac. restoration	2000 ac. restoration	2000 ac. restoration

As displayed in Table BE-21, the predicted timber harvest output in ponderosa pine varies from 1,400 to 2,000 acres and is very fairly similar in all alternatives. Restoration treatments intended to restore the ponderosa pine cover type closer to historic conditions is the primary treatment in Alternative A. These treatments are similar in all alternatives, and are intended to help maintain and restore the large tree component required for goshawk nesting substrate over time. These treatments will target small diameter stands and closed canopy mature stands where density reduction should benefit goshawk foraging patterns. Unless carefully planned, however, density reduction may have negative influences on individual nesting territories.

Treatments in warm-dry mixed-conifer stands are also expected to have variable effects on northern goshawks. Where restoration treatments occur, benefits should be similar to those described for ponderosa pine. Where partial cuts occur, variable effects may occur depending upon existing stand conditions and the amount of overstory removed. Nesting habitat and/or trees could be reduced in some cases. However, the amount of treatment in Alternative A (250 acres) represents a very small percentage of the 71,500 acres of warm-dry mixed conifer on the SJNF, and potential impacts are expected to be minimal and localized. Treatments in aspen are also similar across alternatives, but may impact individual goshawks because of the intensive treatments involved. Older aspen stands that currently contain the structural characteristics needed to support nest platforms may be targeted for regeneration. Conversely, however, long-term benefits may be associated with regenerating stand conditions.

The predicted timber harvest output in secondary habitat such as spruce-fir and cool-moist mixed conifer varies from 250 to 400 acres and is very minimal in all alternatives. These amounts represent about 0.04 to 0.07% of the late-successional stands of these forest types on the SJNF. The amount of timber harvest in all forest types in Alternative A is therefore expected to possibly impact individual goshawks but have little influence on the species or populations on the SJNF.

Alternative A offers more high-use recreation areas than any of the action alternatives. This difference could potentially allow greater disturbances to nesting goshawks than the action alternatives.

The use of prescribed fire is expected to help restore habitat conditions for the northern goshawk due to a reduction in small-diameter trees that could inhibit effective foraging. The use of prescribed fire is also expected to provide benefits by reducing fuel loads that could result in a high-intensity wildfire that could render habitat unsuitable. Benefits to prey species is also anticipated as small mammals and birds respond to the burn areas. Some impacts may occur to individual goshawks if nesting occurs within a prescribed fire area. The use of prescribed fire is projected to occur on approximately 4,000 acres and does not vary across alternatives. Wildland Fire Use may be used as a management tool on 1 to 30,000 acres of spruce-fir in all action alternatives. This could impact individual goshawks if fire occurs in nesting areas.

Wildlife management activities in ponderosa pine systems in Alternative A do not vary from the action alternatives. These activities are also intended to help restore ponderosa pine closer to historic conditions by understory thinnings and other activities that should be beneficial to the northern goshawk.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-21, there is little difference between the no action alternative and Alternative B, C and D in regards to predicted outputs and restoration activities in ponderosa pine. As is consistent with the active management theme, Alternative D offers the greatest amount of projected activities in all cover types that may be utilized by the northern goshawk. This includes a slight increase in restoration harvest in warm-dry mixed conifer, a 100 acre increase in clearcut harvest within aspen stands, and a 63 to 93 acres increase in partial-cut harvest in spruce-fir. The slight reduction in harvest outputs in Alternative C and slight increase in Alternative D suggest that potential impacts and disturbances may therefore also vary. Overall, however, all action alternatives are similar and expected to have similar influences on the northern goshawk. Site-specific impacts may occur to individual goshawks in the short-term, with long-term benefits anticipated in primary ponderosa pine habitat.

All action alternatives offer fewer potential disturbances than the no action from summer motorized recreation because of decreases in the amount of motorized use area. Consistent with their themes, Alternative C offers the fewest motorized acres while Alternative D offers the highest amount of acreage. Alternative B offers a balance between the two other action alternatives, but also provides more undisturbed habitat than the no action. Reductions in open motorized areas should decrease the potential for displacement or disturbances while nesting.

The use of prescribed fire and wildlife management for restoration in ponderosa pine does not vary from the no action alternative. Similar benefits and influences are therefore expected. As with the no action, it is estimated that Wildland Fire Use may be used as a management tool on 1 to 30,000 acres in all action alternatives. Depending upon fire severity and scale, these outputs could have negative influences on the northern goshawk.

Wildlife management activities proposed in the action alternatives to aid in the restoration of ponderosa pine stands does not vary from the no action alternative. Similar benefits and influences are expected.

Cumulative Effects: Since the beginning of the last century, the SJNF has experienced changes in forest structure caused by timber management, fire prevention, domestic livestock grazing and other factors. Extensive logging, particularly in the ponderosa pine and mixed-conifer types, has created much younger, and often much denser, forests than existed in the presettlement era (Romme 1994). The opening of the canopy that results from timber harvest, in combination with fire suppression, has allowed dense shrub layers to develop. These conditions are less suitable for goshawks because of a lower diversity or unavailability of prey species .

The SJNF is implementing a forest restoration program in ponderosa pine to return this cover type to a more suitable condition for goshawks and other species and make them more resilient to disturbance factors such as wildfire and insects and disease. The fuels reduction program on the SJNF is using various techniques to restore ponderosa pine to more suitable habitat conditions. These include forest thinnings, mechanical treatments, and controlled burns. All of these techniques reduce understory trees and shrubs and therefore change habitat capability for goshawks. These changes are expected to improve long-term habitat conditions for prey species and make them more accessible to goshawks. As a result, it is expected that cumulative

effects will be minimized and long-term benefits for goshawks and their primary prey species will occur while the risks of a high-intensity stand replacement fire are reduced.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (northern goshawks), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- Recent information for the Forest indicates that goshawks primarily use ponderosa pine or aspen for nesting habitat.
- Approximately 770,160 acres (41 percent of entire Forest) is considered suitable goshawk nesting and prey habitat. Overall, the amount of suitable habitat has changed very little (less than 1%) in the last twenty years.
- Changes in forest structure over time in some cover types have reduced some habitat attributes that are preferred by goshawks. Most current management practices have retained the structural characteristics preferred by goshawks and their prey species while reducing the dense stand conditions that promote insects and disease and high-intensity stand-replacing fire events. This has improved the resiliency of the habitat and should lead to a more stable habitat and population trend in the long-term.
- Site-specific impacts to individual goshawks may occur from restoration activities and other planned outputs. These are expected to be similar across all alternatives.

Northern Harrier *(FS sensitive)*

a) Natural History and Background: Northern harriers (*Circus cyaneus)* breed through out North America and parts of Eurasia, but reach their highest densities in North America in the prairie-pothole region of the U.S. and Canada (Price et al. 1995, Carter 1998b, Dechant et al. 1992). In Colorado, harriers breed across the state but are less common in dry areas and at high elevations (ibid). They are seen occasionally in summer on the National Forest System lands of SJPL and likely breed in some large open parks and wetlands, especially on the west end of the Forest (the Glade). Harriers declined in the 1970's due to effects of DDT, but declines have continued, probably due to loss of wetlands and conversion of grassland breeding habitats to agricultural uses (Carter 1998b). They may nest semi-colonially, even when large areas of suitable nesting habitat are present, and polygyny has been documented in many populations (Hamerstrom et al. 1985, Hamerstrom 1986).

Harriers prefer open habitats with tall, dense vegetation, and abundant residual vegetation, wetlands, wet or dry grasslands, lightly grazed pastures, croplands and fallow fields, brushy areas, and dry shrublands (Hamerstrom 1986, Dechant et al. 1992). In late summer, they forage up to alpine tundra (Carter 1998b). They breed in a variety of open habitats with tall cover from marshes to grasslands, such as cattail and reed marshes, emergent wetlands, grasslands, and tall desert shrublands (Hamerstrom 1986, Dechant et al. 1992, Carter 1998b).

Voles and other small rodents, captured on the ground after a short pounce, are the primary prey of northern harriers. Rates of polygyny in harrier populations, and many measures of annual reproductive output are tied closely to changes in vole populations (Hamerstrom 1986, Dechant et al. 1992, Carter 1998b). Harriers also prey on other mammals, small birds, reptiles, amphibians and large insects (Bildstein and Gollop 1988).

Intensive grazing, annual burning, tilling or mowing in harrier nesting habitat during the nesting season can significantly reduce harrier nest success and prevent successful nesting in some areas (Dechant et al. 1992). However, periodic disturbance, such as burning every 3-5 years, or light to moderate grazing may help maintain habitat for harrier nesting and their primary small mammal prey (Hands et al. 1989, Bock et al. 1993). The nesting season (April through August) and post-breeding dispersal season are the most critical time periods for harriers on the National Forest.

b) Effects Analysis: Plan Revision activities that could potentially influence the northern harrier primarily involve livestock grazing, motorized recreation, and wildlife management activities (i.e. watershed, riparian, and aquatic habitat improvements).

Alternative A: No Action

Direct/Indirect Effects: In southwest Colorado, the northern harrier occurs primarily on private agricultural lands at lower elevations. However, the species also occasionally occurs in meadows and grasslands on the SJNF where individual nesting pairs is possible. Differences in outputs associated with activities that may influence the northern harrier are displayed below in Table BE-22.

Table BE-22: Activities and Projected Outputs that could Potentially Influence the Northern Harrier, by Alternative.

Livestock Grazing (Cattle AUMs Only)	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
* Premitted AUMs (FS)	115,312	115,312	112,554	117,791
* Suitable Acres on Active Allotments (FS)	654,837	654,837	626,722	694,321
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	same as winter	same as winter	same as winter
Riparian & Watershed Improvements	152 ac.	152 ac.	410 ac.	179 ac.

Because its primary habitat occurs in lower-elevation grasslands, there are probably minimal influences to the northern harrier from activities that occur on National Forest Systems land. Where livestock grazing occurs in suitable habitat, however, it is possible that positive or negative influences could occur depending upon the timing and intensity of the activity. Alternative A continues the current range management practices under the current respective management plans for both the Forest Service and BLM. Cattle grazing on Forest Service lands are continued at 115,312 AUMs on approximately 655,000 acres. As currently permitted, it is possible that this activity may have negative impacts on northern harriers if they overlap nesting areas because the residual cover requirements are most likely not addressed in current annual operating plans. However, positive influences may also occur if light grazing occurs during the non-nesting season. Overall, however, potential influences from grazing are most likely negative but expected to be minimal because the species occurs uncommonly on the Forest.

In regards to summer motorized travel, Alternative A offers more allowable suitable acres for this activity than in any of the action alternatives. Because harriers nest on the ground in relatively flat terrain in meadows or grasslands, it is possible that direct or indirect impacts to the species could occur from unrestricted motorized activity. Therefore, it is likely that Alternative A has a higher potential of having negative impacts on the species from motorized travel.

Riparian and watershed improvements may benefit northern harriers if the activity occurs in or near moist meadow habitat utilized for nesting or foraging. Examples of this activity could include correcting headcuts or other erosion problems within meadows or grasslands that are having negative influences on the water table. The outputs for this activity are projected at 152 acres in both Alternative A and B.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: Alternative B provides for the same amount of livestock grazing as Alternative A. There is a slight reduction in AUMs in Alternative C, and a slight increase in Alternative D. Although conservation measures are expected to be similar across all alternatives, Alternative C may provide some additional potential benefits to northern harriers because livestock grazing objectives are identified as being

secondary to biodiversity and species objectives. However, this difference is probably insignificant to the overall viability of the species because of the uncommon occurrence and unconfirmed nesting status of the harrier on National Forest Systems land.

The action alternatives offer fewer suitable acres for summer motorized travel. Consistent with the theme of minimizing human influences, Alternative C is the most restrictive and therefore probably offers the most potential benefits. all action alternatives provide potential benefits to the northern harrier because of greater controls regarding off-road travel.

Riparian and watershed improvements of potential benefit to northern harriers would occur on over twice as many acres (410) in Alternative C as proposed in Alternative A or B. Alternative D also slightly exceeds the former two alternatives in watershed restoration activities. Potential benefits are therefore expected to be highest with Alternative C and D.

Cumulative Effects: The northern harrier has a widespread distribution in North America and within Forest Service Region 2. It also inhabits a broad range of open wetland and grassland habitats as long as large tracts of tall, dense herbaceous vegetation are present. Population trends are difficult to assess because of the species' low densities and their propensity to shift breeding sites among years in response to prey availability (Slater and Rock 2005). However, there is evidence that harrier populations have declined in some regions, primarily due to loss of wetlands and grasslands from agricultural and urban development. Because current grazing practices overlap the species' breeding season and generally do not provide the residual grasses and dense herbaceous cover required for nesting, it is likely that some land-use practices on National Forest Systems land have the potential to contribute to negative cumulative effects on harriers. Based on known nesting locations in the vicinity of SJPL (Kingery et al. 1998), however, the primary local threats most likely involve agriculture and urban development on private lands and the SJPL probably contributes very little to the overall status of the species.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (northern harriers), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The northern harrier is an uncommon species on the SJNF. Individual nesting pairs are possible but not known to occur.
- Some Plan Revision activities could have potential impacts on nesting or foraging habitat for the harrier if they occur in occupied habitat.
- All potential impacts are expected to be minimal because of the species' uncommon occurrence on the SJNF.

Olive-sided Flycatcher *(FS sensitive)*

a) Natural History and Background: The olive-sided flycatcher (*Contopus cooperi)* is a neotropical migrant, with most of its breeding range in North America and its wintering grounds in Central and South America. There has been a significant population decline of about 3.5% per year since 1966 across its entire North American breeding range, amounting to a loss of about three-quarters of the population over the 30-year span (Sauer et al. 2004).

Within its breeding range, which includes the western mountains of the U.S., much of Canada and Alaska, and scattered populations in the eastern U.S., it is primarily an inhabitant of coniferous forest (Altman and Sallabanks 2000). The western North America breeding range extends south from south-central Alaska eastward through Canada to north-central Manitoba. It extends south in the Rocky Mountains to the higher elevations of northeastern Arizona, northern New Mexico, and western Texas, and the Sierra Nevada Mountains south to northern Baja California (Altman 1997). They are a well distributed and relatively common breeding bird through out montane portions of western Colorado (Jones 1998b). On National Forest System lands of SJNF, they are most commonly found in spruce-fir forests, and ponderosa pine forests where there is a significant remaining component of pre-settlement trees or super-canopy snags. They are found less commonly in mixed-conifer and aspen forests and there mostly along the edges of riparian areas or scree and talus slopes.

The olive-sided flycatcher is one of the most recognizable bird species of North America's coniferous forests due to its distinctive song (quick, three beers) and its habit of singing from tall, prominent perches (Altman and

Sallabanks 2000). Due to their foraging strategy, which involves sallying for insects from high perches, they prefer the edges of open habitats that provide both abundant prey and high visibility for detecting prey (Altman 1997). Thus, their breeding habitat has two primary components, snags for singing and foraging perches, and conifers for nesting.

Flycatcher territories almost always include natural forest openings, bogs, beaver ponds, wetlands, steams, riparian areas, streams, lake shores, or old burns and logged areas (Jones 1998b). Hutto (1995) and Altman (1999) suggest that flycatchers have evolved as early post-fire dependent species, and that managed forest may represent an ecological sink. The nest is typically located in live conifers, although deciduous trees (i.e., aspen) may be used in some areas. Territory sizes are highly variable but generally large for a passerine bird with pairs well spaced apart (Altman 1997).

The olive-sided flycatcher typically forages in open habitats from high prominent perches, often at the top of snags or dead tips of trees, and significantly less often from the uppermost branches of live trees (Altman and Sallabanks 2000). Almost all food captured are flying insects taken in aerial pursuit by sallying from and returning to the same or another prominent perch (ibid.). Bees, wasps, honeybees, flying ants and dragonflies make up a high percentage of diet during the breeding season (Wright 1997, ibid). Other reported prey includes flies (*Diptera*), beetles, grasshoppers, true bugs, and moths (Altman and Sallabanks 2000).

The causes for this species range-wide decline are not well known (Altman and Sallabanks 2000). Suppression of forest fires and expansion of dense second-growth forests are likely factors, but habitat loss along migratory routes and in wintering areas of Central and South America could contribute significantly to population declines (The Nature Conservancy 2005). The extirpation and recovery of beaver populations through out most of the western U.S. between the mid-19th through late-20th centuries likely had a significant affect on flycatchers due to their strong association with beaver pond habitats. Fire suppression through out its breeding range undoubtedly limits the acreage of available habitat (Altman 1997). Deforestation on this bird's Central and South American wintering grounds has been speculated to be a significant threat to species conservation, possibly explaining why field observers report this bird to be disappearing from apparently suitable and unchanged breeding areas with long histories of occupancy (Altman and Sallabanks 2000).

The nesting season (May through August) is the most critical time period for flycatchers on the SJNF because they are absent from the Forest during fall, winter and early spring.

b) Effects Analysis: Plan Revision activities that could potentially influence the olive-sided flycatcher primarily involve timber harvest and possibly fuels treatment activities.

Alternative A: No Action

Direct/Indirect Effects: Initial habitat groups developed for the Monitoring Colorado's Birds Program (Leukering et al. 2000) placed the olive-sided flycatcher in with other Colorado species that had their highest detection rates in aspen. Monitoring information for 2000, however, recorded the highest densities in high-elevation riparian habitat (Leukering et al. 2001). These detections coincide with natural openings and edges near riparian zones in the spruce-fir landtype, and indicate a habitat relationship similar to that described in the Colorado Landbird Conservation Plan (Beidleman 2000). Monitoring information for 2001 varied again, and found the highest detections in ponderosa pine, mixed-conifer, and spruce-fir, respectively (Leukering et al. 2002). This information suggests that the olive-sided flycatcher uses a wide variety of habitats in Colorado but is most commonly found in high to mid-elevation coniferous forests. Local information suggests that olive-sided flycatchers on the San Juan National Forest are most commonly associated with spruce-fir forest types, particularly near forest edges adjacent to riparian habitat. They should also be expected in past wildfire areas, particularly where an available snag component remains. This analysis is based on spruce-fir and cool-moist mixed conifer as the primary habitat types.

Table BE-23: Activities and Projected Outputs that could Potentially Influence the Olive-sided Flycatcher, by Alternative.

Timber Treatment Acres (Suitable Habitat Only)				
* Spruce-fir	50 ac. Partial Cut	50 ac. Partial Cut	20 ac Partial Cut	113 ac Partial cut
* Cool-Moist Mix-Con	200 ac. Partial Cut	125 ac. Partial Cut	20 ac. Partial Cut	287 ac. Partial Cut
Fuels Treatment Acres (Suitable Cover Types Only)				
* Spruce-fir & Mixed Con	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use

The olive-sided flycatcher returns to its breeding habitat in the southern Rocky Mountains in May, initiates pair bonds, and begins actively building nests by late May or early June (Jones 1998). They construct open cup nests that are often placed well out on the tip of a horizontal branch most often in coniferous trees. Their breeding ecology indicates that the species could be nesting while various management activities are occurring.

In regards to activities that could potentially influence the olive-sided flycatcher, Alternative A offers approximately 145,700 to 187,500 more acres of active management, respectively, than Alternative B and D, which could potentially alter flycatcher nesting habitat. Alternative D exceeds Alternative A in active management area by approximately 8,300 acres.

As displayed in Table BE-23, the predicted timber harvest output in primary habitat varies from 250 to 400 acres and is very minimal in all alternatives. The amount of timber harvest in Alternative A may impact individual nesting pairs but is expected to have little influence on overall habitat or populations of flycatchers on the SJNF.

Wildland Fire Use is not a planned output. However, it will be utilized as a tool to allow natural disturbances to occur within suitable olive-sided flycatcher habitat as opportunities arise. It is estimated that all alternatives may allow from 1 to 30,000 acres of Wildland Fire Use. Depending upon fire severity and scale, these outputs could have negative influences on the nesting habitat of the olive-sided flycatcher. However, the post-fire environment may be beneficial to the species, particularly where snags and fire edges border high-elevation riparian systems.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-23, there is little difference between no action and Alternative B, C and D in regards to timber harvest outputs. As is consistent with the active management theme, Alternative D offers the greatest amount of projected timber output and greatest amount of area where this activity may occur. However, all alternatives influence only about 0.04 to 0.07% of the preferred nesting habitat and are expected to have no detectable affect on olive-sided flycatchers.

As with the no action, it is estimated that Wildland Fire Use may be used as a management tool on 1 to 30,000 acres in all action alternatives. Influences are expected to be similar to those described for Alternative A.

Cumulative Effects: It is difficult to assess potential cumulative effects on the olive-sided flycatcher since the best available information notes that the specific factors affecting population viability are not known (Altman and Sallabanks 2000). What is known, however, is that the species appears to be significantly declining throughout its range. It is also suspected that the olive-sided flycatcher is closely associated with natural disturbance processes such as wildfire to create the type of landscape features that it prefers (Hutto 1995, Altman and Sallabanks 2000). The natural disturbance processes that historically maintained productive habitat for the olive-sided flycatcher on the San Juan National Forest are expected to dominate a large portion of primary nesting habitat for the species because of the large amount of area that will remain undeveloped. In other areas of the Forest land management activities are expected to occur that may provide suitable habitat for the olive-sided flycatcher if certain structural

characteristics are maintained. Wildland Fire Use has also been approved for consideration in most of the undeveloped areas on the Forest. It is projected that these factors will minimize the potential for cumulative effects on the San Juan National Forest as related to the olive-sided flycatcher.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (olive-sided flycatchers), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- Olive-sided flycatchers occur and nest on the San Juan National Forest, primarily in the spruce-fir zone.
- Some Plan Revision outputs, such as timber harvest, will likely reduce potential habitat and result in impacts during the breeding season.
- Impacts from Plan Revision outputs are expected to be limited to individual nesting pairs.
- An extensive amount of primary habitat will remain protected in undeveloped areas such as backcountry, roadless, and wilderness areas.

Purple Martin *(FS sensitive)*

a) Natural History and Background: The purple martin (*Progne subis)* is the largest North American swallow and one of the largest swallows worldwide (Brown 1997). It is one of eight members of the genus *Progne* in the Americas, all of which share similar morphology and behavior (ibid.). There are three subspecies of purple martin. The local subspecies found on National Forest System lands of SJPL is presumably *P.s. arboricola.*

Eastern populations of the purple martin have recently shifted breeding to artificial nest structures and are popular and well known for their use of backyard birdhouses. However, western populations continue to nest in their traditional habitats (ibid.). Purple martin was first identified as breeding in Colorado in 1872 but the next confirmed breeding record did not occur until 1978 on the SJNF at Stoner Mesa (Levad 1998). Since that time breeding colonies have been identified across the Western Slope (ibid.). *P.s. arboricola* breeds in the southern and central Rocky Mountains, including the interior highlands of Central Mexico, and may include populations found along the coastal regions of the Pacific Northwest to southern British Columbia (ibid.).

In Colorado, Andrews and Righter (1992) considers purple martin a common summer resident in the lower mountains of northeastern Mesa and Delta, and northwestern Gunnison counties. They consider the species rare to uncommon breeders north to Moffat and Routt counties, east to Pitkin County and south to Montezuma, La Plata and Archuleta counties.

Inventory and monitoring for purple martins has occurred on the Mancos-Dolores Ranger District. Historically, only three purple martin sites are known from the Mancos-Dolores Ranger District, and currently there are 10 site records of recently active colonies. Martins may be found in suitable habitat on the Columbine and Pagosa Ranger Districts but limited time has been invested surveying for the species. Surveys that have occurred were conducted for specific projects to determine presence or absence, and no populations have been reported to date.

Adults arrived in breeding areas by early June and flocked in preparation for departure by late August. Nests may be found in mature aspen stands. Although aspen forest is the typical breeding habitat for this species, it also may be found in mixed aspen/ponderosa pine or aspen/Douglas-fir forests (Andrews and Righter 1992). Nests are more frequently found in live aspen rather than in snags and in cavities excavated by northern flickers (Reynolds et al. 1991). Nests are usually within 1,000 feet of water, which includes small creeks and stock ponds. During migration, martins occur over riparian areas, open agricultural areas, and reservoirs. Diet varies widely across the geographic range of the species with insect availability. Insects found in their diet common to Colorado include: a variety of beetles, wasps and bees, dragonflies, caddis flies, mayflies, a variety of moths and butterflies, and winged termites (Brown 1997).

Due to the specific nest-site requirements, habitat is probably one of the most significant limiting factors for the purple martin in Colorado. Loss of mature aspen stands with parklands and water sources nearby could reduce the availability of suitable habitat for purple martins. Other limiting factors include disease, reproductive success, weather, parasites, competition with other species, and threats on winter grounds.

b) Effects Analysis: Plan Revision activities that could potentially influence the purple martin primarily involve timber harvest, fuels treatments, and wildlife management activities.

Alternative A: No Action

Direct/Indirect Effects: The purple martin is an uncommon nester in aspen stands on SJPL. . Differences in projected outputs by alternative for activities that may influence the species are displayed below in Table BE-24.

Table BE-24: Activities and Projected Outputs that could Potentially Influence the Purple Martin, by Alternative.

Timber Treatment Acres (Suitable Habitat Only)	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
* Aspen	400 ac. clearcut	500 ac. clearcut	400 ac. clearcut	600 ac. clearcut

Aspen forests comprise approximately 16% of the SJNF. Of the total 299,144 acres of aspen across the SJNF, about 220,596 acres or 74% are in the mature habitat structural stages (4A, 4B, and 4C) that may offer potential nesting habitat for the purple martin. Aspen is most abundant in the west end of the SJNF on the Mancos-Dolores Ranger District, followed by the Columbine Ranger District, and then the Pagosa Ranger District.

As displayed in Table BE-24, the amount of projected treatment in aspen stands is relatively similar between alternatives. The projected output in Alternative A involves approximately 400 acres of clearcut harvest. This represents approximately 0.18% of potential purple martin habitat on the SJNF. The type of treatment proposed in aspen stands (clearcut harvest) has the potential to influence individual nesting pairs of martin if it occurs in potential nesting areas. However, minor influences are expected because of the minimal amount of potential habitat involved.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: With the exception of Alternative C (which does not vary from Alternative A), the action alternatives offer a 100 to 200 acre increase in clearcut harvest in aspen stands. This activity could influence approximately 0.23 to 0.27% of the potential martin nesting habitat on the SJNF. As with Alternative A, the action alternatives may impact individual nesting pairs but are expected to have little influence on purple martins or their overall habitat on the SJNF. Long-term regeneration of aspen stands are expected to be beneficial to martins in the future.

Cumulative Effects: Aspen forests comprise 16% of the SJNF and provide important habitat for numerous wildlife species. Over the last 100+ years, humans have played a key role in the status, distribution, and structural composition of aspen across the SJNF. Numerous land use practices (timber harvest, livestock grazing, fire suppression, and others) have influenced the current condition of aspen stands on the SJNF. Management practices over the last 50 years have helped maintain aspen presence across the Forest, but there continues to be a decreasing trend (13%) in early successional aspen (habitat structural stages 2, 3A, 3B, and 3C). Most of these early successional forests have converted to mature aspen forests. Aspen occurring in stringers in lower elevation ponderosa pine habitat associated with riparian areas or other moist environments are decreasing in abundance. The continued decline of these aspen stringers will result in decreased habitat quality for purple martins and other wildlife species.

As natural succession continues, mature aspen will continue to be the dominant stand structure unless large-scale disturbances occur such as fire, or possibly widespread insect and/or disease outbreaks. Along with this will be shifts in stand structural composition, with conifers continuing to dominate the stands, and eventually replacing aspen. As these shifts occur, shifts in wildlife species composition may also occur. Currently, approximately 50% of the aspen across the SJNF is in an aspen/conifer phase. The shift in structure and composition would result in an overall decreasing trend in aspen, resulting in major influences to purple martins and other wildlife species dependent on aspen. Continued management is important to help maintain the aspen component across the SJNF and reduce the conversion of some aspen stands to coniferous species. These actions may temporarily impact species that utilize the older stands for nesting, but are also expected to minimize potential cumulative effects to purple martins and other species in the long-term.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (purple martin), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The purple martin is an uncommon nester on the SJNF, and is primarily associated with older aspen stands.
- Proposed treatments in aspen stands are limited.
- Where treatments do occur, clearcut harvest could potentially impact habitat for individual nesting pairs.

Short-eared Owl *(FS sensitive)*

a) Natural History and Background: The short-eared owl (*Asio flammeus)* is a small to medium-sized owl with long wings (Cramp 1985), and light wing-loading (Clark 1975). In North America, the species ranges from northern Alaska to northern Labrador, south to California, Utah, Colorado, Missouri, Illinois, Ohio, and Virginia. Non-breeding habitat occurs mostly from the southern parts of most Canadian provinces south to southern Baja California, southern Mexico, Gulf Coast, Florida (AOU 1983).

Historically in Colorado, short-eared owls were noted primarily in winter, with only a few reports of nesting. However, nesting records slowly accumulated during the mid 1900s, and Bailey and Niedrach (1965) noted it as an uncommon resident, with most nesting records on the eastern plains. Recent breeding records are mostly from the northeastern quarter of the state, along with isolated breeding in North Park (Arapaho NWR), the San Luis River valley (Monte Vista and Alamosa NWRs), and an isolated breeding record in the southwest (Andrews and Righter 1992, Boyle 1998). Andrews and Righter (1992) and Boyle (1998) stressed the sporadic nature of nesting at specific localities. In general, short-eared owls breed and winter in relatively dense grasslands, especially those associated with water, but their numbers and location vary strongly from year to year. Occurrence on National Forest System lands of SJPL is considered rare to incidental. No nesting has been documented on SJPL.

Short-eared owls primarily eat rodents (commonly Microtus spp.) but also take other small mammals, birds (especially in coastal areas), and insects (Terres 1980). Short-eared owls forage primarily by flying low, typically into wind, and dropping down onto prey, sometimes after brief hover. Sibling cannibalism may occur.

Habitat loss is considered the biggest limiting factor for short-eared owls. The species is declining in many parts of the range due to destruction and degradation of marshes, grasslands, and low-use pastures (Ehrlich et al. 1992). Populations have declined due to reforestation of farmlands and fragmentation and development of coastal grasslands (see Holt 1992). Loss of open grasslands to later successional stages of community development reduces available hunting and breeding habitat. Other limiting factors include predation, prey abundance, human harassment including shooting, and collision with vehicles and structures. (NatureServe 2007). In winter the ground roosting habit may be abandoned for trees, possibly in response to deep snow (Banfield 1947, Bosakowski 1986).

b) Effects Analysis: Plan Revision activities that could potentially influence the short-eared owl primarily involve livestock grazing and water management and wildlife management activities (i.e. watershed, riparian, and aquatic habitat improvements).

Alternative A: No Action

Direct/Indirect Effects: No direct or indirect effects on short-eared owls are expected from the no action alternative because occurrence of the species is considered incidental to rare. Suitable habitat is for this species on National Forest Systems lands is limited, with no breeding or local populations confirmed on NFS lands within the planning area.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: No direct or indirect effects on the short-eared owl are expected from implementation of any of the action alternatives because occurrence of this species is considered incidental to rare. Suitable habitat is for this species on National Forest Systems lands is limited, with no breeding or local populations confirmed on NFS lands within the planning area.

Cumulative Effects: No specific plan components have been developed for the short-eared owl because it is not known to occur on NFS lands managed by the San Juan Public Lands Center. Plan components and existing regulations are expected to alleviate any potential cumulative effects and contribute to favorable habitat conditions for any individual owls that may happen upon SJPL.

c) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the short-eared owl or its primary habitat. The rationale for this determination is as follows:

- The short-eared owl is considered incidental or extremely rare on SJPL, with no breeding populations known to occur.
- Extremely limited potential habitat occurs on SJPL.
- Plan components and existing conservation measures for other ground-nesting raptor species are expected to adequately address the habitat conditions required by this species.

Western Burrowing Owl *(FS sensitive)*

a) Natural History: The western burrowing owl (*Athene cunicularia)* is a medium-sized ground-dwelling inhabitant of western grasslands and deserts. It has several unique physical and behavioral characteristics in relation to other North American owls. It has long legs and an unusually short tail. It has tendency to nest in loose colonies in underground burrows, which is not only unusual for owls but is quite rare in any other avian species. Although it is primarily nocturnal, it is also quite active during the day, especially during the breeding season. This owl generally occurs west of the Mississippi River. However, a small isolated population occurs year-round in the open-grasslands and prairies of central Florida.

The burrowing owl breeds from south-central British Columbia eastward to southern Saskatchewan and south through much of the western United States, Mexico, Central and South America to southern Chile (Jones 1998). Isolated populations are found in central Florida and on several Caribbean islands including Cuba, Hispanola, Lesser Antilles, Antigua, and the Bahamas (Haug et al. 1993).

In Colorado, it is a locally uncommon to fairly common summer resident on the eastern plains, uncommon in the Grande Valley in Mesa County and rare to uncommon in other western valleys and mountain parks. It is considered a casual winter resident on the eastern plains (Andrews and Righter 1992). The species is rare on BLM lands of the SJPL. National Forest System lands of SJPL are not considered breeding habitat for the burrowing owl although prairie dog habitat is present. There are no known occurrences on any district of the Forest and there are no known breeding records on the Forest (Schultz 2001, pers. comm.).

The burrowing owl uses grasslands and mountain parks, usually in or near prairie dog towns (Andrews and Righter 1992). They also use well-drained steppes, deserts, prairies and agricultural lands (Haug et al. 1993). Semi-desert shrublands are rarely used (Andrews and Righter 1992). Openness, short vegetation, and burrow availability are essential components of habitat (Yanishevsky and Petring-Rupp 1998). The presence of a nest burrow seems to be a primary requirement for habitat suitability (Haug 1985). Burrows of prairie dog and ground squirrel are used most frequently, but badger burrows are also used. In Colorado, owls generally select their burrows in areas with other burrows surrounded by bare ground (Jones 1998). They will often use burrows located within active prairie dog communities and in areas where prairie dog colonies have become inactive owls will discontinue their use when grass reaches 6 inches in height (ibid.). The family occasionally uses the surrounding burrows as alternate roosts and escape cover after the young leave the nest. They frequently choose sites close to roads (Plumpton 1992). This owl occasionally becomes urbanized and will breed or forage in vacant areas within urban zones. Little is known about the habitat preferences for migrating owls in their winter habitats (Haug et al. 1993).

Feeds primarily on large insects (especially in warmer months) and rodents; sometimes eats birds and amphibians. Catches prey in flight or drops to ground (NatureServe 2005). Habitat loss is considered to be a major factor limiting burrowing owl populations in the western U.S. (Yanishevsky and Petring-Rupp 1998). Declining populations of prairie dogs colonies, as a result of control programs and plague, have resulted in a reduction in suitable nest areas. Conversion of grasslands to intensive agriculture and urbanization has also had impacts on available burrow habitats. Other limiting factors include low recruitment of juveniles, predation, prey availability, parasites, weather shooting, vehicle collisions, and pesticides.

b) Effects Analysis: Plan Revision activities that could potentially influence the western burrowing owl primarily involve livestock grazing.

Alternative A: No Action

Direct/Indirect Effects: No direct or indirect effects on the burrowing owl are expected from the no action alternative because occurrence of the species is considered incidental to rare on SJPL. Suitable habitat is for this species on National Forest Systems lands is limited, with no breeding or local populations confirmed on NFS lands within the planning area.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: No direct or indirect effects on the burrowing owl are expected from implementation of any of the action alternatives because occurrence of this species is considered incidental to rare on SJPL. Suitable habitat n National Forest Systems lands is limited, with no breeding or local populations confirmed on NFS lands within the planning area.

Cumulative Effects: No specific plan components have been developed for the burrowing owl because it is not known to occur on NFS lands managed by the San Juan Public Lands Center. Plan components developed for Gunnison prairie dog contribute to the conservation of this species. Although prairie dog habitat occurs on both agency lands, no breeding occurrence is recorded for National Forest System lands within the planning area. Incidental occurrence may occur during migration. The species is also rare on BLM lands within the planning area.

c) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the burrowing owl or its primary habitat. The rationale for this determination is as follows:

- The burrowing owl is considered incidental or extremely rare on SJPL, with no breeding populations known to occur on National Forest Systems land.
- Plan components and existing conservation measures for the Gunnison prairie dog are in place and expected to adequately address the habitat conditions required by this species. Prairie dog colonies are expected to continue to exist and provide potential habitat for individual or migrating owls into the future.

Western Yellow-billed Cuckoo *(BLM and FS sensitive)*

a) Natural History and Background: The western yellow-billed cuckoo (*Coccyzus americanus)* was designated Federal Candidate species in October, 2001. This species is rare to uncommon spring and fall migrant and summer resident throughout much of the Rocky Mountain Region. Numbers of this species fluctuate widely from year to year. North American populations of this species are declining significantly and it is on the National Audubon Society Blue List. The range of the western subspecies of this bird has contracted, and populations have declined dramatically within the remaining range, due to loss of mature closed-canopy riparian forests with dense, thick, understories. It appears that this species was never common in the Rocky Mountains. There have been no recent breeding records in southwestern Colorado (Carter 1998). Suitable habitat on SJPL is unknown but may occur in limited amounts. There is no recorded occurrence on SJPL. Due to elevation and geographic location, and lack of suitable habitat quality, occurrence of this species would be considered rare and incidental.

Primary cuckoo habitat consists of lowland riparian forest and urban areas with tall trees, especially with dense undergrowth and thickets. Optimum nesting habitat is closed canopy riparian forest stands of two to five acres or larger with associated dense stands of understory woody vegetation. The western yellow-billed cuckoo is a riparian ecosystem obligate species.

The yellow-billed cuckoo eats mainly caterpillars; also other insects, some fruits, sometimes small lizards and frogs and bird eggs (Terres 1980). The species gleans food from branches or foliage, or sallies from a perch to catch prey on the wing (Ehrlich et al. 1992).

Loss, degradation, and fragmentation of riparian habitat; drought and prey scarcity (linked at least in part to pesticide use) may play a role in declines even where suitable habitat remains (Ehrlich et al. 1992).

b) Effects Analysis: In occupied habitat**,** Plan Revision activities that could potentially influence the western yellow-billed cuckoo primarily involve livestock grazing and wildlife management activities (i.e. watershed, riparian, and aquatic habitat improvements).

Alternative A: No Action

Direct/Indirect Effects: No direct or indirect effects on the yellow billed cuckoo are expected from the no action alternative because occurrence of the species is considered incidental to rare on SJPL. Suitable habitat is for this species on BLM and National Forest Systems lands is limited, with no breeding or local populations confirmed on public lands within the planning area.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: No direct or indirect effects on the yellow-billed cuckoo are expected from implementation of any of the action alternatives because occurrence of this species is considered incidental to rare on SJPL. Suitable habitat on BLM and National Forest Systems lands is limited, with no breeding or local populations confirmed on public lands within the planning area.

Cumulative Effects: No cumulative effects are expected because of lack of suitable nesting habitat.

c) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the yellow-billed cuckoo or its primary habitat. The rationale for this determination is as follows:

- The yellow-billed cuckoo is not known to occur or breed on SJPL. Individuals would be considered incidental or extremely rare.
- Riparian shrub habitats utilized by species such as the yellow-billed cuckoo are protected by numerous laws, Plan components, and conservation measures.

White-faced Ibis *(BLM sensitive)*

a) Natural History and Background: The white-faced ibis (*Plegadis chihi)* is a long-legged wader that inhabits wetlands and marshes and feeds in agricultural fields and flooded hay meadows. Its name comes from the adult's distinctive white feathers along the edge of their facial skin during the breeding season. This species nests in marshes across the western United States (Great Basin) and winters in large flocks in Mexico, western Louisiana and eastern Texas (Ryder and Manry 1994). They are nomadic breeders in response to drought and rains, represented by their wide distribution within their breeding colonies.

The white-faced ibis generally occurs from northern California, eastern Oregon, southern Idaho, southern Alberta, Montana, eastern North and South Dakota, northwestern Iowa, south to the states of Durango and Jalisco in Mexico (Ryder and Manry 1994). The breeding distribution in Mexico is poorly known. Utah, Nevada, Oregon and coastal Texas and Louisiana have generally held the largest breeding colonies (ibid.). This ibis is also resident in South America, mainly from southwestern Peru, central Bolivia, Paraguay, southern Brazil south to central Chile and central Argentina (ibid.). The white-faced ibis winters in coastal Louisiana and Texas, southern California and the lower Colorado River Valley of Arizona south to the Mexican states of Guerrero, Puebla and Tabasco, occasionally to Guatemala and Costa Rica (Ryder and Manry 1994).

There is no known breeding habitat on SJPL. Occurrence on BLM lands on SJPL are considered incidental during migration. There is one record of nesting at the Narraquinnep State Wildlife Area (immediately west of the SJPL boundary on the Dolores District) but this appears to have been a chance occurrence (Levad 2002, pers. comm.).

The white-faced ibis inhabits primarily freshwater wetlands, especially cattail and bulrush marshes (Ryder and Manry 1994). Saltwater marshes and bare ground are also used in coastal areas. The inland marshes they inhabit are generally shallow with islands of emergent vegetation. In Colorado, nesting ibises favor islands of tall emergents, such as bulrushes and cattails, surrounded by water >18-inches in depth. Marshes in the San Luis Valley provide the largest and most consistent breeding grounds in the state (Levad 2002, per. comm.). The white-faced ibis feeds in agricultural fields, flooded hay meadows and shallowly flooded wetlands of short, emergent plants (Ryder and Manry 1994). Wetland plant communities such as sedges, spikerushes, glassworts, saltgrass, and greasewood are often utilized. In Nevada, Colorado, Utah, Idaho, and Oregon, agricultural fields of alfalfa, barley and native hay meadows are important feeding sites. A variety of flooded agricultural fields are used in California

(Ryder and Manry 1994). Flooded ricefields and livestock pastures over salt marshes are preferred in Louisiana (Ryder and Manry 1994).

The white-faced ibis feeds on aquatic and moist-soil invertebrates, crustaceans and earthworms (Ryder and Manry 1994). Earthworms are considered their principal food source (Yanishevsky and Petring-Rupp 1998). Other prey includes larval insects, leeches, snails, crayfish, small fish, and frogs.

Water level fluctuations, both natural and human-caused, may be the main cause of habitat deterioration for the white-faced ibis. Loss of feeding and nesting habitat due to drought, wetlands destruction, water diversion, or competition over water rights can lead to drastic decreases in population size. In addition to drought, flooding of nest sites may also cause temporary or permanent abandonment of traditional colony sites and possible abandonment of young (Ryder and Manry 1994). In addition, other limiting factors include weather productivity, predation, pesticides, toxicants, brood parasitism, and fire.

b) Effects Analysis: Plan Revision activities that could potentially influence the white-faced ibis primarily involve water management and wildlife management activities (i.e. watershed, riparian, and aquatic habitat improvements).

Alternative A: No Action

Direct/Indirect Effects: No direct or indirect effects on the white-faced ibis are expected from the no action alternative because occurrence of the species is considered incidental to rare. Individuals occur only during migration. Suitable habitat is for this species on BLM lands is limited, with no breeding or local populations confirmed on BLM lands within the planning area.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: No direct or indirect effects on the white-faced ibis are expected from implementation of any of the action alternatives because occurrence of this species is considered incidental to rare. Individuals occur only during migration. Suitable habitat is for this species on BLM lands is limited, with no breeding or local populations confirmed on BLM lands within the planning area.

Cumulative Effects: No specific plan components have been developed for the white-faced ibis because it is considered incidental during migration on BLM lands managed by the San Juan Public Lands Center. Plan components and regulations specific to the management of wetlands for other species are expected to alleviate any potential cumulative effects and contribute to favorable habitat conditions for any ibis that may happen upon SJPL.

d) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the white-faced ibis or its primary habitat. The rationale for this determination is as follows:

- The white-faced ibis is considered incidental or rare on SJPL, with no breeding populations known to occur. Occasional migratory individuals only.
- Wetland habitats utilized by species such as the black tern are protected by numerous laws, Plan components, and conservation measures.

c) Determination: All Plan Revision alternatives, including Alternative A, are expected to have ***No Impact*** on the white-faced ibis or its primary habitat. The rationale for this determination is as follows:

- The white-faced ibis is considered incidental or extremely rare on SJPL, with no breeding populations known to occur.
- Wetland habitats utilized by species such as the black tern are protected by numerous laws, Plan components, and conservation measures.

White-tailed Ptarmigan *(FS sensitive)*

a) Natural History and Background: The white-tailed ptarmigan (*Lagopus leucurus)* is a medium-sized grouse inhabiting alpine tundra areas. It is completely white in winter except black bill, eyes and claws. Adult summer plumage is mottled with brown, black, and white, except for the all-white wings, tail, belly, and legs (Baily and

Niedrach 1965). White-tailed ptarmigan inhabit alpine areas from the southern Rocky Mountains in New Mexico north to Alaska and Northwest Territories (Braun et al. 1993). The species has also been introduced into the Sierra Nevada mountains in California, Uinta Mountains in Utah, and the Wallowa Mountains in Oregon (Braun et al. 1993). In Colorado, White-tailed Ptarmigan inhabit all mountain ranges with suitable alpine habitats, including Pikes' Peak, where it was introduced in 1975 (Braun 1971, Hoffman and Giesen 1983). While typically found in habitats at or above treeline, white-tailed ptarmigan also inhabit willow-dominated habitats at or below treeline in winter (Colorado Partners In Flight 2000).

White-tailed ptarmigans have been observed on National Forest System lands of SJPL on all three Ranger Districts in the Lizard Head Wilderness Area, Weminuche Wilderness Area, South San Juan Wilderness Area, and in alpine and subalpine habitat adjacent to Wilderness.

White-tailed ptarmigan primarily inhabit alpine tundra, especially in rocky areas with sparse vegetation (AOU 1983). Summer habitats in the Rocky Mountains consistently include moist, low-growing alpine vegetation. In Colorado, percent canopy cover of willow was higher at winter feeding sites than at random sites (Giesen and Braun 1992). White-tailed ptarmigan nest in alpine tundra, in rocky areas or sparsely vegetated, grassy slopes. The species tends to search for vacant territory in the natal area. High fidelity to breeding territory is exhibited in successive years (NatuerServe 2005).

The white-tailed ptarmigan's winter diet consists of alder catkins, willow buds and twigs (primary winter food in Colorado is willow buds); also buds and needles of spruces, pines, and firs. Spring and summer diet consists of leaves and flowers of herbaceous plants, willow buds, berries, seeds, and insects (NatureServe 2007).

Wintering habitats are especially critical to ptarmigan populations and need to be identified and protected from disturbance or destruction. Excessive grazing by domestic livestock and wildlife, mining, reservoir development, winter recreation, and road building have all negatively impacted alpine habitats, especially critical wintering areas (Braun et al. 1976). Chemical contamination from mine spoils into willow habitats has been shown to affect persistence in some areas. Critical periods are during the breeding period from June through September, and disturbance of critical wintering areas during the winter months.

b) Effects Analysis: Plan Revision activities that could potentially influence the white-tailed ptarmigan primarily involve motorized and non-motorized recreation, livestock grazing, ski area developments/expansions, and solid minerals activities. White-tailed ptarmigan are also classified as a small game species by the Colorado Division of Wildlife. Hunting mortality and population management are controlled by the CDOW and not specifically within the control of the San Juan National Forest.

Alternative A: No Action

Direct/Indirect Effects: The white-tailed ptarmigan is fairly common in localized populations in alpine areas of the San Juan National Forest. The presence of willow is the single most important feature that influences the distribution of ptarmigan in the alpine landscape. Willow comprises a major portion of the diet during all seasons except summer, and is the principal (89% of the diet) and sometimes only food consumed during the winter. Plan Revision activities that affect the alpine willow component and/or disrupt the species' access to this component are of primary conservation concern for white-tailed ptarmigan. Contamination of willows from cadmium leaching is also a concern throughout the Ore Belt of southwest and south-central Colorado. Bio-concentration of cadmium into alpine willows has been documented as impacting local populations of ptarmigan on the San Juan National Forest, particularly within the upper Animas drainage where abandoned mines contribute to the accessibility of the element. With the exception of abandoned mine reclamation, Table BE-25, below, displays differences in the Plan Revision outputs that may influence white-tailed ptarmigan on San Juan Public Lands.

Table BE-25: Activities and Projected Outputs that could Potentially Influence the White-tailed Ptarmigan, by Alternative.

Motorized Recreation (Acres, Winter Travel only)	Alternative A	Alternative B	Alternative C	Alternative D
* Roaded natural	696,652 ac.	544,617 ac.	486,765 ac.	644,084 ac.
* Semi-primitive motorized	683,371 ac.	402,285 ac.	232,249 ac.	628,249 ac.
* Semi-primitive non-motorized	440,948 ac.	879,149 ac.	580,347 ac.	556,288 ac.
* Primitive	0 ac.	2,632 ac.	530,865 ac.	0 ac.
* Primitive Wilderness	536, 290 ac.	536,291 ac.	536,291 ac.	536,291 ac.
* Livestock Grazing (Sheep AUMs Only)				
* Premitted AUMs (FS)	8,754	8,754	6,456	21,783
* Suitable Acres on Active Allotments (FS)	87,858	87,858	73,113	239,280
* Premitted AUMs (BLM)	2,204	2,204	0	2,241
* Suitable Acres on Active Allotments (BLM)	8,619	8,619	1,130	9,031
Ski Area Development/ Expansion	Allows expansion of DMR & development of East Fork Ski Areas	Allows expansion of DMR.	Maintains all ski areas in current footprint; no new developments	Allows expansion of DMR & Wolf Crk, and development of East Fork Ski Area

Winter motorized recreation, primarily in the form of snowmobile use, has some potential to damage the willow component that white-ptarmigan depend upon for over-winter survival. Of greater concern, however, is the potential disturbance to white-tailed ptarmigan from their traditional winter grounds due to the impacts caused by winter motorized recreation. All sexes and age classes of white-tailed ptarmigans usually migrate to the winter grounds by early to mid-October after the first major snowstorms have occurred. Because the availability of willow is limited during winter due to snow cover, ptarmigan frequently move long distances from their breeding areas to traditional winter grounds. Females tend to move longer distances and winter at lower elevations and in larger concentrations than males. Females select willow-dominated drainage basins at or slightly above timberline while males winter in small, scattered flocks at higher elevations closer to their breeding territories (Braun et al. 1976 *in* Schenk and Powers 2006). However, all sexes will move well below timberline during heavy snow years, with ptarmigan in Colorado moving as low as 8,000 feet during severe winters (Braun et al. 1993). Both sexes exhibit strong fidelity to traditional winter areas which provide the food and cover needed for survival. Human disturbances to these sites that cause excessive energy expenditures or prevent ptarmigan form utilizing the resources they require for over-winter survival are a primary conservation concern for white-tailed ptarmigan.

Alternative A offers more high-use recreation areas than any of the action alternatives, including more acres that are suitable for winter motorized recreation. Of particular concern to white-tailed ptarmigan is that Alternative A would keep both sides of Lizard Head and Red Mountain Pass suitable for winter motorized use. This alternative also includes the greatest amount of suitable winter motorized acres in the Wolf Creek Pass area and a high amount of winter motorized use in the Molas Pass area (same amount as Alternative D). The high amount of winter motorized use in the mountain pass areas has a greater potential to disrupt or disturb white-tailed ptarmigan while they are concentrated on their winter grounds. However, Alternative A has fewer

acres suitable for winter motorized use in semi-primitive and primitive areas on SJPL. It is unknown if these differences involve winter areas used by ptarmigan.

Alternative A offers similar acreage available to domestic sheep grazing in alpine systems as alternative B. Although domestic sheep grazing is considered less of potential impact to alpine systems than it was historically, approximately one-third of the alpine zone is currently available for this use on the San Juan National Forest and localized impacts are still possible (Hoffman 2006).

Alternative A allows for the expansion and/or development of two ski areas on SJPL. Based on the type of habitat involved, it appears unlikely that the northern expansion of Durango Mountain Resort (DMR) within its current permitted boundary would influence white-tailed ptarmigan. However, Alternative A also allows for the development of the East Fork Ski Area approximately five miles south of Wolf Creek Pass, which could potentially influence habitat for the species. The impacts of ski areas on white-tailed ptarmigan remain unclear; however, evidence suggests that fewer ptarmigan utilize developed ski areas (Hoffman 2006).

The risk of continued cadmium poisoning to white-tailed ptarmigan on SJPL is not expected to vary by alternative. Cadmium is a highly toxic element found in naturally low concentrations in most soils. In the Ore Belt of the San Juan Mountains, however, cadmium is much more common and has been released from the soils due to run-off from mining wastes and tailing piles. All plants take up cadmium, but willow species biomagnify the element up to orders above background concentrations. The willow riparian areas preferred by wintering female ptarmigan exposes them to a heavy dose of cadmium through their food uptake and causes damage to internal organs and bones. The mortality rate of older females within the ore belt of Colorado is significantly higher than elsewhere in Colorado, leading to a highly skewed sex ratio of breeding adults. This impact has been documented in local ptarmigan populations on SJPL in the upper Animas drainage; however, the significance to the overall population in southern Colorado is uncertain (Hoffman 2006). The headwaters of the Animas River are recognized as one of the priority areas in the state for remediation and reclamation of past mining influences, and interagency efforts are underway to correct these problems. However, complete reclamation of some sites will take many years to complete and/or be difficult to accomplish, and some areas may continue to influence ptarmigans into the future.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: All action alternatives offer fewer potential disturbances across SJPL from winter motorized recreation because of decreases in the amount of motorized use area. In relationship to potential wintering areas for ptarmigan, however, Alternative B would close the west side of Red Mountain Pass to winter motorized use while keeping the east side open. Compared to the no action, Alternative B would also allow fewer suitable acres for winter motorized use around Molas and Wolf Creek Pass. Potential benefits to white-tailed ptarmigan can therefore be expected. Alternative C allocates the fewest acres for winter motorized use, and would close both sides of Red Mountain Pass and the east side of Lizard Head Pass. Fewer suitable acres would also be available in the Molas Pass area while Wolf Creek Pass would be similar. Alternative C is likely to be associated with the highest probability of limiting potential winter impacts to white-tailed ptarmigan. In regards to potential conflicts with winter ptarmigan habitat, Alternative D would be very similar to Alternative A with the exception that slightly fewer acres would be available for winter motorized use in the Wolf Creek Pass area.

As displayed in Table BE-25, Alternative B maintains the same permitted numbers and area for domestic sheep on SJPL as Alternative B. The exception to this would involve closures of several small allotments that are difficult to manage administratively. Similar potential influences on white-tailed ptarmigan can therefore be expected. Alternative C reduces sheep numbers and allotment area on National Forest Systems land to 6,456 AUMs and 73,113 acres. BLM lands are also significantly reduced, with both reductions primarily aimed at reducing potential conflicts with Rocky Mountain bighorn sheep. Because bighorn sheep habitat may overlap areas utilized by ptarmigan, this alternative may also offer the lowest potential conflict with white-tailed ptarmigan. Alternative D allows more livestock grazing than any other alternative, and increases sheep numbers and allotment area on National Forest Systems land to 21,783 AUMs and 239,230 acres. All currently vacant sheep allotments could be filled under this alternative. Alternative D would therefore require more management attention to assure that domestic sheep do not impact alpine willow, forbs, or other forage plants important to white-tailed ptarmigan.

The action alternatives differ in the amount of ski area expansion development that could occur. Alternative D offers the maximum amount of development with the expansion of DMR, the development of East Fork, and the expansion of the existing Wolf Creek Ski Area. In concert with the theme for Alternative C, no expansion of existing ski areas or new developments are associated. Alternative C therefore offers fewer new impacts to the alpine and subalpine zones that might be utilized by white-tailed ptarmigan. Alternative B is similar to Alternative C in that it allows for the expansion of DMR, but not the new development of East Fork or the existing Wolf Creek Ski Area.

The continued risk of cadmium poisoning, and the on-going reclamation activities to address the problem, does not vary by alternative.

Cumulative Effects: The Conservation Assessment for white-tailed ptarmigan (Hoffman 2006) notes that the greatest threat to the long-term survival of white-tailed ptarmigan in Forest Service region 2 involves global climate change and the impacts that may cause to alpine zones. Global climate change is beyond the scope of this analysis and the administrative control of the San Juan Public Lands Center. In terms of Plan Revision activities that could potentially impact white-tailed ptarmigan on SJPL, domestic sheep grazing and mining have probably had the most impact historically. While influences from domestic sheep are still possible, potential cumulative effects from this activity have probably been significantly reduced due to dramatic decreases in numbers and grazing area from historic times. Mining activities have also decreased from historic times, although significantly altered areas and their legacy still remain. Total reclamation of these areas will be difficult if not impossible to achieve in some areas. Motorized and non-motorized winter recreation has increased substantially in recent times on SJPL and demand for these activities can be expected to continue. Although the natural processes that perpetuate the alpine ecosystems are still intact, attention will be needed to minimize the disruptions that human activities have had and will continue to have upon this fragile system. The increased human demand for alpine systems suggests that some cumulative effects on white-tailed ptarmigan can be expected to continue. In Colorado, however, the species is currently considered secure and does not appear to be in immediate threat of declining. Continued persistence on San Juan Public Lands is expected.

c) Determination: Based on this analysis, it is determined that Alternative A and D, "**may adversely impact individuals (white-tailed ptarmigan), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** Alternative B and C can be expected to provide a **"Beneficial Impact"** to the species. The rationale for this determination is as follows:

- The white-tailed ptarmigan occurs and breeds on the San Juan National Forest in several locations in suitable alpine habitat.
- Some historical impacts to the white-tailed ptarmigan have occurred and will continue to occur on Forest lands.
- The dramatic increase in winter motorized recreation has a high potential to influence some winter populations.
- Alternative B and C may provide a higher degree of benefit to white-tailed ptarmigan by limiting winter motorized recreations and new ski area development in key areas.

Insects

Nokomis Fritillary Butterfly *(FS sensitive)*

a) Natural History and Background: The nokomis fritillary (*Speyeria nokomis Nokomis)* butterfly is a large and distinct fritillary that inhabits spring seeps and is associated with marshes with flowing water. It lives in wet meadows and seeps or sloughs at lower elevations, found only where there is permanent moisture sufficient to sustain a healthy violet crop at elevations from 5,200 to 9,000 feet. The Nokomis fritillary has one flight from mid-July to late September. For the species *Speyeria nokomis* the wingspan is 2 ½ - 3 1/8 in. (6.3-7.9 cm). Also for the species the upper side of the male is a bright brownish orange with darkened wing bases and dark markings. Sub marginal chevrons do not touch the very even black marginal line. The upper side of the female is black and the outer half of the wing has cream-colored spots. Both sexes have hind wing below with black-bordered silver spots. For *Speyeria nokomis nokomis* the hind wing disc is light brown in males and deep olive in females. Males patrol

for receptive females, who walk on the ground to lay single eggs near host plants. Unfed, first-stage caterpillars hibernate and in the spring they feed on the leaves of the host. They have one brood from late July-September (Arizona Game and Fish Department 2005).

The Nokomis fritillary butterfly is found in streamside meadows and open seepage areas with an abundance of violets in generally desert landscapes. Colonies are often isolated (NatureServe 2007). For the species *Speyeria nokomis* the caterpillar host plant is *Viola nephropphylla*. The adults feed on flower nectar including that from thistles (Arizona Game and Fish Department 2005). Limiting factors for the species as a whole are mainly habitat loss, herbiciding, heavy grazing and changes to hydrology (NatureServe 2007).

Some taxonomists consider this subspecies to be a narrowly endemic subspecies found only at a few locations in Colorado and eastern Utah while others consider it a more broadly distributed taxon found in Colorado, Arizona, Utah, New Mexico and perhaps even Nevada (Arizona Game and Fish Department 2005).

Surveys for this species have not been conducted on the National Forest System lands of SJPL. No species occurrence or distribution data is available for the Forest. There are two records of species occurrence south of the SJPL boundary on State and private lands.

b) Effects Analysis: Plan Revision activities that could potentially influence the nokomis fritillary butterfly primarily involve livestock grazing and wildlife management activities (i.e. watershed, riparian, and aquatic habitat improvements).

Alternative A: No Action

Direct/Indirect Effects: The Nokomis fritillary butterfly is not known to occur on the SJNF. However, surveys are limited and the species could potentially occur around seeps and springs in low-elevation habitat types. Table BE-26, below, displays differences in the Plan Revision outputs that may influence the species on San Juan Public Lands.

Table BE-26: Activities and Projected Outputs that could Potentially Influence the Nokomis Fritillary Butterfly, by Alternative.

Livestock Grazing (Cattle AUMs Only)	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
* Premitted AUMs (FS)	115,312	115,312	112,554	117,791
* Suitable Acres on Active Allotments (FS)	654,837	654,837	626,722	694,321
Riparian & Watershed Improvements	152 ac.	152 ac.	410 ac.	179 ac.

Impacts to seeps and springs that support *Viola* spp., the host plant, could influence potential habitat for the Nokomis fritillary butterfly. Livestock grazing is a dominant land use practice in many of the areas that could potentially support the species. Light grazing is not expected to influence the habitat components or riparian features that support the host plant. However, livestock grazing can damage seeps and springs if grazing is heavy or trampling occurs.

Alternative A continues the current range management practices under the current respective management plans for both the Forest Service and BLM. Cattle grazing on Forest Service lands are continued at 115,312 AUMs on approximately 655,000 acres. Cattle grazing influences have impacted seeps and springs on the SJNF and have therefore had potential negative influences on potential habitat for the Nokomis fritillary butterfly. The Plan Revision components developed for this and other riparian associated species are intended to minimize impacts to riparian areas. Although improvement is expected, it is difficult to monitor all seeps and spring areas and it is likely that some impacts may continue to occur in isolated cases.

Riparian and watershed improvements may benefit potential habitat for the Nokomis fritillary butterfly if the activity occurs in or near seeps and springs that support the host plant. Examples of this activity could include fencing or correcting erosion problems that have occurred from past activities. The outputs for this activity are projected at 152 acres in both Alternative A and B.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-26, Alternative B maintains the same permitted numbers and area for domestic livestock grazing as Alternative A, currently set at 115,312 AUMs and 654,837 acres. No difference in risk or protective measures concerning potential butterfly habitat is expected under this alternative. Alternative C reduces livestock numbers and allotment area to 112,554 AUMs on 626,722 acres. This alternative has the potential to reduce impacts to butterfly habitat if the differences involve seep/spring areas that support the host plant. Alternative D allows more livestock grazing than any other alternative, and increases livestock numbers and allotment area to 117,791 AUMs on 694,321 acres. Alternative D may therefore require more management attention to assure that domestic livestock are not impacting potential butterfly habitat.

Riparian and watershed improvements of potential benefit to the Nokomis fritillary butterfly would occur on over twice as many acres (410) in Alternative C as proposed in Alternative A or B. Alternative D also slightly exceeds the former two alternatives in watershed restoration activities. Potential benefits are therefore expected to be highest with Alternative C and D.

Cumulative Effects: Extensive riparian areas that once occurred on the SJNF were significantly diminished in quantity and quality after European settlement. Since implementation of the San Juan Forest Plan there has been significant reduction in activities that may occur in riparian habitat. No timber harvest is conducted, fewer livestock allotments are being used, and there has been reduction in numbers of livestock on existing allotments. According to the Riparian and Wetland Habitat Assessment for the San Juan National Forest, is unlikely the amount of riparian habitat has increased since 1983 (USDA Forest Service 2002). However, qualitative assessments indicate the quality and condition of riparian habitat is improving in many places. Pressures on riparian areas continue and recreation use has increased across the Forest. Overall, riparian habitat is in a stable and improving condition with corresponding improvements in wildlife habitat capability. This information indicates that some cumulative effects on species such as the Nokomis fritillary butterfly are still possible, but that overall habitat condition is improving and negative effects should be few and isolated.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (nokomis fritillary butterflies), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- Potential habitat for the Nokomis fritillary butterfly occurs on the San Juan National Forest. However, it is currently unknown if any of the habitat supports the species.
- Impacts to the spring/seep habitat that supports the butterfly and its host plant have occurred in the past. Some impacts or influences may continue in isolated areas.
- Although there are differences in some outputs that may influence habitat, there is no site-specific information to suggest that this would have any measurable difference on the species.

Amphibians

Boreal Toad *(FS sensitive)*

a) Natural History and Background: The boreal toad (*Bufo boreas)*, also known as the mountain or western toad (Hammerson 1999) is Colorado's only alpine species of toad. Females generally grow to 11 cm (4.3 in.) and males to 9 centimeters (3.5 in.). Both sexes appear warty and usually have a light stripe along the middle of the back (most prominent on the female). Juveniles may lack the central stripe and may have red warts.

Bufo boreas boreas is one of two subspecies of the western toad found in the United States (FWS 2002). The California toad *(B.b. halophilus)* is restricted in range to California. *B.b. boreas* forms two distinctly separate populations (Southern Rocky Mountain (SRM) population and Northern Rocky Mountain (NRM) population), which appear to be genetically different and probably represent independently evolving lineages (Keinath and Bennett 2000). These populations are separated by a swath of approximately 100 miles of harsh dry habitat in central Wyoming (ibid). The Southern Rocky Mountain (SRM) population occupies extreme south-central Wyoming, most of the mountains of Colorado and, historically, the north-central mountainous portions of New

Mexico. Only the SRM population occurs in Colorado and is the subject of this assessment. Hammerson (1999) suggests that, until there is a formal change in the scientific nomenclature, the California toad should be referred to as the Western toad, the NRM population as the boreal toad, and the SRM population as the Mountain toad. Although once considered fairly common in southern Wyoming, Colorado and northern New Mexico, the SRM boreal toad is now much less common and absent in portions of. While some historic populations have existed on the San Juan National Forest, there are currently no known populations. Surveys for presences are conducted annually.

The boreal toad (SRM) primarily generally occurs between 8,000 and 11,000 feet elevation in spruce-fir forests and subalpine and alpine meadows. They have been reported as high as 11,860 feet in the San Juan Mountains. They have also been reported at lower elevations including an old Pagosa Springs record at 7,100 feet and another in Colbran at 6,800 feet. However, Hammerson (1999) suspects the accuracy of these low elevation records and feels that either the area of collection was incorrect or that the specimens were incorrectly identified.

The boreal toad typically inhabits areas with damp conditions in the vicinity of marshes, wet meadows, streams, beaver ponds, glacial kettle ponds and lakes interspersed in subalpine forests. In Colorado, the largest populations are typically found in areas characterized by willows *(Salix spp.)*, bog birch *(Betula glandulosa)*, and shrubby cinquefoil *(Pentaphylloides floribunda)* (FWS 1994). In southern Colorado they have been reported in areas where ponderosa pine is present.

During the early spring and summer boreal toads are usually found in water, at the waters edge, or on top of partially submerged logs. Later in the summer toads have been reported to disperse a considerable distance (up to 2.5 miles) from breeding areas to upland forest sites (Loeffler 2001). They still tend to favor moist sites. However, some toads, especially females may relocate to drier montane habitats offering dense vegetation for cover.

Habitat for the boreal toad is found on National Forest System lands of all Districts on SJPL, primarily within the spruce-fir and alpine zones. Because suitable elevations have been reported to as low as 8,000 feet, cool, moist mixed-conifer forests and aspen with appropriate site characteristics may also provide additional suitable habitat. Ponds, wet meadows, wet stands of willow, small lakes, marshes, beaver impoundments, and glacial kettle ponds would offer suitable breeding habitat for this species. Suitable late summer non-breeding habitat would be found within 2.5 miles of suitable breeding areas (Loeffler 2001). CVU data for the Forest does not provide a segregation of the habitats suitable for this species that would allow for a meaningful quantification of available habitat on the Forest or Districts.

This toad preys on a variety of invertebrates. It is not selective about food and any moving animal is a potential meal so long as it is smaller than the toad (Campbell 1970). Ants may comprise a large portion of its diet (Keinath and Bennett 2000). Other prey include grasshoppers, beetles, mosquitoes, crane flies, stink bugs, damsel bugs, water striders, backswimmers, alderflies, moths, caterpillars, black flies, deer flies, muscid flies, wasps, bees, mites, spiders, and snails. Larvae filter suspended plant material or feed on bottom detritus (Keinath and Bennett 2000). Activities that destroy, modify, or curtail habitat are likely to contribute to the continued decline in toad numbers.

b) Effects Analysis: Plan Revision activities that could potentially influence the boreal toad primarily involve timber harvest, livestock grazing (sheep only), road construction/ reconstruction, motorized/non-motorized recreation, and fuels treatment activities (Wildland Fire Use only).

Alternative A: No Action

Direct/Indirect Effects: The boreal toad occurred historically on the San Juan National Forest in high-elevation water bodies in alpine and subalpine habitats in Archuleta County. Between 1974 and 1982, boreal toad populations began disappearing in the mountains of west-central Colorado. By the late 1980's, boreal toads were absent from 83%of their historic locations in Colorado, including the San Juan National Forest (Corn et al. 1989). Although boreal toads remain absent from their historic locations on the SJNF, potential habitat remains for possible reintroductions in the future. This analysis assumes that the boreal toad could potentially be reintroduced into its historic habitats on the SJNF, and therefore assess potential impacts to both potential habitat and the species itself. Table BE-27, below, displays differences in Plan Revision outputs that may influence the species on San Juan Public Lands.

Table BE-27: Activities and Projected Outputs that could Potentially Influence the Boreal Toad, by Alternative.

Timber Treatment Acres (Suitable Habitat Only)	*Alternative A*	*Alternative B*	*Alternative C*	*Alternative D*
* Aspen	400 ac. clearcut	500 ac. clearcut	400 ac. clearcut	600 ac. clearcut
* Spruce-fir	50 ac. Partial Cut	50 ac. Partial Cut	20 ac Partial Cut	113 ac Partial cut
* Cool-Moist Mix-Con	200 ac. Partial Cut	125 ac. Partial Cut	20 ac. Partial Cut	287 ac. Partial Cut
* Livestock Grazing (Sheep AUMs Only)				
* Premitted AUMs (FS)	8,754	8,754	6,456	21,783
* Suitable Acres on Active Allotments (FS)	87,858	87,858	73,113	239,280
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	2,632 ac	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	536,291 ac.	536,291 ac.	536,291 ac.
Riparian & Watershed Improvements	152 ac.	152 ac.	410 ac.	179 ac.
Fuels Treatment Acres (Suitable Cover Types Only)				
* Spruce-fir & Mixed Con	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use	1-30,000 ac. Wildland Fire Use

As displayed in Table BE-27, there are several activities that could potentially influence habitat suitability for the boreal toad. Because wetlands and alpine systems are particularly vulnerable to human impacts and disturbances, it is probable that themes with more active management may offer more risk of impact to these sensitive habitats. Alternative A offers approximately 145,700 to 187,500 more acres of active management area than Alternative B and D, respectively. Therefore, it is likely that Alternative A has a higher potential of having negative impacts to the primary habitat components for the boreal toad. Alternative D exceeds Alternative A in active management area by approximately 8,300 acres, and may offer the highest risk of potential impacts.

Potential effects from timber harvest on boreal toads includes direct crushing of individuals from equipment, soil compaction (alteration of burrows), alteration of tree root systems (hibernacula), alteration of movement zones, and general influences on soil moisture and hydrology (Loeffler et al. 2001). Most lakes, streams, and other water bodies are protected from direct potential impacts that may be associated with timber harvest activities because of standard buffers and other conservation measures intended to protect riparian areas and water quality. However, boreal toads may also be associated with small seeps or wet areas that may not necessarily be protected by no-entry buffers. Boreal toads also move great distances (up to 2.5 miles) from breeding to upland forest sites during migration or for hibernation. Individuals may therefore be susceptible to direct and indirect impacts from timber harvest if the activity occurs around breeding sites.

The predicted timber harvest output in primary boreal toad habitat (spruce-fir and cool-moist mixed conifer) varies from 250 to 400 acres and is very minimal in all alternatives. Additional timber harvest in aspen varied from 400 to 600 acres of clearcut during the life of the Plan revision (10-15 years). Although impacts could occur if timber sale activities occurred around a currently extant yet unknown population or breeding site, it is unlikely that this would occur due to historic knowledge and continued survey requirements and conservation measures. The overall amount of timber harvest associated with Alternative A is also very minimal, thereby reducing the risk that unknown populations could be impacted. Alternative A is therefore expected to have little, if any, influence on potential boreal toad habitat on the SJNF.

Construction of new roads and reconstruction of existing roads for timber harvest is estimated to involve 3 miles and 7.2 miles, respectively. The primary direct effect of roads on boreal toads involves the crushing of individuals from vehicle use. Roads can also create barriers to water flow and to the movement of toads across the landscape. The indirect effects of roads on landscape hydrology can influence wetlands and riparian vegetation (Loeffler et al. 2001). Roads within riparian zones can also lead to conflicts with beaver, which if removed can disrupt key habitat processes related to beaver ponds (Loeffler et al. 2001). Alternative A offers more high-use recreation areas than any of the action alternatives, including areas suitable for motorized recreation. This difference could potentially allow greater impacts to high-elevation upland sites that could be considered potential habitat. Because all historic breeding sites are now absent of toads, no impacts are expected from the small amount of roads to be constructed/ reconstructed in Alternative A.

Primary influences from recreational activities can include direct trampling (eggs and toadlets). Many indirect effects can also occur that influence riparian vegetation and water quality. Potential activities that could influence boreal toad populations and/or habitat include off-road vehicle use, trail construction and use, camping in riparian areas, and activities related to fisheries management such as in-stream channel work, poisoning, and stocking of fish in areas that historically did not support them (Loeffler et al. 2001). Alternative A offers more high-use recreation areas than any of the action alternatives, including areas suitable for motorized recreation. This difference could potentially allow greater impacts to high-elevation upland sites that could be considered potential habitat.

Livestock grazing is not considered much of threat to boreal toads even when the activity overlaps species occurrence (Loeffler et al. 2001). Cattle generally do not overlap with most boreal toad sites because their grazing occurs primarily at lower-elevations. However, domestic sheep are grazed at higher elevations and can frequently overlap with potential boreal toad habitat. Potential direct effects from grazing can include trampling. Potential indirect effects can include reduced egg and tadpole survival from changes in water chemistry and/or riparian vegetation related to grazing. Overall grazing influences can lead to changes in riparian vegetation and hydrology (Loeffler et al. 2001). Alternative A and all action alternatives continue to allocate allotments to domestic sheep grazing. Alternative A maintains the same permitted numbers and area as Alternative B, currently set at 8,754 AUMs and 87,858 acres. Some historic domestic sheep allotments have been maintained as vacant for at least a decade because of potential conflicts with bighorn sheep. It is possible that these vacant allotments could be filled under Alternative A, thereby allowing more sheep to graze and potentially influence boreal toad habitat.

Riparian and watershed improvements may benefit potential habitat for the boreal toad if they occur in high-elevation habitats of importance to the species. The outputs for this activity are projected at 152 acres in both Alternative A and B. However, most watershed and riparian improvement activities are expected to occur in lower elevations where past riparian impacts are more prevalent, and therefore have little influence on potential boreal toad habitat.

Prescribed fire activities most likely do not overlap in elevation with boreal toad habitat on the Forest. However, Wildland Fire Use will be utilized as a tool to allow natural disturbances to occur within high-elevation spruce-fir zones as opportunities arise. It is estimated that all alternatives may allow from 1 to 30,000 acres of Wildland Fire Use. Depending upon fire severity and scale, these outputs could have negative or positive influences on the boreal toad. For example, the Conservation Strategy notes that one of the primary influences of fire in boreal toad habitat involves the burning of small diameter (7-10") ground fuels and slash piles that toads may use as refugia sites. Positive influences can occur if fire stimulates the growth of the shrub component used in upland sites (Loeffler et al. 2001). Potential positive or negative influences cannot be predicted at this time because Wildland Fire Use is not a planned output.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-27, the projected timber harvest output in spruce-fir and cool-moist mixed conifer forest in Alternatives B, C, and D varies from about 40 acres (Alternative C) to 175 acres (Alternative B) to 400 acres (Alternative D). Overall, little difference exists between the alternatives because all of the outputs represent a minimal amount of the forest cover types involved, and potential impacts would only be possible around water bodies. New road construction is not associated with Alternatives B or C, but is proposed in Alternative D. As is consistent with the active management theme, Alternative D also offers the greatest amount of projected timber output and greatest amount of area where this activity may occur. However, all alternatives influence less than one-tenth of the cover type and are expected to have no minimal effects on boreal toad habitat.

All action alternatives offer fewer potential disturbances than the no action from summer motorized recreation because of decrease in the amount of permitted motorized use area. Consistent with their themes, Alternative C offers the fewest motorized acres while Alternative D offers the highest amount of acreage. Alternative B offers a balance between the two other action alternatives, but also provides less potential disturbance than the no action.

As displayed in Table BE-27, Alternative B maintains the same permitted numbers and area for domestic sheep as Alternative B, currently set at 8,754 AUMs and 87,858 acres. The exception to this would involve closures of several small allotments that are difficult to manage administratively. No difference in risk or protective measures concerning potential boreal toad habitat is expected from these changes, and potential effects would be similar to Alternative A. Alternative C reduces sheep numbers and allotment area to 6,456 AUMs and 73,113 acres. This alternative would permanently close several sheep allotments, primarily to avoid potential conflicts with bighorn sheep. This alternative may reduce the amount of potential habitat influenced, but is expected to have any measurable difference in regards to protection of habitat for the boreal toad. Alternative D allows more livestock grazing than any other alternative, and increases sheep numbers and allotment area to 21,783 AUMs and 239,230 acres. All currently vacant sheep allotments could be filled under this alternative. Alternative D would therefore require more management attention to assure that livestock do not damage potential habitat for the boreal toad.

As with the no action, it is estimated that Wildland Fire Use may be used as a management tool on 1 to 30,000 acres in all action alternatives. The amount of area potentially used for Wildland Fire Use is not dependent upon which alternative is selected, and no differences are expected.

Cumulative Effects: The boreal toad has significantly declined through portions of its range in Colorado, Utah, and Wyoming. Colorado currently has four known metapopulations of toads and a few smaller outlying populations, one of which is the on the Rio Grande National Forest. Thus, a once common species is now reduced to about 50 known breeding localities in Colorado (Jones 2003). All historic populations on the San Juan National Forest appear to have disappeared since the early 1980's. In Wyoming, the boreal toad currently exists as one breeding colony in one county. In New Mexico, the boreal toad may be extirpated or reduced to one small breeding population. These declines are not thought to be strongly associated with habitat conditions, but rather to a larger issue that may be an early indicator of other types of environmental degradation at a global scale (Jones 2003). For example, the recent discovery of chytrid fungus (*Batrachochytrium dendrobatidis*) in some boreal toad populations in Colorado may be contributing to their decline. Samples taken from 43 sites in Colorado during 2000 to 2001 indicated that approximately 9 percent of 213 boreal toads tested chytrid positive (Livo 2002). This fungus has now been identified in boreal toads from over a dozen Colorado populations and evidence suggests that this pathogen was responsible for the declines documented in the late 1970's and early 1980's.

Interagency efforts are currently underway to learn more about chytrid fungus and halt its spread. A captive-breeding program has also been established that can be used to reintroduce boreal toads back into suitable former habitat areas. The habitat condition on the San Juan National Forest and other Forests remains in excellent condition to reintroduce the species as appropriate. The state Recovery Plan and the interagency Conservation Plan and Agreement are both expected to minimize any potential cumulative effects on the boreal toad.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (boreal toads), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The boreal toad has significantly declined within its former habitat in Colorado, and all historic populations on the San Juan National Forest have disappeared.
- All alternatives are associated with activities and outputs that may have potential influences on previously occupied habitat. However, chytrid fungus has now been identified as the most likely cause for the widespread disappearance of the boreal toad.
- Habitat is suitable and expected to remain suitable for potential reintroduction is the future.

Northern leopard frog *(FS sensitive)*

a) Natural History and Background: The Northern leopard frog (NLF) (*Rana pipiens)* is a medium-sized frog with an adult body length that typically ranges from 5 to 9 cm (2 to 3.5 inches) with a maximum of 11 cm (4.3 inches) (Hammerson 1999). It is usually green in color, although some may be a light brown. Its back is covered with round or oval dark spots, creating a pattern that gives this frog its name. The call is described as a "chuckling", "gabbling" or snoring sound.

The range of the NLF includes much of the southern half of Canada and the northern U.S. south to Maryland, West Virginia, Kentucky, northern Illinois, northwestern Missouri, Nebraska, New Mexico, Arizona and eastern California (Hammerson 1999). The northern extent of the range in Canada is poorly known (Smith 2003). Within Colorado the NLF occurs throughout much of the state, although most occurrences are in the western half of the state including the Front Range. On the eastern plains it occurs in more spotty distribution with populations associated primarily with major drainages systems (Hammerson 1999).

During the summers of 1994-1998 the San Juan National Forest conducted amphibian surveys in suitable amphibian breeding habitats across the Forest, including suitable leopard frog habitat. The available District records from these surveys were incomplete. Northern leopard frogs were determined to be present on at least six sites on National Forest System lands of SJPL on the Dolores District and sixteen sites on the Pagosa District. No records were available for the Columbine District. These surveys apparently sampled only a portion of the available suitable habitat within different elevational zones and did not include all suitable habitats on the Forest. Therefore, it is likely that other local populations exist on the Forest that were not identified during the 1994-1998 surveys.

The habitats used by the NLF are varied across its range. In Colorado it is reported to range in occurrence from below 3,500 feet in northeastern Colorado to above 11,000 feet in southern Colorado (Hammerson 1999). Merrell and Rodell (1968) describe three major habitat divisions: winter habitat (lakes, streams and ponds), summer habitat (post-breeding areas including upland habitats for feeding), and egg/tadpole habitat (shallow breeding ponds). Although aqueous habitats are a central feature in the frog's cycles of life, it may range a considerable distance from natal and breeding areas to a variety of other habitat types. Typical aqueous features used by the NLF include wet meadows and the banks and shallows of marshes, glacial kettle ponds, beaver ponds, lakes, reservoirs, streams and irrigation ditches (Hammerson 1999). Streams are often used as dispersal corridors, but upland areas are also used.

Suitable breeding habitat for the NLF on the Forest would be found in streams, natural lakes and ponds, glacial kettles, stock ponds and reservoirs, marshes and wetlands. Post-breeding habitat would be found along the edges of these features as well as the surrounding upland habitats (generally within 2 miles). Wintering habitat would be found in streams, ponds, and lakes that do not completely freeze during winter and do not have substantial populations of predaceous fish.

Larvae of the NLF are primarily vegetarian gaining sustenance by filtering free-floating algae from their surrounding waters . However, they have been observed feeding on dead animal material including conspecifics. Adults and sub-adults are carnivorous and primarily insectivorous, although they have been described as generalists that will "consume anything that moves and is small enough to swallow." Beetles and grasshoppers may make up a large portion of their diets. Other common prey includes flies, wasps and bees, and spiders. Studies

on stomach contents have also found mollusk, crustaceans, garter snakes, hummingbirds and a yellow warbler (Smith 2003).

Loss or degradation of breeding habitat can occur through changes in hydrology or water quality. Other factors include habitat fragmentation, predation, disease, sensitivity to UV radiation, and recruitment into the population.

b) Effects Analysis: Plan Revision activities that could potentially influence the northern leopard frog primarily involve fluid minerals development, livestock grazing, motorized recreation, water management, and wildlife management activities (i.e. watershed, riparian, and aquatic habitat improvements).

Alternative A: No Action

Direct/Indirect Effects: The northern leopard frog occurs in several locations on the San Juan National Forest in lower-elevation water bodies. Table BE-28, below, displays differences in Plan Revision outputs that may influence the species on San Juan Public Lands.

Table BE-28: Activities and Projected Outputs that could Potentially Influence the Northern Leopard Frog, by Alternative.

Fluid Minerals Acreage Available & Stipulated	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
Livestock Grazing (Cattle AUMs Only)				
* Premitted AUMs (FS)	115,312	115,312	112,554	117,791
* Suitable Acres on Active Allotments (FS)	654,837	654,837	626,722	694,321
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	same as winter	same as winter	same as winter
Riparian & Watershed Improvements	152 ac.	152 ac.	410 ac.	179 ac.

Alternative A offers approximately 28,300 more acres open to leasing than any of the action alternatives. Alternative A also offers fewer protective lease stipulations than any of the action alternatives, with approximately 700,000 to 746,000 fewer lease acres stipulated with a No Surface Occupancy (NSO). Therefore, Alternative A most likely has a greater risk of impacting the northern leopard frog because it is associated with greater development, fewer strict protective measures, and the species overlaps where fluid minerals development may occur. Although conservation measures to protect water quality and riparian

habitat are present in Alternative A, possible impacts to individuals cannot be completely discounted. Under the "no new lease" scenario only the existing lease areas have potential for development under this alternative resulting in fewer acres of potential influence to the species.

The effect of livestock grazing on riparian areas, water quality, and upland habitats is well documented (Buckhouse and Gifford 1976, Kauffman and Krueger 1984, Krueper 1992, Belskey and Uselmann 1999, etc.). These effects include sedimentation, degradation of water quality, direct trampling, and changes in vegetation and/or moisture retention capacity and may affect breeding habitat, migration habitat and/or over-wintering habitat for northern leopard frogs (Smith 2003). Because the leopard frog occurs primarily at lower elevations, its range would primarily overlap areas used for cattle grazing.

Alternative A continues the current range management practices under the current management plans for both the Forest Service and BLM. Cattle grazing on Forest Service lands are continued at 115,312 AUMs on approximately 655,000 acres. Cattle grazing influences have riparian zones on the SJNF and have therefore had potential negative influences on potential habitat for the northern leopard frog. The Plan Revision components developed for amphibians and other riparian associated species are intended to minimize impacts to riparian areas. Although improvements continue to be made, there is a potential that impacts to individual habitats and/or frogs could occur in some areas.

Road related mortality of juvenile northern leopard frogs is well documented (numerous authors in Smith 2003). Significant road mortality of emergent adults migrating to their breeding ponds has also been noted (Nussbaum et al. 1983). Roads may also be associated with factors such as sedimentation and the run-off of toxic compounds that can also affect aquatic communities (Welsh and Oliver 1998, Trombulak and Frissell 2000). Alternative A offers more high-use recreation areas than any of the action alternatives, including areas suitable for motorized recreation. This difference could potentially allow greater impacts to riparian areas that offer potential habitat for the northern leopard frog.

Riparian and watershed improvements may benefit potential habitat for the northern leopard frog if the activity occurs in or near occupied or potential habitat. Examples of this activity could include fencing or correcting erosion problems that have occurred from past activities. The outputs for this activity are projected at 152 acres in both Alternative A and B, and expected to have similar potential benefits.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: As displayed in Table BE-28, Alternative B, C and D offer fewer potential impacts from oil and gas development because they offer fewer acres of potential lease area. The action alternatives also offer greater protective lease stipulations, with approximately 746,000 more acres stipulated with a NSO in Alternatives B and C, and approximately 700,000 more acres in Alternative D. The fewer amounts of available lease acres and greater amount of protective lease stipulations suggest that fewer potential impacts to riparian habitats, amphibians, and other associated species may be associated with the action alternatives. Still, some potential impacts may still occur and influence habitat components or impact individual leopard frogs. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

Alternative B maintains the same permitted numbers and area for domestic livestock grazing as Alternative A, currently set at 115,312 AUMs and 654,837 acres. No difference in risk or protective measures for the leopard frog is expected under this alternative. Alternative C reduces livestock numbers and allotment area to 112,554 AUMs on 626,722 acres. This alternative has the potential to reduce potential impacts to leopard frogs if the differences involves occupied or potential habitat. Alternative D allows more livestock grazing than any other alternative, and increases livestock numbers and allotment area to 117,791 AUMs on 694,321 acres. Alternative D may therefore require more management attention to assure that domestic livestock are not impacting riparian habitat attributes that are important to the leopard frog and other associated species.

All action alternatives offer fewer potential disturbances than the no action from summer motorized recreation because of decrease in the amount of permitted motorized use area. Consistent with their themes, Alternative C offers the fewest motorized acres while Alternative D offers the highest amount of acreage. Alternative B offers a balance between the two other action alternatives, but also provides less potential disturbance than the no action. Potential benefits to the northern leopard frog are expected to be associated with Alternatives B and C, with perhaps a higher risk of impact in Alternative D.

Riparian and watershed improvements of potential benefit to the Nokomis fritillary butterfly would occur on over twice as many acres (410) in Alternative C as proposed in Alternative A or B. Alternative D also slightly exceeds the former two alternatives in watershed restoration activities. Potential benefits are therefore expected to be highest with Alternative C and D.

Cumulative Effects: The northern leopard frog has significantly declined throughout most portions of its range, with populations in the western United States apparently declining at a quicker rate than those in the east (Smith 2003). The northern leopard frog has also experienced significant declines in Colorado (Hammerson 1999). Introduced predators and habitat have been indicated as causes in some areas. However, as with all amphibians, the causes are complex and may involve several factors. Currently, it is believed that anthropogenic stressors may be related to the declines and causing some amphibian species to be more susceptible to infectious diseases (Carey et al. 1999, Smith 2003).

The conservation measures included in the Plan Revision are expected to be adequate for protecting most of the habitat elements required by the northern leopard frog. Given the significant decline in their populations, however, special management attention may be warranted in areas that still retain existing and high-potential breeding habitat.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (northern leopard frogs), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The northern leopard frog has significantly declined within its former habitat in Colorado, indicating a conservation concern.
- Several populations of the northern leopard frog still occur on the San Juan National Forest.
- All alternatives are associated with activities and outputs that may have potential influences on the species.
- All potential impacts are expected to be site-specific and limited to individuals, if they occur at all.

Reptiles

Desert Spiny Lizard *(BLM sensitive)*

a) Natural History and Background: The desert spiny lizard (*Sceloporus magister)* is found in the south western United States from Texas to California. Well distributed and stable populations occur throughout most of the lizards range. The periphery of its range extends into extreme southwest Colorado within Montezuma and Dolores counties (NatureServe, 2007). Colorado populations are not wide spread and are classified as S2 (vulnerable) on NatureServe. This lizard inhabits arid and semiarid regions, from plains to lower mountain slopes. Habitat in Colorado includes shrub covered dirt banks and sparsely vegetated rocky areas near flowing streams. The species prefer soft soils beneath greasewood, rabbit brush, salt cedar, and other shrubs and are also frequently perched on large rocks or large shrubs or trees. Food consists mainly of insects and occasionally small lizards and vegetation. No major threats have been identified for the species (Hammerson, 1999).

b) Effects Analysis: Plan Revision activities that could potentially influence the desert spiny lizard primarily involve motorized recreation.

Alternative A: No Action

Direct/Indirect Effects: The range of the desert spiny lizard in Colorado occurs in a small area in the extreme southwest corner of the state. Small scattered parcels of BLM land occur in this area and may therefore overlap a portion of its range. The species is fairly common where it occurs, populations appear to be stable, and there are no known threats identified (Hammerson 1999). These areas are outside the Paradox Basin and the primary areas where oil and gas development could occur. Motorized travel is probably the primary activity that could potentially influence this species. Differences in this activity by alternative are displayed below in Table BE-29.

Table BE-29: Activities and Projected Outputs that could Potentially Influence the Desert Spiny Lizard, by Alternative.

Motorized recreation (Acres, Winter Travel)	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**
* Roaded natural	696,652 ac.	544,617 ac.	486,765 ac.	644,084 ac.
* Semi-primitive motorized	683,371 ac.	402,285 ac.	232,249 ac.	628,249 ac.
* Semi-primitive non-motorized	440,948 ac.	879,149 ac.	580,347 ac.	556,288 ac.
* Primitive	0 ac.	2,632 ac.	530,865 ac.	0 ac.
* Primitive Wilderness	536, 290 ac.	536,291 ac.	536,291 ac.	536,291 ac.
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	same as winter	same as winter	same as winter

Based on existing life history and conservation status information, the risk of impact to the desert spiny lizard in any alternative appears to be minor. However, it is possible that Alternative A provides a higher risk of impact to individuals because there is more "suitable opportunity" land for motorized travel on BLM lands. A higher amount of travel and human activity area could potentially damage soils, vegetation, or other habitat components utilized by the species.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: All action alternatives reduce potential impacts from motorized travel in a similar manner in potential habitat for the desert spiny lizard. All alternatives tighten the boundaries on the amount of "suitable opportunity" land for motorized travel on lands administered by the Dolores Field Office. Travel is restricted to areas that already have existing and desirable motorized routes, and identify areas without existing routes as unsuitable. Although travel impacts to individual lizards may still occur, it is likely that these travel management actions will reduce the amount of conflict that could potentially occur to individual lizards and their important habitat components.

Cumulative Effects: The desert spiny lizard appears to be fairly common within its restricted range in Colorado, and no specific threats have been identified (Hammerson 1999). As with other desert species, it is possible that some human activities have influenced the desert spiny lizard. However, no cumulative impacts have been identified and acuities on SJPL are not expected to contribute to negative impacts. Although speculative, it is possible that some indirect benefits to individuals could be associated with planned travel management actions. Some impacts may still occur from designated travel routes.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (desert spiny lizards), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The desert spiny lizard has a very small range in Colorado, and limited habitat on the SJPL.

- Primary habitat for this species on the SJPL is most likely restricted to isolated BLM parcels in the southwest corner of the state. These parcels are remote and probably not highly utilized by the public.
- Potential impacts to individuals cannot be completely discounted because of some planned activities such as motorized travel.

Longnose Leopard Lizard *(BLM sensitive)*

a) Natural History and Background: The long-nosed leopard lizard (*Gambelia wislizenii)* is found throughout much of the western United States from Texas through Arizona and California, northward into Idaho and Oregon. Well distributed and stable populations occur throughout most of the lizards range. The periphery of its range extends into western Colorado (NatureServe, 2007). Colorado populations are not wide spread and classified as S1 (critically imperiled) on NatureServe. Leopard lizards inhabit flat or gently sloping shrublands with a large percentage of open ground. Habitat in Colorado includes shrub and semi desert shrublands. Leopard lizards are most common where the ground surface between shrubs is bare or sparsely vegetated. These lizards occur where soil mounded at the base of shrubs is riddled with rodent burrows, which is used as nighttime and winter refuges. Diet consists mainly of insects and other lizards, occasionally small rodents and some vegetation matter is also ingested. Threats include habitat loss and degradation resulting from agriculture, commercial and residential development and invasion of exotic herbaceous plants (Hammerson, 1999).

b) Effects Analysis: Plan Revision activities that could potentially influence the longnose leopard lizard primarily involve fluid minerals development, and motorized/non-motorized recreation.

Alternative A: No Action

Direct/Indirect Effects: The longnose leopard lizard has a relatively low reproductive rate and exhibits low population density. In Colorado, their range is limited and their populations are localized. Primary impacts to this species are believed to be associated with agriculture and residential development. However, the introduction and spread of exotic cheatgrass has probably also influenced habitat quality because the species prefers sparse vegetation for locomotion. Although their range is limited and their populations localized in Colorado, this species range could overlap planned activities such as oil and gas development and motorized/non-motorized recreation. Differences in these outputs by alternative are displayed below in Table BE-30.

Table BE-30: Activities and Projected Outputs that could Potentially Influence the Longnose Leopard Lizard, by Alternative.

Fluid Minerals Acreage Available & Stipulated	***Alternative A***	***Alternative B***	***Alternative C***	***Alternative D***
* Acres Not Available	504, 622	535,645	535,645	535,645
* Acres Open for Leasing	2,136,779	2,108,476	2,108,476	2,108,476
* No Surface Occupancy	219,011	965,422	965,422	920,484
* Controlled Surface Use	294,515	183,058	183,058	195,642
* Timing Limitations	246,214	495,461	495,461	513,724
* Standard Lease Terms	1,377,039	488,591	488,591	502,938
Motorized recreation (Acres, Winter Travel)				
* Roaded natural	696,652 ac.	544,617 ac.	486,765 ac.	644,084 ac.
* Semi-primitive motorized	683,371 ac.	402,285 ac.	232,249 ac.	628,249 ac.
* Semi-primitive non-motorized	440,948 ac.	879,149 ac.	580,347 ac.	556,288 ac.
* Primitive	0 ac.	2,632 ac.	530,865 ac.	0 ac.
* Primitive Wilderness	536, 290 ac.	536,291 ac.	536,291 ac.	536,291 ac.
Motorized recreation (Acres, Summer Travel)				
* Roaded natural	957,909 ac.	647,407ac.	569,731 ac.	699,274 ac.
* Semi-primitive motorized	414,152 ac.	746,407ac.	595,821 ac.	779,219 ac.
* Semi-primitive non-motorized	433,277 ac.	433,520 ac.	133,994 ac.	351,735 ac.
* Primitive	486,844 ac.	same as winter	530,861 ac.	0 ac.
* Primitive Wilderness	0 ac.	same as winter	same as winter	same as winter

None of the alternatives, including Alternative A, are expected to have much influence on localized populations of the longnose leopard lizard. However, it is possible that Alternative A may be associated with a higher risk of impacting individuals because of oil and gas development and motorized travel. For example, oil and gas development in and around the Dolores River Canyon area and the Paradox Basin could potentially influence more lizard habitat because more acres are available for leasing. There are also fewer restrictive stipulations associated with this alternative, such as No Surface Occupancy stipulations, that could result in greater habitat disturbance. However, the extent of potential disturbance is speculative because the exact locations of future developments are unknown. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

It is possible that Alternative A provides a higher risk of impact to individual longnose leopard lizards because there is more "suitable opportunity" land for motorized travel in potential habitat areas such as the Canyons area and the Dolores Field Office. A higher amount of travel and human activity area could potentially damage soils, burrows, or other habitat components utilized by the species.

Action Alternatives: Alternative B-D

Direct/Indirect Effects: It is probable that there is no measurable difference between the action alternatives in regards to potential influences on the longnose leopard lizard. All action alternatives provide potential benefits over the no action. These benefits include a reduction in available lease areas in the Paradox Basin (Alternative C), and more protective lease stipulations in all action alternatives. It is assumed that the amount of potential habitat disturbance will therefore also be reduced. Under the "no new lease" scenario only the existing lease areas have potential for development under these alternatives resulting in fewer acres of potential influence to the species.

All action alternatives reduce potential impacts similarly from motorized travel in potential longnose leopard habitat. All alternatives tighten the boundaries on the amount of "suitable opportunity" land for motorized travel in the Canyons area and on the Dolores Field Office. Travel is restricted to areas that already have existing and desirable motorized routes, and identify areas without existing routes as unsuitable. Although travel impacts to individual lizards may still occur, it is likely that these travel management actions will reduce the amount of conflict that could potentially occur to individual lizards and their important habitat components.

Cumulative Effects: Hammerson (1999) notes that the longnose leopard lizard has most likely declined from some portions of its range in Colorado. The primary reasons for this involve human developments associated with agriculture and residential developments. The spread of exotic species such as cheatgrass may also be a factor. These types of developments are expected to continue and perhaps expand into areas utilized by the leopard lizard. Some planned activities on SJPL, such as oil and gas development, may contribute to localized impacts to lizard habitat. While Alternatives A through D include both current and projected new leases, the "no new lease" scenario only includes current leases under each of the Alternatives. Other planned activities, such as travel management restrictions, should benefit species such as the leopard lizard. Planned activities should also help reduce the spread of exotic species such as cheatgrass through better control of actions that promote the spread of such species. Because of these actions, and the small localized populations of leopard lizards, no measurable cumulative effects are anticipated.

c) Determination: All Plan Revision alternatives, including Alternative A, "**may adversely impact individuals (longnose leopard lizards), but would not likely result in a loss of viability on the Planning Area, nor cause a trend to federal listing or a loss of species viability rangewide."** The rationale for this determination is as follows:

- The longnose leopard lizard has limited habitat on the SJPL, and occurs as small, localized populations.
- Primary habitat for this species is often remote and not highly utilized by the public.
- Potential impacts to habitat or individuals on SJPL are generally localized and probably does not have much influence on populations.
- Potential impacts to individuals cannot be completely discounted because of some planned activities such as oil and gas development and motorized travel.

FISH

Gila robusta (**Roundtail Chub)**

Distribution

The roundtail chub is an endemic species to the Colorado River Basin in Colorado and Wyoming (Rees, Ptacek, and Miller 2005). Historically, roundtail chubs were known to commonly occur in most medium to large tributaries of the Upper Colorado River Basin (Vanicek 1967, Holden and Stalnaker 1975, Joseph et al 1977). Roundtail chubs historically occur in lower elevation streams, including the Colorado, Dolores, Duchesne,

Escalante, Green, Gunnison, Price, San Juan, San Rafael, White, and Yampa rivers (Bezzerides and Bestgen 2002).

The roundtail chub is not restricted to large rivers within the Colorado River Basin. Populations currently exist in western Colorado and southcentral Wyoming. Miller and Rees (2000) described historical and recent accounts of roundtail chub in the mainstream of the San Juan River and various tributaries in the southwestern portion of Colorado and in New Mexico. These tributaries include the Animas, Florida, La Plata, and Mancos rivers as well as Navajo Wash (tributary of the Mancos River).

The current distribution of roundtail chub on Federal lands in Colorado appears to be very limited. However, the San Juan Public Lands contain a documented population of roundtail chubs (Gerhardt, 2003, pers com); this population occurs in the Dolores River, downstream from McPhee Reservoir, Colorado. Several roundtail chub populations exist in tributary streams immediately downstream of Federal lands in Colorado. These tributary streams include Divide Creek and Rifle Creek (tributaries to the Colorado River), Elkhead Creek (tributary to the Yampa River), and Florida River, La Plata River, and Los Pinos River (San Juan River drainage).

Reason for Concern

Roundtail chubs have been extirpated from 45% of their total historical habitat, especially portions of the Price, San Juan, Gunnison, and Green rivers (Bezzerides and Bestgen, 2002). A decline in populations has been observed in the Animas, Green, Gunnison, Salt, San Juan, White, and Yampa rivers (Minckley 1973, Platania 1990, Wheeler 1997, Lentsch et al 1998, Propst and Hobbes 1999, Bestgen and Crist 2000, Miller and Rees 2000).

The decline in roundtail chub populations can be attributed with the construction of dams and reservoirs between the 1930's and 1960's, introduction of non-native fishes, and removal of water from the Colorado River system (Rees, Ptacek, and Miller 2005). Dams, impoundments, and water use practices (eg., diversion ditches) are probably the major reasons for modified natural river flows and channel characteristics in the both mainstem rivers and tributary streams. Dams on the mainstem rivers have segmented the river system, blocking spawning migrations, and changing flows and temperatures (eg., conversion of warm water habitat to cold water habitat). Other water use and development projects have reduced or eliminated suitable habitat due to water depletions and reduced stream flows. Major changes in species composition have occurred with the introduction of non-native species. The decline of roundtail chub seems related to predation, competition, or other behavioral interactions with non-native fishes. Alterations in the natural fluvial environment from land management activity has exacerbated this problem (USFWS 1995).

Life History

Roundtail chubs evolved in the Colorado River Basin below an elevation of of approximately 7500 ft. Most reaches of this system receive heavy sediment loads and high annual peak flows that contrast with low base flows. Little is known about the specific influence of these annual events, but healthy roundtail chub populations have persisted in habitats with a wide range of annual flows, sediment transport, and even sediment deposition, providing that these physical events are associated with a natural flow regime (Rees, Ptacek, and Miller 2005).

Roundtail chub live in big rivers and tend to occupy slow-moving waters (Woodling 1985). Murky, rather than clear, water is sought (Sigler and Sigler 1996). Rountail chub are often found in stream reaches that have a complexity of pool and riffle habitats (Bezzerides and Bestgen 2000). Juveniles and adults are typically found in relatively deep, low-velocity habitats that are often associated with woody debris or other types of cover (Vanicek and Kramer 1969, McAda et al 1980, Miller et al 1995, Beyers et al 2001, Bezzerides and Bestgen 2002). Sigler and Sigler (1996) reported that substate in roundtail chub habitat may range from rock and gravel to silt and sand. Temperature tolerance of roundtail chub has been reported up to 39 oC, but temperature preference ranges between 22 and 24 oC (Weitzel 2002).

The life history phases that appear to be most critical for the roundtail chub include spawning, larvae development, and feeding of the young through the first year of life. In most Colorado River tributaries, natural spawning is initiated on the descending limb of the annual hydrograph as water temperatures approach 18-20oC (Bezzerides and Bestgen 2002). Spawning occurs from July 1 to September 1, although high flow water years may suppress temperatures and extend spawning into September. Conversely, during low flow years when water warms earlier, spawning may occur in late June (USFWS 1995). Depending on water temperature, eggs usually hatch within four to 15 days after spawning.

There is a downstream drift of larvae following hatching (Haines and Tyus 1990). Drifting occurs primarily after mid-July and appears to become more frequent as water termperatures initially increase. From late summer through fall, young of the year roundtail chub prefer natural backwater areas of zero to low velocity.

Very little information is available on the influence of turbidity on the sensitive Colorado River fishes. It is assumed that turbidity is important particularly as it affects the interaction between introduced fishes and the endemic Colorado River fishes. Because these endemic fishes have evolved under natural conditions of high turbidity, it is probable high turbidity is important. Reduction of turbidity may enable introduced species to gain a competitive edge which could further contribute to the decline of roundtail chub (USFWS 1995).

Direct and Indirect Impacts For All Alternatives

The anticipated levels of land management activities that are associated with each alternative are displayed in Chapter 2 of this EIS.

Except for some general area descriptions for oil and gas leasing and development (eg., San Juan Sag east of Pagosa Springs and Paradox Basin in the Glade area on the western side of the Unit) uranium and vanadium exploration and development (western Dolores Ranger District/Field Office), and a few other activities, specific locations and details for many management actions are unknown. Although most historic management activities (eg., livestock grazing, etc) will continue to occur in the general vicinity that they are now occurring, precise effects cannot be determined until the location, timing, size, and exact design of the projects are known. As a result, these effects on sensitive fish species are discussed in general terms.

Areas on the Unit with salinity issues, high road densities, and/or sensitive to disturbance (eg., Dolores River watershed) are identified in Chapter 3.3 ("Water" Section) of this EIS. This information is factored into the effects analysis that follows.

Desired Conditions, Objectives, Design Criteria, and Guidelines from the accompanying Forest Plan/RMP Revision that pertain to each sensitive fish species are identified in Appendix M, Table M.2 of this EIS. These Revision components apply to all alternatives and help minimize impacts on aquatic species. They also include Forest Service and BLM manuals and handbooks, such as the Forest Service's Watershed Conservation Practices Handbook and BLM's Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, which prescribe extensive measures that apply to certain management activities that protect soil, riparian, and aquatic resources.

As previously stated, water diversions and depletions have had the greatest effect on roundtail chubs and other warm water sensitive fish species. Water diversions and depletions occur as a result of municipal and domestic uses, water storage, irrigation, stock ponds, transbasin diversions, snowmaking, and numerous other reasons. The effects from water use and development projects (including diversion ditches, storage reservoirs, pipelines, wells, etc) are reduced or eliminated stream flows and reduced or eliminated fishery habitat that is not available for use. Water depletions reduce peak flow and durations. This causes losses of backwater pools for spawning and rearing. It also reduces suspended sediments which may confer a competitive advantage on non-native species. Additional impacts include increased stream temperatures and reduced dissolved oxygen levels. These effects could be more pronounced during periods of natural cyclic flow reductions (in fall and winter) or during summer months in a drought.

The effects from water use and development projects would likely be moderately adverse to roundtail chubs immediately downstream from these projects found in the Dolores, Mancos, LaPlata, Animas, Florida, Los Pinos, and San Juan rivers or their major tributaries (Navajo Wash for the Mancos River) at the lower elevations of the San Juan Public Lands under all alternatives. The impacts of reduced or eliminated fishery habitat would result from water depletions and reduced stream flows. The impacts are not expected to vary between alternatives since the demand for water use authorizations are driven by proponents rather than by San Juan Public Land's programs or budgets. Because the effects of water use and development projects are speculative, more precise effects cannot be determined until the location, timing, size, and exact design of the projects are known.

Livestock grazing can degrade in-stream habitat and water quality. Effects generally are increased sedimentation, increased stream temperatures, and fecal/bacteria contamination. The effects from livestock grazing and big game use under all alternatives may adversely affect specific individuals but would overall be minor for the populations of the roundtail chub. Because of the lag time to influence existing conditions, Alternative C with its reductions in suitable and available livestock grazing areas may reduce grazing effects on fisheries from the present conditions in the long-term, but not in the short-term. For Alternative D with its increases in suitable and available livestock grazing areas, grazing may increase effects on these fisheries from the present in the long-term, but not in the short-term. Although there will be localized improvements in grazing management and implementation of rangeland health improvement projects, the impacts of sediment and increased water temperatures on fishery habitat quality should continue.

The effects of roads are primarily through sediment production. Heavy sediment loads can reduce pool depths, bury stream substrates and spawning gravels, adhere to aquatic insects and the gills of fish, alter channel form and function, and result in other forms of habitat degradation. Improperly placed, shaped, and sized culverts can act as fish barriers on key streams or exacerbate erosion and cause head-cutting.

Generally, the effects from roads may adversely affect specific individuals but overall would be minor for the populations of roundtail chubs found in the LaPlata, Animas, Florida, Los Pinos, and San Juan rivers and their tributaries at the lower elevations of the San Juan Public Lands under all alternatives. Specific projects with new road construction in the Dolores or Mancos river drainages (including the Navajo Wash drainage) could likely result in moderately adverse effects to the roundtail chub because of the salinity issues and higher sediment production from these sensitive watersheds. Again, since the exact details for these projects are unknown presently, the impacts continue to be speculative.

There is some indication that oil and gas resource potential may result in leasing and exploration east of Pagosa Springs in the San Juan Sag and on the national forest portion of the Paradox Basin (in the Glade area). Exploration could include about two wildcat wells per year in the San Juan Sag and initially up to nine wildcat wells per year in the national forest portion of the Paradox Basin (see Chapter 2 of this EIS). For those two areas together, approximately 45 acres per year may be disturbed from well pads, roads, etc. If paying quantities of gas are discovered in the San Juan Sag and national forest portion of the Paradox Basin, then as many as 140 production wells are projected. The impacts to fisheries and aquatic species from oil and gas leasing and development are primarily from reduced stream flows over time (via dewatering gas-producing rock formations) and subsequently reduced fishery habitat available for use, sediment production and the resulting degraded fishery habitat, and the potential for contamination by petroleum products, drilling mud, and other contaminants.

Another concern for aquatic resources with oil and gas development would be water depletion. Water can be removed from the ecosystem by two ways. First, small amounts of water will be used during the drilling process. Typically, this water is hauled on-site by water trucks and removed as a waste sludge. This water usage occurs with all well drilling operations. Second, water can be depleted during coalbed methane gas field development and production. Here, water is produced or pumped from the coal seams in order to release the pressure on the methane gas tied-up in the coal and allow it to flow. This water is transported to a disposal well for re-injection into a formation several thousand feet lower than where it was removed. Because of connectivity of this produced groundwater to surface water streams, coalbed methane gas production may affect streamflow. For the San Juan Sag and Forest Service portion of the Paradox Basin, together, about 3 acre-feet of water per year are anticipated to be used in the well drilling process.

The effects of oil and gas leasing and development, generally similar for all alternatives, could likely be moderately adverse to the roundtail chub downstream from this activity found in the Dolores, Mancos, LaPlata, Animas, Florida, Los Pinos, and San Juan rivers or their tributaries (Navajo Wash for the Mancos River) at the lower elevations of the San Juan Public Lands. The impacts are mainly due to water depletion and reduced stream flows over time (from dewatering gas seams) and subsequently reduced fishery habitat available for use, and because of concerns for new oil and gas development in the Dolores or Mancos river watersheds (including the Navajo Wash drainage) with salinity issues, high road densities, or sensitive to disturbance (eg., degraded fishery habitat). Since the effects from oil and gas development are speculative, more precise effects cannot be determined until the location, timing, size, and exact design of the projects are known. If no new leases were made available, there would be no impacts on the roundtail chub because no new impacts would occur from oil and gas development.

Mining activities on the San Juan Public Lands can include recreational gold panning and suction dredging, gravel mining operations, hard-rock mining, uranium and vanadium mining, etc. Chapter 2 displays the potential acreage of disturbance per year from these activities. The effects to fisheries and aquatic species from mining or mining reclamation are mainly from erosion and sediment impacts (eg., degraded fishery habitat), saline runoff or heavy metal loading of streams (eg., toxic levels for aquatic species), and altered stream channels and associated fishery habitat.

Generally, the effects of mining and mining reclamation, mostly similar under all alternatives, may adversely affect specific individuals but would overall be minor for the populations of roundtail chub found in the LaPlata, Animas, Florida, Los Pinos, and San Juan rivers at the lower elevations of the San Juan Public Lands. Specific uranium and vanadium mining projects in the Dolores or Mancos river drainages (including the Navajo Wash drainage) under all alternatives with salinity issues, high road densities, or sensitive to disturbance would likely result in minor adverse effects to the roundtail chub because of populations in other unaffected drainages. Again, since the exact details for these projects are unknown presently, the impacts continue to be speculative.

Timber harvesting within Forest Service standards has little impact on stream habitats except for the roads and trails necessary to skid logs to landings and to haul logs to mills. Construction and use of the roads exposes soil and may accelerate erosion. If these areas of bare soil are connected to the stream network, sedimentation can occur. Connectivity of disturbed areas can be due to road crossings, rills, gullies, and poorly designed road drainage systems. Fine sediments in streams can reduce spawning habitat and limit macroinvertebrate populations. If sediment enters the stream during incubation, it can smother the eggs. Sediment can also deposit in pools and reduce pool depth and volume. Adult fish may move out of these pools to find more suitable areas.

The effects from vegetation management may adversely affect specific individuals but would overall be minor for the population of roundtail chubs. Since all alternatives have generally the same levels of timber harvest, hazardous fuels treatment, etc. (only 1800 acres separate Alternative D with the greatest levels of harvest and Alternative C with the least amount of vegetation treatment), the effects would be nearly the same for all alternatives. Again, the impacts are driven by sediment and stream temperature influences on fishery habitat quality.

Cumulative Impacts

Roundtail chubs are Forest Service and BLM sensitive species as a result of past cumulative effects, locally and regionally. For all alternatives, the primary adverse cumulative effects on this warm water species, found in the Dolores, Mancos, LaPlata, Animas, Florida, Los Pinos, and San Juan rivers and their tributaries (Navajo Wash for the Mancos River) at the lower elevations of the San Juan Public Lands, presently, would occur from activities that lead to additional water depletions and reduced stream flows (ie., reduced or eliminated fishery habitat that is available for use). Again, these activities would mainly be water use and development projects on or off the San Juan Public Lands, or oil and gas development from current leases and projected new leases on or off the San Juan Public Lands. The demands for water use and development projects are difficult to analysis because they are driven by proponents rather than by San Juan Public Land's programs or budgets. Because of heightened concerns about sediment and salinity inputs and downstream effects on fishery habitat quality, ground-disturbing activities (new road construction, uranium and vanadium mining, etc) in the Dolores or Mancos river watersheds (including the Navajo Wash drainage) may also adversely affect the roundtail chub. However, since the exact details for these projects and activities in the Dolores or Mancos river watersheds are unknown presently, the impacts continue to be speculative.

Water depletions from the oil and gas leasing and development on the San Juan Public Lands would be moderately adverse to the roundtail chub immediately downstream. These water depletions would result either from the small amounts of water used during the drilling process for each individual well and/or from dewatering the coal seams during coalbed methane gas field development and production. For the cumulative, oil and gas well developments on the Unit, ongoing and proposed gas development for both Forest Service and BLM public lands, about 60 acre-feet of water per year would be used in the drilling process and about 469 acre-feet of water per year would be removed as produced water during coalbed methane gas field development.

These water depletions are small relative to the total, historic depletions within these river basins. For instance, as of December 31, 2002, the US Fish and Wildlife Service recognized that there was 846,192 acre-feet per year of water depletions from federal actions within the San Juan River Basin. Of this, 241,814 acre-feet per year were

associated with federal actions in Colorado (USFWS 2003). Depletions associated with non-federal actions (private or State activities) increase these values considerably.

It is likely there will be cumulative effects from as many as 2,200 new gas wells drilled on or adjacent to the San Juan Public Lands over the next planning period. In addition to an estimated 170 new wells that may be drilled on new leases (discussed under Direct and Indirect Impacts), there could be as many as 450 new and infill gas wells drilled in the northern San Juan Basin, 1000 new wells drilled on the Southern Ute Tribal lands adjacent to the Unit, and 240 new wells on previously leased land in the Paradox Basin. The Reasonable and Foreseeable Development projected wells would require new roads, pipelines and associated disturbance for gas well construction. Consequently, oil and gas development may have large potential to have substantial cumulative effects when compared to all other activities that affect the San Juan Public Lands. The magnitude of new road/pipeline construction and other disturbances would vary only slightly by alternative.

Although not attributed to management activities on the San Juan Public Lands, the urbanization or development of intermixed private lands within or immediately adjacent to the Unit would have potential effects. Continued development of these lands for residential purposes has the potential at affect fisheries and aquatic resources. Increased runoff and sedimentation from paved and unpaved roads, roofs, and driveways, increased use of surface and groundwater, increased use of herbicides, pesticides, and fertilizers, and increased recreation uses on adjacent public lands can all be attributed to urbanization. If activities on intermixed private lands approach tolerance limits for watershed disturbance, additional activities on the Unit may be limited or curtailed to avoid adverse and cumulative effects to watersheds and aquatic ecosystems. With the amount of intermixed ownership within or immediately adjacent to the Unit, this effect could be moderate at the lower elevations of the public lands.

Effects Determination

Water depletions caused by oil and gas leasing and development on the San Juan Public Lands are relatively small compared to the total, historic depletions within these river basins. Since water use and development projects are proponent driven, the effects these projects would have on the roundtail chub are speculative but likely adverse immediately downstream of these activities. Although the roundtail chub distribution and abundance have diminished, they still occupy a wide geographic area and range of locations. Through the Desired Conditions, Objectives, Design Criteria, and Guidelines, effects to the roundtail chub would be minimized. Therefore, management activities in all alternatives associated with the Forest Plan/RMP Revision **MAY IMPACT INDIVIDUALS, BUT NOT LIKELY RESULTS IN A LOSS OF VIABILITY ON THE PLANNING AREA, NOR CAUSE A TREND TO FEDERAL LISTING OR A LOSS OF SPECIES VIABILITY RANGE WIDE**. However, it should be recognized that these water depletions from the Unit would contribute to the overall cumulative effects of water depletion within the San Juan and Dolores river basins. Some years into the future, the cumulative effects of water depletions within these basins could have the potential to comprise population viability within the planning unit and could possibly increase the probability of federal listing of the roundtail chub.

Catostomus latipinnis **(Flannelmouth Sucker)**

Distribution

Flannelmouth sucker are endemic to the Colorado River Basin (Rees, Ptacek, Carr, and Miller 2005). Historically, the flannelmouth sucker was commonly found in most, of not all, medium to large lower elevation rivers of the Upper Colorado River drainage (upstream of Glen Canyon Dam). It was found in similar habitats of the Lower Colorado River drainage (downstream of Glen Canyon Dam), but in lesser numbers (Joseph et al 1977). Although this species is typically associated with large rivers, it also occurs in smaller tributaries and occasionally in lakes and reservoirs (Bezzerides and Bestgen 2002).

The flannelmouth sucker is still widely distributed in medium to large streams in the Upper Colorado River Basin, which includes the mainstream of the Colorado River, numerous tributaries that drain a large portion of Colorado, Wyoming, and Utah, and the San Juan River drainage in New Mexico (Holden and Stalnaker 1975). However, in many areas of the upper basin populations are thought to be decreasing (Sigler and Sigler 1996).

Within Colorado, flannelmouth sucker are currently present in streams and rivers that are not heavily impacted by impoundments or habitat degradtion. Flannelmouth suckers have been reported from the San Juan River and the following tributaries that occur in the southern portion of Colorado: Animas, Florida, La Plata, Los Pinos, Mancos, Navajo, and Piedra rivers, as well as McElmo Creek (Miller et al 1995, Miller and Rees 2000, Whiteman 2000). Some of these tributaries are located on San Juan Public Lands. The distribution parallels that of the bluehead

suckers and they are often found together; however the flannelmouth sucker is not as common as the bluehead sucker on Forest Service and BLM lands. Available data provided by Miller and Rees (2000) suggested that the range of flannelmouth suckers in the Piedra and San Juan rivers (and possibly other tributaries) included lower reaches in the San Juan Public Lands. The flannelmouth sucker is known to occur on San Juan Public Lands of the upper San Juan River, Piedra River, Animas River, and the Dolores River (Mike Japhet, CDOW, 2006, pres. com.). Occurrence on Forest Service lands of the Piedra River is unlikely, but it is known to occur in the Piedra River downstream of Forest Service lands (Dave Gerhardt, 2006, pers com.).

Reason for Concern

Flannelmouth sucker populations have declined in abundance and distribution throughout their historic range (Bezzerides and Bestgen 2002, Weitzel 2002). Most of the decline has been attributed to construction of dams and reservoirs, activties that have diverted water or changed the natural regime in both tributary and mainstem streams and rivers, and introduction of non-native fish species (Rees, Ptacek, Carr, and Miller 2005). Dams on the mainstem Colorado River and its main tributaries have segmented the river system, blocking spawning migrations, altered channel geomorphology, and changed flows and temperatures (eg., conversion of warm water habitat to cold water habitat from hypolimnetic releases below dams). Other water use and development projects (eg., diversion ditches, etc) have reduced or eliminated suitable habitat due to water depletions and reduced stream flows. Major changes in species composition have occurred with the introduction of non-native species, especially the white sucker. The decline of flannelmouth sucker seems related to predation, competition, hybridization, or other behavioral interactions with non-native fishes.

At present, there is concern regarding the status of flannelmouth sucker in the Colorado River drainage (Rees, Ptacek, Carr, and Miller 2005). Although the specific mechanisms of most threats to this species are poorly understood, the flannelmouth sucker appears to be vulnerable throughout its range in the Upper Colorado River Basin due to the combined impacts of habitat loss, habitat degradation, habitat fragmentation, and interactions with non-native species. Of the three warm water sensitive species found on the San Juan Public Lands, the flannelmouth sucker appears more at risk than the roundtail chub or bluehead sucker from present water developments, water diversions, or drought effects (Dave Gerhardt, 2006, pers com.).

Life History

The flannelmouth sucker is considered a “big river” fish, preferring deeper, high-gradient riffles and clean substrates. Flannelmouth suckers are typically found in slower, warmer rivers of the Colorado River drainage (Deacon and Mize 1997). They usually inhabit the mainstem of moderate to large rivers but are occasionally found in small streams (Rees, Ptacek, Carr, and Miller 2005). This species frequents pools and deep runs but can also be found in the mouths of tributaries, riffles, and backwaters. Flannelmouth suckers are occasionally found in lakes or reservoirs, but they generally react poorly to impounded habitats, or habitats influenced by impoundments (Minckley 1973, Chart and Bergersen 1992).

Juvenile and adult flannlemouth suckers utilize most habitats and can be considered a habitat generalist. Juveniles and adults are most often found using run, pool, and eddy habitats (Joseph et al 1977, McAda 1977, Tyus et al 1982). This species appears to prefer temperatures around 25oC (Sublette et al 1990).

Flannelmouth sucker typically spawn in the Upper Colorado River Basin between April and June (McAda 1977, McAda and Wydoski 1983, Snyder and Muth 1990, Tyus and Karp 1990). Otis (1994) reports that spawning occurs at water temperatuers ranging from 12 to 15oC and that flannelmouth suckers in the Lower Colorado River Basin spawn six to eight weeks earlier than those in the upper basin. Flannelmouth spawning aggregations have been observed in tributaries of the Lower Colorado River in glides or slow riffles, over medium-coarse gravel substrate (Weiss 1993, Otis 1994).

There is downstream drift of larvae following hatching (Bezzerides and Bestgen 2002). Carter et al (1986) and Robinson et al (1998) suggest that larvae have the ability to actively enter and escape the draft. The draft mechanism likely accomplishes population dispersal and location of suitable larval habitat.

Hybridization between flannelmouth suckers and other species is a common occurrence throughout the range of the species. Flannelmouth sucker are known to hybridize with the following species of suckers: mountain, bluehead, desert, razorback, and the introduced white suckers (Bezzerides and Bestgen 2002). The most common, and perhaps the most detrimental, instance of hybridization occurs with the non-native white sucker. Also introduced white suckers compete with flannelmouth suckers for food resources.

Very little information is available on the influence of turbidity on the sensitive Colorado River fishes. It is assumed that turbidity is important particularly as it affects the interaction between introduced fishes and the endemic Colorado River fishes. Because these endemic fishes have evolved under natural conditions of high turbidity, it is probable high turbidity is important. Reduction of turbidity may enable introduced species to gain a competitive edge which could further contribute to the decline of flannelmouth sucker (USFWS 1995).

Direct and Indirect Impacts For All Alternatives

The anticipated levels of land management activities that are associated with each alternative are displayed in Chapter 2 of this EIS.

Except for some general area descriptions for oil and gas leasing and development (eg., San Juan Sag east of Pagosa Springs and Paradox Basin in the Glade area on the western side of the Unit) uranium and vanadium exploration and development (western Dolores Ranger District/Field Office), and a few other activities, specific locations and details for many management actions are unknown. Although most historic management activities (eg., livestock grazing, etc) will continue to occur in the general vicinity that they are now occurring, precise effects cannot be determined until the location, timing, size, and exact design of the projects are known. As a result, these effects on sensitive fish species are discussed in general terms.

Areas on the Unit with salinity issues, high road densities, and/or sensitive to disturbance (eg., Dolores River watershed) are identified in Chapter 3.3 ("Water" Section) of this EIS. This information is factored into the effects analysis that follows.

Desired Conditions, Objectives, Design Criteria, and Guidelines from the accompanying Forest Plan/RMP Revision that pertain to each sensitive fish species are identified in Appendix M, Table M.2 of this EIS. These Revision components apply to all alternatives and help minimize impacts on aquatic species. They also include Forest Service and BLM manuals and handbooks, such as the Forest Service's Watershed Conservation Practices Handbook and BLM's Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, which prescribe extensive measures that apply to certain management activities that protect soil, riparian, and aquatic resources.

As previously stated, water diversions and depletions have had the greatest effect on flannelmouth suckers and other warm water sensitive fish species. Water diversions and depletions occur as a result of municipal and domestic uses, water storage, irrigation, stock ponds, transbasin diversions, snowmaking, and numerous other reasons. The effects from water use and development projects (including diversion ditches, storage reservoirs, pipelines, wells, etc) are reduced or eliminated stream flows and reduced or eliminated fishery habitat that is not available for use. Water depletions reduce peak flow and durations. This causes losses of backwater pools for spawning and rearing. It also reduces suspended sediments which may confer a competitive advantage on non-native species. Additional impacts include increased stream temperatures and reduced dissolved oxygen levels. These effects could be more pronounced during periods of natural cyclic flow reductions (in fall and winter) or during summer months in a drought.

The effects from water use and development projects would likely be moderately adverse to flannelmouth suckers immediately downstream from these projects found in the Dolores, Mancos, LaPlata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo rivers or their major tributaries, and McElmo Canyon at the lower elevations of the San Juan Public Lands under all alternatives. The impacts of reduced or eliminated fishery habitat would result from water depletions and reduced stream flows. The impacts are not expected to vary between alternatives since the demand for water use authorizations are driven by proponents rather than by San Juan Public Land's programs or budgets. Because the effects of water use and development projects are speculative, more precise effects cannot be determined until the location, timing, size, and exact design of the projects are known.

Livestock grazing can degrade in-stream habitat and water quality. Effects generally are increased sedimentation, increased stream temperatures, and fecal/bacteria contamination. The effects from livestock grazing and big game use under all alternatives may adversely affect specific individuals but would overall be minor for the populations of the flannelmouth sucker. Because of the lag time to influence existing conditions, Alternative C with its reductions in suitable and available livestock grazing areas may reduce grazing effects on fisheries from the present conditions in the long-term, but not in the short-term. For Alternative D with its increases in suitable and available livestock grazing areas, grazing may increase effects on these fisheries from the present in the long-term, but not in the short-term. Although there will be localized improvements in grazing management and

implementation of rangeland health improvement projects, the impacts of sediment and increased water temperatures on fishery habitat quality should continue.

The effects of roads are primarily through sediment production. Heavy sediment loads can reduce pool depths, bury stream substrates and spawning gravels, adhere to aquatic insects and the gills of fish, alter channel form and function, and result in other forms of habitat degradation. Improperly placed, shaped, and sized culverts can act as fish barriers on key streams or exacerbate erosion and cause head-cutting.

Generally, the effects from roads may adversely affect specific individuals but overall would be minor for the populations of flannelmouth suckers found in the LaPlata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo rivers and their tributaries at the lower elevations of the San Juan Public Lands under all alternatives. Specific projects with new road construction in the Dolores or Mancos river drainages, or within the McElmo Canyon watershed could likely result in moderately adverse effects to the flannelmouth sucker because of the salinity issues and higher sediment production from these sensitive watersheds. The effects to the flannelmouth sucker would be more adverse than to the roundtail chub or bluehead sucker because of its more tenuous situation. Again, since the exact details for these projects are unknown presently, the impacts continue to be speculative.

There is some indication that oil and gas resource potential may result in leasing and exploration east of Pagosa Springs in the San Juan Sag and on the national forest portion of the Paradox Basin (in the Glade area). Exploration could include about two wildcat wells per year in the San Juan Sag and initially up to nine wildcat wells per year in the national forest portion of the Paradox Basin (see Chapter 2 of this EIS). For those two areas together, approximately 45 acres per year may be disturbed from well pads, roads, etc. If paying quantities of gas are discovered in the San Juan Sag and national forest portion of the Paradox Basin, then as many as 140 production wells are projected. The impacts to fisheries and aquatic species from oil and gas leasing and development are primarily from reduced stream flows over time (via dewatering gas-producing rock formations) and subsequently reduced fishery habitat available for use, sediment production and the resulting degraded fishery habitat, and the potential for contamination by petroleum products, drilling mud, and other contaminants.

Another concern for aquatic resources with oil and gas development would be water depletion. Water can be removed from the ecosystem by two ways. First, small amounts of water will be used during the drilling process. Typically, this water is hauled on-site by water trucks and removed as a waste sludge. This water usage occurs with all well drilling operations. Second, water can be depleted during coalbed methane gas field development and production. Here, water is produced or pumped from the coal seams in order to release the pressure on the methane gas tied-up in the coal and allow it to flow. This water is transported to a disposal well for re-injection into a formation several thousand feet lower than where it was removed. Because of connectivity of this produced groundwater to surface water streams, coalbed methane gas production may affect streamflow. For the San Juan Sag and Forest Service portion of the Paradox Basin, together, about 3 acre-feet of water per year are anticipated to be used in the well drilling process.

The effects of oil and gas leasing and development, generally similar for all alternatives, could likely be moderately adverse to the flannelmouth sucker downstream from this activity found in the Dolores, Mancos, LaPlata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo rivers or their tributaries, or in McElmo Canyon at the lower elevations of the San Juan Public Lands. The impacts are mainly due to water depletion and reduced stream flows over time (from dewatering gas seams) and subsequently reduced fishery habitat available for use, and because of concerns for new oil and gas development in the Dolores or Mancos river watersheds, or within the McElmo Canyon watershed with salinity issues, high road densities, or sensitive to disturbance (eg., degraded fishery habitat). Since the effects from oil and gas development are speculative, more precise effects cannot be determined until the location, timing, size, and exact design of the projects are known. If no new leases were made available, there would be no impacts on the flannelmouth sucker because no new impacts would occur from oil and gas development.

Mining activities on the San Juan Public Lands can include recreational gold panning and suction dredging, gravel mining operations, hard-rock mining, uranium and vanadium mining, etc. Chapter 2 displays the potential acreage of disturbance per year from these activities. The effects to fisheries and aquatic species from mining or mining reclamation are mainly from erosion and sediment impacts (eg., degraded fishery habitat), saline runoff or heavy metal loading of streams (eg., toxic levels for aquatic species), and altered stream channels and associated fishery habitat.

Generally, the effects of mining and mining reclamation, mostly similar under all alternatives, may adversely affect specific individuals but would overall be minor for the populations of flannelmouth sucker found in the LaPlata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo rivers at the lower elevations of the San Juan Public Lands. Specific uranium and vanadium mining projects in the Dolores or Mancos river drainages, or within the McElmo Canyon watershed under all alternatives with salinity issues, high road densities, or sensitive to disturbance would likely result in moderately adverse effects to the flannelmouth sucker because of its more tenuous situation than the roundtail chub or bluehead sucker. Again, since the exact details for these projects are unknown presently, the impacts continue to be speculative.

Timber harvesting within Forest Service standards has little impact on stream habitats except for the roads and trails necessary to skid logs to landings and to haul logs to mills. Construction and use of the roads exposes soil and may accelerate erosion. If these areas of bare soil are connected to the stream network, sedimentation can occur. Connectivity of disturbed areas can be due to road crossings, rills, gullies, and poorly designed road drainage systems. Fine sediments in streams can reduce spawning habitat and limit macroinvertebrate populations. If sediment enters the stream during incubation, it can smother the eggs. Sediment can also deposit in pools and reduce pool depth and volume. Adult fish may move out of these pools to find more suitable areas.

The effects from vegetation management may adversely affect specific individuals but would overall be minor for the population of flannelmouth suckers. Since all alternatives have generally the same levels of timber harvest, hazardous fuels treatment, etc. (only 1800 acres separate Alternative D with the greatest levels of harvest and Alternative C with the least amount of vegetation treatment), the effects would be nearly the same for all alternatives. Again, the impacts are driven by sediment and stream temperature influences on fishery habitat quality.

Cumulative Impacts

Flannelmouth suckers are Forest Service and BLM sensitive species as a result of past cumulative effects, locally and regionally. For all alternatives, the primary adverse cumulative effects on this warm water species, found in the Dolores, Mancos, LaPlata, Animas, Florida, Los Pinos, Piedra, San Juan, and Navajo rivers and their tributaries, or in McElmo Canyon at the lower elevations of the San Juan Public Lands, presently, would occur from activities that lead to additional water depletions and reduced stream flows (ie., reduced or eliminated fishery habitat that is available for use). Again, these activities would mainly be water use and development projects on or off the San Juan Public Lands, or oil and gas development from current leases and projected new leases on or off the San Juan Public Lands. The demands for water use and development projects are difficult to analysis because they are driven by proponents rather than by San Juan Public Land's programs or budgets. Because of heightened concerns about sediment and salinity inputs and downstream effects on fishery habitat quality, ground-disturbing activities (new road construction, uranium and vanadium mining, etc) in the Dolores or Mancos rivers watershed or within the McElmo Canyon watershed may also adversely affect the flannelmouth sucker. Since the flannelmouth sucker appears more at risk than the roundtail chub or bluehead sucker under all alternatives, fewer activities on or off the San Juan Public Lands could contribute to adverse impacts. However, since the exact details for these projects and activities in the Dolores or Mancos river watersheds, or within the McElmo Canyon watershed are unknown presently, the impacts continue to be speculative.

Water depletions from the oil and gas leasing and development on the San Juan Public Lands would be moderately adverse to the flannelmouth sucker immediately downstream. These water depletions would result either from the small amounts of water used during the drilling process for each individual well and/or from dewatering the coal seams during coalbed methane gas field development and production. For the cumulative, oil and gas well developments on the Unit, ongoing and proposed gas development for both Forest Service and BLM public lands, about 60 acre-feet of water per year would be used in the drilling process and about 469 acre-feet of water per year would be removed as produced water during coalbed methane gas field development.

These water depletions are small relative to the total, historic depletions within these river basins. For instance, as of December 31, 2002, the US Fish and Wildlife Service recognized that there was 846,192 acre-feet per year of water depletions from federal actions within the San Juan River Basin. Of this, 241,814 acre-feet per year were associated with federal actions in Colorado (USFWS 2003). Depletions associated with non-federal actions (private or State activities) increase these values considerably.

It is likely there will be cumulative effects from as many as 2,200 new gas wells drilled on or adjacent to the San Juan Public Lands over the next planning period. In addition to an estimated 170 new wells that may be drilled on

new leases (discussed under Direct and Indirect Impacts), there could be as many as 450 new and infill gas wells drilled in the northern San Juan Basin, 1000 new wells drilled on the Southern Ute Tribal lands adjacent to the Unit, and 240 new wells on previously leased land in the Paradox Basin. The Reasonable and Foreseeable Development projected wells would require new roads, pipelines and associated disturbance for gas well construction. Consequently, oil and gas development may have large potential to have substantial cumulative effects when compared to all other activities that affect the San Juan Public Lands. The magnitude of new road/pipeline construction and other disturbances would vary only slightly by alternative.

Although not attributed to management activities on the San Juan Public Lands, the urbanization or development of intermixed private lands within or immediately adjacent to the Unit would have potential effects. Continued development of these lands for residential purposes has the potential at affect fisheries and aquatic resources. Increased runoff and sedimentation from paved and unpaved roads, roofs, and driveways, increased use of surface and groundwater, increased use of herbicides, pesticides, and fertilizers, and increased recreation uses on adjacent public lands can all be attributed to urbanization. If activities on intermixed private lands approach tolerance limits for watershed disturbance, additional activities on the Unit may be limited or curtailed to avoid adverse and cumulative effects to watersheds and aquatic ecosystems. With the amount of intermixed ownership within or immediately adjacent to the Unit, this effect could be moderate at the lower elevations of the public lands.

Effects Determination

Water depletions caused by oil and gas leasing and development on the San Juan Public Lands are relatively small compared to the total, historic depletions within these river basins. Since water use and development projects are proponent driven, the effects these projects would have on the flannelmouth sucker are speculative but likely adverse immediately downstream of these activities. Although the flannelmouth sucker distribution and abundance have diminished, they still occupy a wide geographic area and range of locations. Through the Desired Conditions, Objectives, Design Criteria, and Guidelines, effects to the flannelmouth sucker would be minimized. Therefore, management activities in all alternatives associated with the Forest Plan/RMP Revision **MAY IMPACT INDIVIDUALS, BUT NOT LIKELY RESULTS IN A LOSS OF VIABILITY ON THE PLANNING AREA, NOR CAUSE A TREND TO FEDERAL LISTING OR A LOSS OF SPECIES VIABILITY RANGE WIDE**. However, it should be recognized that these water depletions from the Unit would contribute to the overall cumulative effects of water depletion within the San Juan and Dolores river basins. Some years into the future, the cumulative effects of water depletions within these basins could have the potential to comprise population viability within the planning unit and could possibly increase the probability of federal listing of the flannelmouth sucker.

Catostomus discobolus **(Bluehead Sucker)**

Distribution

The bluehead sucker is native to the Colorado River Basin and ancient Lake Bonneville in Idaho, Utah, and Wyoming (Ptacek, Rees, and Miller 2005). Historically, bluehead suckers occurred in streams and rivers in the Colorado River Basin (Joseph et al 1977, Bezzerides and Bestgen 2002) as well as in the drainages of the upper Snake, Weber, and Bear rivers (Sigler and Miller 1963, Sublette et al 1990). Within the Colorado River Basin, bluehead suckers are presently found in the Colorado, Dolores, Duchesne, Escalante, Fremont, Green, Gunnison, Price, San Juan, San Rafael, White, and Yampa rivers and numerous smaller tributaries (Vanicek et al 1970, Bezzerides and Bestgen 2002).

Bluehead sucker populations are known to exist in several tributary streams immediately downstream of lands managed by the San Juan Public Lands. Miller and Rees (2000) indicated that the bluehead sucker was among the most common fish species collected in tributaries on the San Juan River. While most of these tributaries originate on the San Juan Public Lands, their study area did not extend onto BLM and NFS lands. These tributary streams include Florida River, La Plata River, and Los Pinos River. The bluehead sucker is known to occur on San Juan Public Lands of the upper San Juan River, Piedra River, Animas River, and the Dolores River (Mike Japhet, CDOW, 2006, pers. com.).

Reason for Concern

Recent work suggests that bluehead sucker populations are decling throughout their historic range (Wheeler 1997, Bezzerides and Bestgen 2002, Weitzel 2002). Currently, they are found in only 45 percent of their historic range in the Upper Colorado River Basin (Bezzerides and Bestgen 2002). The reasons for this decline are mostly due to

water diversion and alteration of streamflow regimes in mainstem rivers and tributary streams, changes in water temperature regimes of these streams, degradation of habitat, and interactions with non-native species (Ptacek, Rees, and Miller 2005). Dams, impoundments, and water use practices (eg., diversion ditches) are probably the major reasons for modified natural river flows and channel characteristics in the both mainstem rivers and tributary streams. Dams on the mainstem rivers have segmented the river system, blocking spawning migrations, and changing flows and temperatures (eg., conversion of warm water habitat to cold water habitat). Other water use and development projects have reduced or eliminated suitable habitat due to water depletions and reduced stream flows. Major changes in species composition have occurred with the introduction of non-native species. The decline of bluehead sucker seems related to predation, competition, or other behavioral interactions with non-native fishes. Alterations in the natural fluvial environment from land management activity has exacerbated this problem (USFWS 1995).

Historically, the bluehead, flannelmouth, and razorback suckers comprised the medium to large size Catostomid population in the Upper Colorado River Basin. Again, distribution and abundance of bluehead suckers have diminished (Bezzerides and Bestgen 2002). The introduced white sucker and channel catfish have diets that partially overlap with bluehead sucker and are thus competitors for food resources. In addition to competing with bluehead suckers, several non-native and native fishes prey on bluehead suckers (Brooks et al 2000, Ruppert et al 1993).

Life History

Although this species sometimes occupies areas of suitable habitat in larger, low elevation, mainstem streams, it is most commonly collected in small or mid-sized tributaries of the Upper Colorado River Basin (Ptacek, Rees, and Miller 2005). Most reaches of this system receive heavy sediment loads and high annual peak flows that contrast with low base flows. Little is known about the specific influence of these annual events, but healthy bluehead sucker populations have persisted in habitats with a wide range of annual flows, sediment transport, and even sediment deposition, providing that these physical events are associated with a natural flow regime (Ptacek, Rees, and Miller 2005).

Adult bluehead suckers exhibit a strong preference for specific habitat types (Holden and Stalnaker 1975). In-stream distribution is often related to the prescence of rocky substrate which they prefer (Holden 1973). This species has been reported to typically be found in runs or riffles with rock or gravel substrate (Vanicek 1967, Holden and Stalnaker 1975, Carlson et al 1979, Sublette et al 1990). Junveniles have been collected from shallow riffles, backwaters, and eddies with silt or gravel substrate (Vanicek 1967).

Although the species generally inhabits streams with cool temperatures, bluehead suckers have been found inhabiting small creeks with water temperatures as high as 28oC (Smith 1966). This species is found in a large variety of river systems ranging from large rivers with discharges of several hundred cubic meters per second to small creeks with less than 0.05 cubic meters per second (Smith 1966).

Bluehead suckers spawn in the spring and early summer. Holden (1973) and Andreasen and Barnes (1975) reported spawning activity occurring during June and July in the Upper Colorado River Basin. All ripe fish that were collected by Vanicek (1967) during spawning occurred in pools or slow runs associated with large cobbles or boulders. Spawning occurred when water temperatures ranged from 18.2 to 24.6oC (Maddux and Kepner 1988).

Hybridization between bluehead suckers and other sucker species occurs throughout the range of this species. Bluehead suckers are known to hybridize with the native flannelmouth sucker and mountain sucker, as well as the non-native white sucker (Bezzerides and Bestgen 2002). In natural or minimally altered systems, certain undefined mechanisms (eg., depth and velocity requirements, habitat selection, spawning timing) likely isolate spawning individuals of bluehead sucker and flannelmouth sucker; however, hybrids of these two species do occur (Hubbs and Hubbs 1947, Hubbs and Miller 1953, Whiteman 2000). The most common instance of hybridization, and perhaps the most detrimental, occurs with the non-native white sucker.

Very little information is available on the influence of turbidity on the sensitive Colorado River fishes. It is assumed that turbidity is important particularly as it affects the interaction between introduced fishes and the endemic Colorado River fishes. Because these endemic fishes have evolved under natural conditions of high turbidity, it is probable high turbidity is important. Reduction of turbidity may enable introduced species to gain a competitive edge which could further contribute to the decline of bluehead sucker (USFWS 1995).

Direct and Indirect Impacts For All Alternatives

The anticipated levels of land management activities that are associated with each alternative are displayed in Chapter 2 of this EIS.

Except for some general area descriptions for oil and gas leasing and development (eg., San Juan Sag east of Pagosa Springs and Paradox Basin in the Glade area on the western side of the Unit) uranium and vanadium exploration and development (western Dolores Ranger District/Field Office), and a few other activities, specific locations and details for many management actions are unknown. Although most historic management activities (eg., livestock grazing, etc) will continue to occur in the general vicinity that they are now occurring, precise effects cannot be determined until the location, timing, size, and exact design of the projects are known. As a result, these effects on sensitive fish species are discussed in general terms.

Areas on the Unit with salinity issues, high road densities, and/or sensitive to disturbance (eg., Dolores River watershed) are identified in Chapter 3.3 ("Water" Section) of this EIS. This information is factored into the effects analysis that follows.

Desired Conditions, Objectives, Design Criteria, and Guidelines from the accompanying Forest Plan/RMP Revision that pertain to each sensitive fish species are identified in Appendix M, Table M.2 of this EIS. These Revision components apply to all alternatives and help minimize impacts on aquatic species. They also include Forest Service and BLM manuals and handbooks, such as the Forest Service's Watershed Conservation Practices Handbook and BLM's Surface Operating Standards and Guidelines for Oil and gas Exploration and Development, which prescribe extensive measures that apply to certain management activities that protect soil, riparian, and aquatic resources.

As previously stated, water diversions and depletions have had the greatest effect on bluehead suckers and other warm water sensitive fish species. Water diversions and depletions occur as a result of municipal and domestic uses, water storage, irrigation, stock ponds, transbasin diversions, snowmaking, and numerous other reasons. The effects from water use and development projects (including diversion ditches, storage reservoirs, pipelines, wells, etc) are reduced or eliminated stream flows and reduced or eliminated fishery habitat that is not available for use. Water depletions reduce peak flow and durations. This causes losses of backwater pools for spawning and rearing. It also reduces suspended sediments which may confer a competitive advantage on non-native species. Additional impacts include increased stream temperatures and reduced dissolved oxygen levels. These effects could be more pronounced during periods of natural cyclic flow reductions (in fall and winter) or during summer months in a drought.

The effects from water use and development projects would likely be moderately adverse to bluehead suckers immediately downstream from these projects found in the Dolores, LaPlata, Animas, Florida, Los Pinos, Piedra, and San Juan rivers or their major tributaries at the lower elevations of the San Juan Public Lands under all alternatives. The impacts of reduced or eliminated fishery habitat would result from water depletions and reduced stream flows. The impacts are not expected to vary between alternatives since the demand for water use authorizations are driven by proponents rather than by San Juan Public Land's programs or budgets. Because the effects of water use and development projects are speculative, more precise effects cannot be determined until the location, timing, size, and exact design of the projects are known.

Livestock grazing can degrade in-stream habitat and water quality. Effects generally are increased sedimentation, increased stream temperatures, and fecal/bacteria contamination. The effects from livestock grazing and big game use under all alternatives may adversely affect specific individuals but would overall be minor for the populations of the blueheader sucker. Because of the lag time to influence existing conditions, Alternative C with its reductions in suitable and available livestock grazing areas may reduce grazing effects on fisheries from the present conditions in the long-term, but not in the short-term. For Alternative D with its increases in suitable and available livestock grazing areas, grazing may increase effects on these fisheries from the present in the long-term, but not in the short-term. Although there will be localized improvements in grazing management and implementation of rangeland health improvement projects, the impacts of sediment and increased water temperatures on fishery habitat quality should continue.

The effects of roads are primarily through sediment production. Heavy sediment loads can reduce pool depths, bury stream substrates and spawning gravels, adhere to aquatic insects and the gills of fish, alter channel form and

function, and result in other forms of habitat degradation. Improperly placed, shaped, and sized culverts can act as fish barriers on key streams or exacerbate erosion and cause head-cutting.

Generally, the effects from roads may adversely affect specific individuals but overall would be minor for the populations of bluehead suckers found in the LaPlata, Animas, Florida, Los Pinos, Piedra, and San Juan rivers and their tributaries at the lower elevations of the San Juan Public Lands under all alternatives. Specific projects with new road construction in the Dolores River drainage could likely result in moderately adverse effects to the bluehead sucker because of the salinity issues and higher sediment production from these sensitive watersheds. Again, since the exact details for these projects are unknown presently, the impacts continue to be speculative.

There is some indication that oil and gas resource potential may result in leasing and exploration east of Pagosa Springs in the San Juan Sag and on the national forest portion of the Paradox Basin (in the Glade area). Exploration could include about two wildcat wells per year in the San Juan Sag and initially up to nine wildcat wells per year in the national forest portion of the Paradox Basin (see Chapter 2 of this EIS). For those two areas together, approximately 45 acres per year may be disturbed from well pads, roads, etc. If paying quantities of gas are discovered in the San Juan Sag and national forest portion of the Paradox Basin, then as many as 140 production wells are projected. The impacts to fisheries and aquatic species from oil and gas leasing and development are primarily from reduced stream flows over time (via dewatering gas-producing rock formations) and subsequently reduced fishery habitat available for use, sediment production and the resulting degraded fishery habitat, and the potential for contamination by petroleum products, drilling mud, and other contaminants.

Another concern for aquatic resources with oil and gas development would be water depletion. Water can be removed from the ecosystem by two ways. First, small amounts of water will be used during the drilling process. Typically, this water is hauled on-site by water trucks and removed as a waste sludge. This water usage occurs with all well drilling operations. Second, water can be depleted during coalbed methane gas field development and production. Here, water is produced or pumped from the coal seams in order to release the pressure on the methane gas tied-up in the coal and allow it to flow. This water is transported to a disposal well for re-injection into a formation several thousand feet lower than where it was removed. Because of connectivity of this produced groundwater to surface water streams, coalbed methane gas production may affect streamflow. For the San Juan Sag and Forest Service portion of the Paradox Basin, together, about 3 acre-feet of water per year are anticipated to be used in the well drilling process.

The effects of oil and gas leasing and development, generally similar for all alternatives, could likely be moderately adverse to the bluehead sucker downstream from this activity found in the Dolores, LaPlata, Animas, Florida, Los Pinos, Piedra, and San Juan rivers or their tributaries at the lower elevations of the San Juan Public Lands. The impacts are mainly due to water depletion and reduced stream flows over time (from dewatering gas seams) and subsequently reduced fishery habitat available for use, and because of concerns for new oil and gas development in the Dolores River watershed with salinity issues, high road densities, or sensitive to disturbance (eg., degraded fishery habitat). Since the effects from oil and gas development are speculative, more precise effects cannot be determined until the location, timing, size, and exact design of the projects are known. If no new leases were made available, there would be no impacts on the bluehead sucker because no new impacts would occur from oil and gas development.

Mining activities on the San Juan Public Lands can include recreational gold panning and suction dredging, gravel mining operations, hard-rock mining, uranium and vanadium mining, etc. Chapter 2 displays the potential acreage of disturbance per year from these activities. The effects to fisheries and aquatic species from mining or mining reclamation are mainly from erosion and sediment impacts (eg., degraded fishery habitat), saline runoff or heavy metal loading of streams (eg., toxic levels for aquatic species), and altered stream channels and associated fishery habitat.

Generally, the effects of mining and mining reclamation, mostly similar under all alternatives, may adversely affect specific individuals but would overall be minor for the populations of bluehead sucker found in the LaPlata, Animas, Florida, Los Pinos, Piedra, and San Juan rivers at the lower elevations of the San Juan Public Lands. Specific uranium and vanadium mining projects in the Dolores River drainage under all alternatives with salinity issues, high road densities, or sensitive to disturbance would likely result in minor adverse effects to the bluehead sucker because of populations in other unaffected drainages. Again, since the exact details for these projects are unknown presently, the impacts continue to be speculative.

Timber harvesting within Forest Service standards has little impact on stream habitats except for the roads and trails necessary to skid logs to landings and to haul logs to mills. Construction and use of the roads exposes soil and may accelerate erosion. If these areas of bare soil are connected to the stream network, sedimentation can occur. Connectivity of disturbed areas can be due to road crossings, rills, gullies, and poorly designed road drainage systems. Fine sediments in streams can reduce spawning habitat and limit macroinvertebrate populations. If sediment enters the stream during incubation, it can smother the eggs. Sediment can also deposit in pools and reduce pool depth and volume. Adult fish may move out of these pools to find more suitable areas.

The effects from vegetation management may adversely affect specific individuals but would overall be minor for the population of bluehead suckers. Since all alternatives have generally the same levels of timber harvest, hazardous fuels treatment, etc. (only 1800 acres separate Alternative D with the greatest levels of harvest and Alternative C with the least amount of vegetation treatment), the effects would be nearly the same for all alternatives. Again, the impacts are driven by sediment and stream temperature influences on fishery habitat quality.

Cumulative Impacts

Bluehead suckers are Forest Service and BLM sensitive species as a result of past cumulative effects, locally and regionally. For all alternatives, the primary adverse cumulative effects on this warm water species, found in the Dolores, LaPlata, Animas, Florida, Los Pinos, Piedra, and San Juan rivers and their tributaries at the lower elevations of the San Juan Public Lands, presently, would occur from activities that lead to additional water depletions and reduced stream flows (ie., reduced or eliminated fishery habitat that is available for use). Again, these activities would mainly be water use and development projects on or off the San Juan Public Lands, or oil and gas development from current leases and projected new leases on or off the San Juan Public Lands. The demands for water use and development projects are difficult to analysis because they are driven by proponents rather than by San Juan Public Land's programs or budgets. Because of heightened concerns about sediment and salinity inputs and downstream effects on fishery habitat quality, ground-disturbing activities (new road construction, uranium and vanadium mining, etc) in the Dolores River watershed may also adversely affect the bluehead sucker. However, since the exact details for these projects and activities in the Dolores River watershed are unknown presently, the impacts continue to be speculative.

Water depletions from the oil and gas leasing and development on the San Juan Public Lands would be moderately adverse to the bluehead sucker immediately downstream. These water depletions would result either from the small amounts of water used during the drilling process for each individual well and/or from dewatering the coal seams during coalbed methane gas field development and production. For the cumulative, oil and gas well developments on the Unit, ongoing and proposed gas development for both Forest Service and BLM public lands, about 60 acre-feet of water per year would be used in the drilling process and about 469 acre-feet of water per year would be removed as produced water during coalbed methane gas field development.

These water depletions are small relative to the total, historic depletions within these river basins. For instance, as of December 31, 2002, the US Fish and Wildlife Service recognized that there was 846,192 acre-feet per year of water depletions from federal actions within the San Juan River Basin. Of this, 241,814 acre-feet per year were associated with federal actions in Colorado (USFWS 2003). Depletions associated with non-federal actions (private or State activities) increase these values considerably.

It is likely there will be cumulative effects from as many as 2,200 new gas wells drilled on or adjacent to the San Juan Public Lands over the next planning period. In addition to an estimated 170 new wells that may be drilled on new leases (discussed under Direct and Indirect Impacts), there could be as many as 450 new and infill gas wells drilled in the northern San Juan Basin, 1000 new wells drilled on the Southern Ute Tribal lands adjacent to the Unit, and 240 new wells on previously leased land in the Paradox Basin. The Reasonable and Foreseeable Development projected wells would require new roads, pipelines and associated disturbance for gas well construction. Consequently, oil and gas development may have large potential to have substantial cumulative effects when compared to all other activities that affect the San Juan Public Lands. The magnitude of new road/pipeline construction and other disturbances would vary only slightly by alternative.

Although not attributed to management activities on the San Juan Public Lands, the urbanization or development of intermixed private lands within or immediately adjacent to the Unit would have potential effects. Continued development of these lands for residential purposes has the potential at affect fisheries and aquatic resources. Increased runoff and sedimentation from paved and unpaved roads, roofs, and driveways, increased use of surface

and groundwater, increased use of herbicides, pesticides, and fertilizers, and increased recreation uses on adjacent public lands can all be attributed to urbanization. If activities on intermixed private lands approach tolerance limits for watershed disturbance, additional activities on the Unit may be limited or curtailed to avoid adverse and cumulative effects to watersheds and aquatic ecosystems. With the amount of intermixed ownership within or immediately adjacent to the Unit, this effect could be moderate at the lower elevations of the public lands.

Effects Determination

Water depletions caused by oil and gas leasing and development on the San Juan Public Lands are relatively small compared to the total, historic depletions within these river basins. Since water use and development projects are proponent driven, the effects these projects would have on the bluehead sucker are speculative but likely adverse immediately downstream of these activities. Although the bluehead sucker distribution and abundance have diminished, they still occupy a wide geographic area and range of locations. Through the Desired Conditions, Objectives, Design Criteria, and Guidelines, effects to the bluehead sucker would be minimized. Therefore, management activities in all alternatives associated with the Forest Plan/RMP Revision **MAY IMPACT INDIVIDUALS, BUT NOT LIKELY RESULTS IN A LOSS OF VIABILITY ON THE PLANNING AREA, NOR CAUSE A TREND TO FEDERAL LISTING OR A LOSS OF SPECIES VIABILITY RANGE WIDE**. However, it should be recognized that these water depletions from the Unit would contribute to the overall cumulative effects of water depletion within the San Juan and Dolores river basins. Some years into the future, the cumulative effects of water depletions within these basins could have the potential to comprise population viability within the planning unit and could possibly increase the probability of federal listing of the bluehead sucker.

***Oncorhynchus clarki pleuriticus* (Colorado River Cutthroat Trout)**

Distribution

The Colorado River cutthroat trout is the only salmonid species native to western Colorado. The Colorado River cutthroat trout historically occupied portions of the Colorado River drainage in Wyoming, Colorado, Utah, Arizona, and New Mexico (Behnke 1992). Its original distribution probably included portions of larger streams, such as the Green (Simon 1935), Yampa, White, Colorado, and San Juan Rivers. Behnke and Zarn (1976) suggested this subspecies was absent from the lower reaches of many large rivers because of summer thermal barriers. Portions of the lower reaches may have been used in winter (Young 1995).

Now remaining populations occur mostly in headwater streams and lakes, and in several isolated headwater tributaries of the San Juan River. In southwest Colorado, conservation populations (i.e., a reproducing and recurring population that is managed to preserve the historical genome and/or unique genetic, ecological, and/or behavioral characteristics within specific populations and within geographic units) of the Colorado River cutthroat trout can be found in the Dolores River System (Deep Creek, Elk Creek, Rio Lado Creek, and Little Taylor Creek) and the San Juan River System (Augustora Creek, Beaver Creek, Big Bend Creek, Clear Creek, Headache Creek, East Fork Hermosa Creek, Himes Creek, Upper Navajo River, East Fork Piedra River, Shaw Creek, Terminal Reservoir, and West Virginia Gulch Creek) (CRCT Task Force 2001). Most of these creeks and rivers are located on the San Juan Public Lands. Several tributaries in the Hermosa drainage of the San Juan National Forest are managed as a metapopulation for Colorado River cutthroat trout—a collection of localized populations that are geographically distinct, yet are genetically interconnected through natural movement of individual fish between populations (Dave Gerhardt, 2006, pers com).

Reason For Concern

The abundance and distribution of Colorado River cuthroat trout have declined so much over the past 100 years that calls have been made for federal listing (Behnke and Zarn 1976; Young 1995). Colorado River cuthroat trout now occupy less than 1% of their historic range (Behnke 1979). In 2001, the Colorado River Cutthroat Trout Conservation Agreement and Strategy was established for the states of Colorado, Utah, and Wyoming to help State and Federal Agencies and Indian Tribes to work collaboratively and cooperatively to implement conservation measures to maintain and increase the species, and to avoid listing as a threatened or endangered species under the Endangered Species Act (CRCT Task Force 2001). Efforts have been underway for a number of years to reverse the declines in Colorado River cutthroat trout populations and reclaim pieces of its historic habitat so that the range of occupied cutthroat habitat is increased. However, the declines over time have been so severe that this subspecies of cutthroat has recently been petitioned for federal listing. The US Fish and Wildlife Service decided

against listing because of no evidence of major declines in the overall distribution or abundance over the last several decades (Durango Herald, June 2007).

Introductions of non-native salmonids have had the greatest affect on Colorado River cutthroat trout (Young 1995). Stocking of non-natives began before 1900 and has been very widespread. Interactions with other species impact Colorado River cutthroat trout differently. Brook trout dislodge most subspecies of inland cutthroat when in sympatry, especially at lower elevations (Fausch 1989). The mechanism favoring brook trout is poorly understood, however it is clear higher water temperatures favor brook trout (DeStaso and Rahel 1994). Rainbow trout and other cutthroat subspecies readily hybridize with Colorado River cutthroat trout and produce fertile offspring. More populations of Colorado River cutthroat trout have probably been lost through hybridization than through any other means (Behnke and Zarn 1976).

A wide variety of land management practices have been suggested to affect populations of Colorado River cutthroat trout. These include livestock grazing, mining activities, road construction, and water diversions (Binns 1977, Jespersen 1981). Although the primary risk factors for this species are biological (non-native species and to some degree disease), roads can further affect Colorado River cutthroat trout populations through creation of barriers to fish movement, degradation of habitat by constraining streams and eliminating riparian vegetation, introduction of sediment, and the provision of access to anglers. Diversions and other water use practices have reduced or eliminated suitable habitat, fragmented streams, and restricted movement between formerly connected Colorado River cutthroat trout populations and created small, isolated populations. Although this subspecies has been regarded as the "canary in the mine" with regard to habitat degradation (Behnke and Benson 1980), it has also persevered in sub-optimal habitats (Binns 1977).

Life History

The diversity of Colorado River cutthroat trout life histories is probably reduced from historic levels (Young 1995). Adfluvial stocks were once common, but have largely been eliminated. Most remaining stocks are fluvial or resident.

Spawning by this subspecies begins after flows have peaked in spring or early summer and ends before runoff subsides (Quinlan 1980; Young 1995). Water temperature may be a cue for spawning. Colorado River cutthroat trout typically spawn in gravel substrate, mean particle size from 3.7 to 30 mm (Young 1995). The best survival rates are found in substrates with mean particle sizes from 13.8 to 15.9 mm or larger (Young et al. 1991). Redds tend to be located where velocity, depth, and bottom configuration induce water flow through the stream substrate (Young 1989). Redds are generally located where the water is between 11 and 18 cm deep and nose velocity is 15 to 35 cm per second (Young 1995).

Emergence generally occurs in late summer depending on elevation and annual climatic variation. Fry summer microhabitats are usually deeper than 3 cm and water velocity is slower than 6 cm per second (Bozek and Rahel 1991). Woody debris, boulders and rootwads shelter these sites from higher flows.

Colorado River cutthroat trout reach maturity at age 3 and rarely live past age 6 (Young 1995). Growth rates are among the lowest of all salmonids, probably due to the short growing seasons and colder temperatures at the higher elevations to which Colorado River cutthroat trout are currently confined. Lakes and streams with beaver ponds tend to have higher growth rates.

Some studies have shown spawning habitat, riffle water velocity, and cover to be the most important factors in determining trout biomass, with spawning habitat being the most significant (Jesperson 1981). Herger (1993) found most larger cutthroat trout in pools, and that trout density increased with pool depth. Young (1995) found coarse woody debris to be an important factor in determining Colorado River cutthroat trout biomass. He also noted meander habitats were underused, and occupied sites were deeper than average with slower water velocities.

Cutthroat trout, in some streams, do migrate (Jespersen 1981). Adults often move upstream to spawn and then downstream to deeper waters following spawning (Young 1995). Lake populations move in and out of tributaries. It is common to find smaller cutthroat upstream and the larger fish downstream (Jespersen 1981). Cutthroat may move from tributaries to larger river systems to overwinter.

The influence of predatory species on Colorado River cutthroat trout is not known, but dippers, mink, and other predatory birds and mammals do feed on them (Young 1995). The daytime positions of cutthroats are not

associated with banks or overhead cover, and they may face a greater risk of predation to focus on daytime foraging.

Direct and Indirect Impacts For All Alternatives

The anticipated levels of land management activities that are associated with each alternative are displayed in Chapter 2 of this EIS.

Except for some general area descriptions for oil and gas leasing and development (eg., San Juan Sag east of Pagosa Springs and Paradox Basin in the Glade area on the western side of the Unit) uranium and vanadium exploration and development (western Dolores Ranger District/Field Office), and a few other activities, specific locations and details for many management actions are unknown. Although most historic management activities (eg., livestock grazing, etc) will continue to occur in the general vicinity that they are now occurring, precise effects cannot be determined until the location, timing, size, and exact design of the projects are known. As a result, these effects on sensitive fish species are discussed in general terms.

Areas on the Unit with salinity issues, high road densities, and/or sensitive to disturbance (eg., Dolores River watershed) are identified in Chapter 3.3 ("Water" Section) of this EIS. This information is factored into the effects analysis that follows.

Desired Conditions, Objectives, Design Criteria, and Guidelines from the accompanying Forest Plan/RMP Revision that pertain to each sensitive fish species are identified in Appendix M, Table M.2 of this EIS. These Revision components apply to all alternatives and help minimize impacts on aquatic species. They also include Forest Service and BLM manuals and handbooks, such as the Forest Service's Watershed Conservation Practices Handbook and BLM's Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, which prescribe extensive measures that apply to certain management activities that protect soil, riparian, and aquatic resources.

A wide variety of land use practices may impact Colorado River cutthroat trout. The effects from water use and development projects (including diversion ditches, storage reservoirs, pipelines, wells, etc) on Colorado River cutthroat trout immediately downstream from these projects is from reduced or eliminated stream flows and reduced or eliminated fishery habitat that is not available for use. Additional impacts include increased stream temperatures and reduced dissolved oxygen levels. These effects could be more pronounced during periods of natural cyclic flow reductions (in fall and winter) or during summer months in a drought. Also, snowmaking for ski areas that drains water from streams or from water wells that are likely connected by groundwater to streams also reduces winter base flows that are limiting to habitat and populations of this species. Life cycles of species can be disrupted.

Depending on the location of the water use and development project, the effects on Colorado River cutthroat trout could vary from no impact to a moderately adverse impact immediately downstream of the project under all alternatives. Again, the impacts are predominately due to water depletions and reduced stream flows and the subsequent effects on fishery habitat available for use. The impacts are not expected to vary between alternatives since the demand for water use authorizations are driven by proponents rather than by San Juan Public Land's programs or budgets.

Livestock grazing can degrade in-stream habitat and water quality. Effects generally are increased sedimentation, increased stream temperatures, and fecal/bacteria contamination. The effects from livestock grazing and big game use under all alternatives may adversely affect specific individuals but would overall be minor for the populations of Colorado River cutthroat trout. Because of the lag time to influence existing conditions, Alternative C with its reductions in suitable and available livestock grazing areas may reduce grazing effects on fisheries from the present conditions in the long-term, but not in the short-term. For Alternative D with its increases in suitable and available livestock grazing areas, grazing may increase effects on these fisheries from the present in the long-term, but not in the short-term. Although there will be localized improvements in grazing management and implementation of rangeland health improvement projects, the impacts of sediment and increased water temperatures on fishery habitat quality should continue.

The effects of roads are primarily through sediment production. Heavy sediment loads can reduce pool depths, bury stream substrates and spawning gravels, adhere to aquatic insects and the gills of fish, alter channel form and function, and result in other forms of habitat degradation. Improperly placed, shaped, and sized culverts can act as fish barriers on key streams or exacerbate erosion and cause head-cutting. In addition to being potential sediment

sources, roads and specifically road crossings create opportunities for stocking of non-native fish and for introducing diseases such as whirling disease. Roads may be sediment sources and closing them has a beneficial impact on stream. Additionally, closing roads which provide access to Colorado River cutthroat trout streams would reduce fishing pressure and have a positive impact on the Colorado River cutthroat trout population. Because of the locations of streams with conservation populations, roads under all alternatives may adversely impact individuals but would overall be minor for the population of the Colorado River cutthroat trout.

There is some indication that oil and gas resource potential may result in leasing and exploration east of Pagosa Springs in the San Juan Sag and on the national forest portion of the Paradox Basin (in the Glade area). Exploration could include about two wildcat wells per year in the San Juan Sag and initially up to nine wildcat wells per year in the national forest portion of the Paradox Basin (see Chapter 2 of this EIS). For those two areas together, approximately 45 acres per year may be disturbed from well pads, roads, etc. If paying quantities of gas are discovered in the San Juan Sag and national forest portion of the Paradox Basin, then as many as 140 production wells are projected. The impacts to fisheries and aquatic species from oil and gas leasing and development are primarily from reduced stream flows over time (via dewatering gas-producing rock formations) and subsequently reduced fishery habitat available for use, sediment production and the resulting degraded fishery habitat, and the potential for contamination by petroleum products, drilling mud, and other contaminants.

The effects of oil and gas leasing and development would generally be similar for all alternatives. Given the locations of the conservation populations and the lease parcels, the effects on Colorado River cutthroat trout would generally be negligible under all alternatives. However, if oil and gas development occurs in the vicinity of streams occupied with Colorado River cutthroat trout or with potential habitat, then the impacts could be moderately adverse immediately downstream over time. Again, the impacts are predominately due to water depletions and the subsequent effects from reduced stream flows over time as the coalbeds are dewatered. However, an oil and gas stipulation would be applied to protect Colorado River cutthroat trout and minimize effects, in addition to leasing stipulations for watershed, soil, steep slopes, riparian areas, wetland, and floodplain concerns. If no new leases were made available, there would be no impacts on the Colorado River cutthroat trout because no new impacts would occur from oil and gas development.

Mining activities on the San Juan Public Lands can include recreational gold panning and suction dredging, gravel mining operations, hard-rock mining, uranium and vanadium mining, etc. Chapter 2 displays the potential acreage of disturbance per year from these activities. The effects to fisheries and aquatic species from mining or mining reclamation are mainly from erosion and sediment impacts (ie., degraded fishery habitat), saline runoff or heavy metal loading of streams (ie., toxic levels for aquatic species), and altered stream channels and associated fishery habitat. Depending on the location of the action, the effects of mining or mining reclamation, which is nearly identical under all alternatives, on Colorado River cutthroat trout could vary from no impact to adversely affecting specific individuals but would overall be minor for the Unit's population.

Timber harvesting within Forest Service standards has little impact on stream habitats except for the roads and trails necessary to skid logs to landings and to haul logs to mills. Construction and use of the roads exposes soil and may accelerate erosion. If these areas of bare soil are connected to the stream network, sedimentation can occur. Connectivity of disturbed areas can be due to road crossings, rills, gullies, and poorly designed road drainage systems. Fine sediments in streams can reduce spawning habitat and limit macroinvertebrate populations. If sediment enters the stream during incubation, it can smother the eggs. Sediment can also deposit in pools and reduce pool depth and volume. Adult fish may move out of these pools to find more suitable areas.

Beyond the effects of sediment from vegetation management, fisheries and aquatic species can be impacted by a reduction of streamside vegetation. A reduction in streamside vegetation can increase average annual and average daily stream temperature by reducing shade and decrease the recruitment of large woody debris in streams. Overhanging vegetation provides hiding cover for fish and it helps cool stream temperatures. Large woody debris recruitment is important, because it dissipates erosive stream energy, regulates sediment movement downstream, provides nutrients, and creates pools important to aquatic species.

The effects from vegetation management may adversely affect specific individuals but would overall be minor for the population of Colorado River cutthroat trout. Since all alternatives have generally the same levels of timber harvest, hazardous fuels treatment, etc. (only 1800 acres separate Alternative D with the greatest levels of harvest and Alternative C with the least amount of vegetation treatment), the effects would be nearly the same for all

alternatives. Again, the impacts are driven by sediment and stream temperature influences on fishery habitat quality.

Over the last 20 years, a variety of fish habitat improvement projects such as stream bank stabilizations, pool forming structure placements, spawning habitat enhancement, fish barriers, and culvert replacements have been implemented on the San Juan Public Lands. In addition, the Unit has assisted the Colorado Division of Wildlife in conserving and reintroducing genetically pure, wild populations of Colorado River cutthroat trout in selected streams, particularly in Hermosa Creek Watershed. On occasions and after project level analysis and public involvement, some desired, non-native fish populations are removed in order to favor establishment of native fish populations, such as the Colorado River cutthroat trout. In these instances, the San Juan Public Lands and Colorado Division of Wildlife work closely together to achieve all environmental objectives. Because of locations of specific streams with conservation populations or a reintroduction effort, these improvement projects would either have no impact or a beneficial impact to Colorado River cutthroat trout under all alterntives.

Cutthroat trout populations can be susceptible to overangling. The Colorado Division of Wildlife has an artificial lures and catch and release regulation on many Colorado River cutthroat trout streams. Angling mortality is rarely heavy enough to reduce population viability, but it can change the age structure of fish populations. Loss of breeding individuals could lead to increased inbreeding and long-term loss of viability.

Whirling disease occurs in many fish hatcheries throughout Colorado and infected fish have been stocked statewide. Whirling disease is a parasitic, protozoan which attacks the cartilage of young fish. Whirling disease affects rainbow, cutthroat, brook, and to a lesser degree, brown trout. Mortality rates for rainbow, cutthroat, and brook trout can exceed 80%. Dramatic declines in rainbow trout populations have been recorded in the Madison River in Montana, and the Colorado and Fryingpan rivers in Colorado. Research has shown cutthroat trout are as susceptible as rainbows. Infected fish, birds, mammals, boats, fishermen, and other equipment can spread the spores from area to area.

Cumulative Impacts

The Colorado River cutthroat trout is both a Forest Service and BLM sensitive species as a result of past cumulative effects, on a local and regional basis. Like the other sensitive species, the primary adverse cumulative effects under all alternatives, presently, would occur from activities on the San Juan Public Lands that lead to further water depletions and reduced stream flows (ie., reduced or eliminated fishery habitat for use). Depending on the location of ground-disturbing activities, the cumulative effects of sedimentation may range from minor to moderately adverse for certain stretches of stream habitat and individual fish. To help avoid federal listing, the San Juan Public Lands will focus the majority of its fishery habitat improvement efforts in the next 10-15 years to the recovery of the Colorado River cutthroat trout.

With the exception of some lands in the upper Animas watershed and the northwestern portions of the San Juan Public Lands, there are no water courses that originate on lands of other ownership that flow onto the San Juan Public Lands. Importantly for the Colorado River cutthroat trout, the cumulative effects of activities from private lands, Indian tribal lands, and other jurisdictions that could affect this species are generally downstream from the remaining Colorado River cutthroat populations, their potential habitat, or potential recovery areas. For instance, it is likely there will be cumulative effects from as many as 2,200 new gas wells drilled on or adjacent to the San Juan Public Lands over the next planning period. In addition to an estimated 170 new wells that may be drilled on new leases (discussed under Direct and Indirect Impacts), there could be as many as 450 new and infill gas wells drilled in the northern San Juan Basin, 1000 new wells drilled on the Southern Ute Tribal lands adjacent to the Unit, and 240 new wells on previously leased land in the Paradox Basin. The Reasonable and Foreseeable Development projected wells would require new roads, pipelines and associated disturbance for gas well construction. Consequently, oil and gas development may have large potential to have substantial cumulative effects when compared to all other activities that affect the San Juan Public Lands. The magnitude of new road/pipeline construction and other disturbances would vary only slightly by alternative.

Effects Determination

Management Area allocations influence land management activities and public use. Although Desired Conditions, Objectives, Design Criteria, and Guidelines have been included to address Colorado River cutthroat trout and other fish species, there is still risk inherent in concentrating these activities in areas with cutthroat trout. Therefore, all

alternatives in this Forest Plan/RMP Revision 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.

Plants

Eighty eight Forest Service and 103 BLM sensitive plant species were considered for this project. Of those, seventeen Forest Service and eight BLM species are known to occur on SJPL. Six other R2 Regional Forester's sensitive plant species could occur on the San Juan National Forest and one other BLM sensitive plant species could occur on BLM lands of the SJPL because potential habitat for them exists there.

Astragalus missouriensis var. humistratus (from Decker, K. 2006, July 13)

Astragalus missouriensis var. *humistratus* (Missouri milkvetch) is a local endemic plant whose global distribution is limited to the upper basin of the San Juan River in southwestern Colorado and northwestern New Mexico. Documented locations include four sites on the Pagosa and Columbine Ranger Districts of the San Juan National Forest. Although data are lacking, population numbers generally appear to be small.

Within its range, *Astragalus missouriensis* var. *humistratus* is broadly associated with the Rocky Mountain Ponderosa Pine Woodland or Rocky Mountain Gambel Oak-Mixed Montane Shrubland ecological system types (Colorado Natural Heritage Program 2005b). Occurrences in Colorado are found in pinyon-juniper woodlands, ponderosa pine forests, and Gambel oak montane shrublands. Within these types, it is typically found in openings or on sparsely vegetated soils. Elevations of reported occurrences range from about 7,100 to 8,600 ft. (1,645 to 2,285 m). Annual precipitation within the distribution of *Astragalus missouriensis var. humistratus* ranges from about 14 to 20 inches (18 to 48 cm). *Astragalus missouriensis* var. *humistratus* appears to favor shaley substrates; the majority of known populations are on sites underlain by substrates of either Mancos Shale or the almost identical Lewis Shale, with a few on shales of the Mesa Verde Formation.

Population trend data that would allow an evaluation of the conservation status of *Astragalus missouriensis* var. *humistratus* are generally not available. There is no way to know whether current management practices on lands supporting *A. missouriensis* var. *humistratus* populations are effective in protecting the species in the long term.

Astragalus missouriensis var. humistratus is not rhizomatous and reproduces only by seed, not vegetatively or by clonal growth. Flowers contain both male and female reproductive organs.

Based on the available information, threats to *Astragalus missouriensis* var. *humistratus* in approximate order of decreasing priority include effects of small population size, land development, surface disturbance, invasive species, air pollution, and global climate change. The entire global range of *A. missouriensis* var. *humistratus* is small (about 800 square miles), and effects of threats to the population may be compounded by this restricted range. Land and resource development activities that result in surface disturbance are the primary source of habitat change in the area. Anthropogenic activities that fragment the habitat of *Astragalus missouriensis* var. *humistratus* are increasing throughout its range, especially in the Pagosa Springs area, and could have a negative effect on the persistence of the species in the Region. The dispersed nature of the *A. missouriensis* var. *humistratus* populations may render them especially susceptible to environmental changes or management policies that introduce fragmentation into once continuous habitat.

Astragalus naturitensis

Astragalus naturitensis occurs in New Mexico, Utah, and Colorado (Mesa, Montezuma, Montrose, and San Miguel counties). Its habitat includes sandstone mesas, ledges, crevices, and slopes in pinyon-juniper woodlands at elevations of 5000-7000 feet.

Population trend data that would allow an evaluation of this species are not available. Potential threats are trails and livestock grazing.

Astragalus proximus (from Decker, K. 2005, September 7).

Astragalus proximus (Aztec milkvetch) is a local endemic whose global distribution is limited to the San Juan Basin in southwestern Colorado and northwestern New Mexico. It is considered fairly common within the New Mexico part of the basin, but much rarer in the Colorado portion of its range. Documented locations include five

sites on the Pagosa and Columbine Ranger Districts of the San Juan National Forest in Region 2. Although data are lacking, population numbers are assumed to be stable.

A. proximus is broadly associated with the Rocky Mountain Ponderosa Pine Woodland, Colorado Plateau Pinyon-juniper Woodland, Intermountain-basins Semi-desert Shrub-steppe, and Rocky Mountain Gambel Oak-Mixed Montane Shrubland ecological system types (Rondeau 2001, NatureServe 2003b). Occurrences of lower elevations in New Mexico are most often found in Great Basin grassland or pinyon-juniper communities. Occurrences in Colorado (within Region 2) are found in pinyon-juniper (with or without sagebrush) and ponderosa pine/Gambel oak communities. Occurrences have also been described from sagebrush and desert scrub.

Elevations of reported stations range from 5,400 to 7,500 ft., not including the two questionable specimens at 7,840 ft. and 8,700 ft. Annual precipitation within the distribution of *A. proximus* ranges from about 7 to 19 inches. Little information is available with which to characterize its microhabitat preferences. Soils, as reported from herbarium labels, are most often sandy, sandy clay, or clay with rock or shale fragments, or seleniferous shale. *A. proximus* does not appear to be an extreme habitat specialist, but it is possible that microhabitat characters controlling its distribution have not yet been identified.

Although occasional new stems may arise from the underground caudex, *Astragalus proximus* is not rhizomatous and reproduces only by seed, not by vegetative reproduction or clonal growth. Flowers contain both male and female reproductive organs.

Based on the available information, there are several threats to *A. proximus*. In approximate order of decreasing priority these are oil and gas development, road building and maintenance (including attendant sand and gravel mining), off-road vehicle use, grazing, fire, air pollution, and global climate change. A lack of systematic tracking of population trends and conditions, and the lack of knowledge about its basic life cycle also contribute to the possibility that one or more of these factors will threaten the long-term persistence of the species.

Calochortus flexuosus (from Panjabi, S.S. and D.G. Anderson. 2006, July 24)

*Calochortus flexuosus g*rows in dry habitats in the southwestern United States (California, Nevada, Utah, New Mexico, and Arizona) and apparently reaches its eastern limit in southwestern Colorado. Within the Rocky Mountain Region (Region 2) of the USDA Forest Service (USFS), it is found only in Colorado, where it has been documented from 15 locations. The total population is estimated to be between 6,000 and 9,000 plants. It is a peripheral species within Region 2, known only from an approximately 30 by 85 mile range in Montezuma, Dolores, San Miguel, and Montrose counties. Its distribution within the boundary of Region 2 is limited to BLM (Big Gypsum Valley on SJPL), Ute Mountain Indian Reservation, state, and private lands in southwestern Colorado. The area that has the greatest likelihood of supporting *C. flexuosus* on National Forest System lands in Region 2 is the lowest elevations of the Ryman Creek drainage in Dolores County. This area is near known occurrences, and habitat for *C. flexuosus* appeared to be present (Stewart personal communication 2004).

Plant communities associated with *Calochortus flexuosus* in Colorado have been described as grasslands, desert shrublands, and open pinyon juniper woodlands. The range of elevation documented in CNHP records (2004) is 4,700 ft. to 7,300 ft.

Rangewide, *Calochortus flexuosus* is found on dry stony slopes and desert hills between 3,000 and 8,330 ft. elevation (Callahan 2001, Fiedler and Zebell 2002). Callahan (2001) reports that this species may have an affinity for alkaline soils. The habitat is described by Cronquist and others (1977) as “dry stony slopes, rocky mesas and flats.” Tidestrom and Kittell (1941) report that the species is known from “slopes and canyons of the grass and pinyon belts.” Shreve and Wiggins (1964) report the habitat as “desert mesas and hillsides.” *Calochortus flexuosus* is found on fine-textured soils (clay).

C. flexuosus is a slow-growing perennial that flowers intermittently over a relatively long life. It has perfect, actinomorphic flowers. It may reproduce sexually and vegetatively (Fiedler 1986, Fiedler 1987). *C. flexuosus* may persist for several years as a bulb or corm awaiting favorable conditions for flowering.

There are no quantitative data that could be used to infer the population trend of *Calochortus flexuosus* in Colorado. The fact that in most years *C. flexuosus* is in a dormant form complicates estimates of abundance and occurrence extent. Impacts to *C. flexuosus* individuals and habitat resulting from recreational use, grazing, oil and gas development, and associated roads strongly suggest a downward trend. Loss of habitat, anthropogenic

disturbance of habitat, and plant harvesting have probably caused at least a slight downward trend since the area was settled.

There are several tangible threats to the persistence of *Calochortus flexuosus* in Colorado. In order of decreasing priority, these include exotic species invasion, oil and gas development, motorized recreation, effects of small population size, collection for horticultural trade, grazing, global climate change, and pollution. A large portion of the range of *C. flexuosus* in Colorado is vulnerable to oil and gas development; however, the scale and timeframe of extraction activities that might affect occurrences of *C. flexuosus* are unknown. Motorized recreation is increasing in areas where this species grows, and it is extremely difficult to enforce regulations or close areas to protect populations.

Carex diandra (from Gage, E. and D.J. Cooper. 2006, June 2)

Carex diandra is documented from three states in USFS Region 2: Wyoming, Colorado, and Nebraska. With approximately 25 known occurrences, Nebraska has the greatest number of occurrences, followed by Wyoming and then Colorado. Within Region 2, occurrences are discontinuously distributed, with several populations highly disjunct from one another and from populations in neighboring states. Occurrences in Wyoming and Colorado are found at elevations of 6,100 to 9,614 ft.. Herbarium and natural heritage element occur-rence records document the species as occurring in the Roosevelt, White River, Routt, Medicine Bow, Samuel McKelvie, and Shoshone national forests.

Within Region 2, Carex diandra is found primarily in fens, which are peat-forming wetlands influenced hydrologically and geochemically by groundwater inputs. The general habitat characteristics for *Carex diandra* have been variously described as swampy, marshy, or boggy areas, including features such as wet meadows, fens, muskegs, floating mats, and shores of lakes and ponds. The most common habitats described in Colorado and Wyoming are montane and subalpine fens, particularly those formed in depressions such as small kettles or other basins in periglacial environments

Carex diandra can reproduce both sexually via seed and vegetatively through the formation of tussocks. The species fruits from late May to mid-August, producing numerous small achenes.

There are insufficient data from which to evaluate possible population trends in Region 2 *Carex diandra* occurrences. As mentioned earlier, the majority of occurrence records lack population estimates, and the few estimates that are presented are too imprecise to be of much use in estimating trends.

Due to the region's relatively dry climate and high evapotranspiration rates, fens are restricted in distribution and are sensitive to any kind of perturbation altering their hydrologic regime. Because of *C. diandra's* strong fidelity for these kinds of habitats, its ultimate fate in Region 2 is tied to the persistence and continued functioning of these sites. Historically, many peatlands have been hydrologically modified by ditching, and to a lesser degree, by peat mining activities. Both are currently uncommon on public lands and do not appear to represent a significant threat to extant *C. diandra* populations. However, many fens that suffered anthropogenic impacts in the past continue to exhibit impaired function and require active hydrologic restoration before any ecological recovery can begin. Another historical impact of unknown extent is the construction of reservoirs, which could have affected fens through flooding. Since *C. diandra* is typically associated with small ponds or lakes, which are attractive sites for impounding and storing water, past and future water resource developments may have impacted the species. An additional direct threat is road construction and expansion activities. Of additional concern are activities (e.g., trampling by livestock, recreationists, native ungulates, or illegal off-highway vehicles) that compromise the integrity of the peat substrates that support many *C. diandra* occurrences.

Although direct impacts currently appear to pose a relatively small threat to most Region 2 *Carex diandra* populations, a wide variety of activities are known to indirectly impact wetland structure and function and thus potentially reduce the suitability of sites for this species. Activities like logging and road construction can significantly alter hydrologic or sediment dynamics in fens and consequently have a negative impact on any C. diandra that may occur there. Regional climate change, predicted under several different climate models, also has the potential to negatively impact fens by altering hydrology and shifting the balance of production and decomposition that is key to driving peat formation and maintaining habitat stability.

There is little evidence suggesting that the viability of known *Carex diandra* occurrences is imminently threatened, and what little data are available suggest that the majority of the Region 2 occurrences are stable. Many

occurrences are found in either USFS Wilderness or national parks or other special management areas, which may afford the species some level of protection.

Carex viridula

Carex viridula occurs in Colorado (Gunnison, Jackson, LaPlata, Park, and San Juan counties). Its habitat includes wetlands and calcareous fens at elevations of 8700 – 9200 feet.

Population trend data that would allow an evaluation of this species are not available. Direct impacts currently appear to pose a relatively small threat to most Region 2 populations. A variety of activities are known to indirectly impact wetland structure and function and thus potentially reduce the suitability of sites for this species. Activities like logging and road construction can significantly alter hydrologic or sediment dynamics in wetlands and consequently have a negative impact on any *C. viridula* that may occur there.

Cryptogramma stelleri

Cryptogramma stelleri occurs in Colorado (Archuleta, Conejos, Grand, San Juan, and San Miguel counties). Its habitat includes moist wooded slopes, rock outcrops, and riparian areas.

Population trend data that would allow an evaluation of this species are not available. Potential threats are trails and livestock grazing.

Cypripedium parviflorum (from Mergen, D.E. 2006, July 17)

Cypripedium parviflorum

There are currently 224 occurrences of *Cypripedium parviflorum* within Region 2. Of the 46 occurrences in Colorado, 11 are known from National Forest System lands. Of the occurrences documented on National Forest System lands, six are on the Pike-San Isabel National Forest, three are on the Arapaho-Roosevelt National Forest, and two are on the San Juan National Forest (Colorado Natural Heritage Program 2003).

In Colorado, *Cypripedium parviflorum* has been recorded at elevations between 5,800 and 12,683 ft. Habitat was described as *Populus tremuloides* (aspen), *Pinus* (pine), conifer, *Populus/Shepherdia* (aspen/buffalo berry), *Pinus ponderosa* (ponderosa pine), *Pseudotsuga menziesii* (Douglas-fir), *Pinus contorta* (lodgepole pine), *Populus angustifolia* (narrowleaf cottonwood), and spruce-fir-aspen. In Region 2, some occurrences are found in dry ponderosa pine habitat at elevations less than 4,000 ft. where soil moisture can be very low late in the growing season. Other occurrences are confined to riparian areas, north slopes, and cool drainages that have moist to near saturated soil moisture throughout the growing season. *Cypripedium parviflorum* is most often found on or confined to predominantly calcareous soils. In general, *C. parviflorum is* often found on soils and stony soils that have developed over a calcareous substrate, limestone scree and the base of limestone cliffs, or in peaty soils.

C. parviflorum plants depend upon mycorrhizal relationships for seed development, seedling establishment, and very possibly for adult phases such as dormancy

Determining a population trend from historical accounts is difficult due to the lack of quantitative data.

Plant collecting, timber harvest, road construction, grazing, and all other activities that cause habitat loss are probably the greatest risks to *Cypripedium parviflorum*. Some management activities, such as plant collecting and livestock grazing, may cause direct damage to plants while other activities indirectly impact plants by altering their habitat. Most management activities, like recreation, weed control, fire suppression, mining, fuelwood harvest, and prescribed fires, may kill individual plants or change the habitat beyond a threshold that *C. parviflorum* can survive. Environmental risks to this species include drought, flooding, and wildfire.

Draba smithii (from Ladyman, J.A.R. 2004, February 3)

Draba smithii is known from Alamosa, Archuleta, Custer, Las Animas, Mineral, and Saguache counties in southern Colorado. The majority of known *Draba smithii* occurrence sites are on USDA Forest Service land. The single known occurrence on the San Juan National Forest is visited periodically to determine its presence, but the size and structure of the population is not formally monitored (Redders personal communication 2002). There are insufficient numerical data in the literature, associated with herbarium specimens, or at the Colorado Natural Heritage Program to definitively determine a long-term population trend for *D. smithii*. However, the information

currently available suggests that it is likely to survive satisfactorily, especially if additional research and surveys are carried out so that some basic management strategies can be formulated.

Draba smithii occurs in montane and mountain shrub zones (Johnson 1987). Although directly part of the sparse vegetation of rock dwelling communities, *Draba smithii* grows in various douglas-fir (*Pseudotsuga menziesii*), blue spruce (*Picea pungens*), bristlecone pine (*Pinus aristata*), *Pinus aristata*/*Festuca arizonica* (bristlecone pine/Arizona fescue), Arizona fescue grassland, and pinyon juniper woodland, and aspen (*Populus tremuloides*) communities. In one case, a population was found associated with thin-leaf alder (*Alnus tenuifolia*) and a species of willow (*Salix* spp.). Historical occurrence information indicates that it also grows at or above the tree line (Schulz 1927). It grows on rock outcrops and on talus slopes with little closely-associated vascular vegetation, although frequently the rocks are covered by abundant lichen and, in some cases, mosses. Although many habitats are described as xeric, plants have been also been reported to occur in seasonal seep areas and moist rock outcrops in aspen stands. *Draba smithii* occurs at elevations from 2,365 m to approximately 4,000 m (7,760 to 13,123 ft.), with the majority of occurrences between 2,500 and 3,299 m. A correlation between occurrences and volcanically derived soils has been noted.

Draba smithii reproduces sexually, although it is not clear whether it is self- or cross-pollinated (Windham personal communication 2002). Current evidence suggests that seedling recruitment is infrequent and that seeds may have a restricted dispersal pattern. This may explain the species' rarity. The infrequency of suitable habitat niches may also contribute to its lack of abundance.

Draba smithii is vulnerable due to its limited geographic range, small numbers, and infrequent occurrence. The most significant threats to *D. smithii* appear to come from habitat modification. Several known occurrences are subject to threats from recreational hiking and from permanent habitat modification from development projects such as road construction. Modification of the hydrology of occupied habitat may also affect some populations. Livestock grazing, fire, and invasive weeds appear to be low-level threats at the current time. *Draba smithii* grows in rock cracks and crevices, and thus only the accessible occurrences are vulnerable to large herbivores. Its rocky habitat provides a natural refuge from fire, and weed invasions appear unlikely at the present time.

Drosera anglica (from Wolf, E.C. et al. 2006, December 14)

Drosera anglica (English sundew) has a circumboreal distribution and is widespread and abundant in many regions. However, the three occurrences located in USDA Forest Service Region 2 are geographically isolated and near the southern extent of the species' range.

The most immediate threats to Drosera anglica are events that alter the hydrologic functioning of the fens in which it occurs. Water-saturated conditions produced by perennial groundwater discharge are critical for maintaining slow rates of organic matter decomposition and slow nutrient turnover. Activities that disrupt, divert, augment, or redistribute groundwater flow to and through a fen have the potential to alter ecosystem functions and the floristic composition of fens. Site-wide impacts may occur directly in the fen from activities such as ditching or groundwater pumping. Other impacts can occur from activities in adjacent ecosystems, including logging, fires, road building, diverting surface flow, and pumping groundwater. Within a fen, a variety of microsites occur that influence the distribution of fen plant communities. Activity within the fen can significantly affect the quality and abundance of microsites. For example, trampling by cattle, people, vehicles, and native animals can break apart floating peat mats that provide *Drosera anglica* habitat.

Any change in the nutrient budget of a fen can significantly alter site suitability for *Drosera anglica*. Being adapted to nutrient poor environments, *D. anglica* would likely be out competed if fertilization were to occur via atmospheric deposition of nitrogen, excrement of rangeland grazing animals, or if there were other increases in the nutrient concentration of the water supporting the fen.

Epipactis gigantea (from Rocchio, J., M. et al. 2006, March 20)

Epipactis gigantea extends from southern British Columbia through the western United States, reaching inland as far as Texas, with one collection from central Mexico. Forty-one occurrences of it are known from Region 2; the majority of these occurrences (32) and much of the species' habitat are on public lands. Fifteen occurrences are on land managed by the BLM, and 13 occurrences are on National Park Service land. Only two occurrences are on NFS lands: one on the Black Hills National Forest and one on the San Juan National Forest.

Epipactis gigantea is one of the few orchids that grow in the desert, albeit in wet habitats. Most Colorado occurrences occupy seeps, streambanks, and hanging gardens between 4,800 and 6,500 ft. Although *Epipactis gigantea* occurs from desert, montane, and boreal climates, it is always restricted to minerotrophic (nutrient-rich) habitats and requires a constant supply of moisture

Given the clonal nature of *Epipactis gigantea*, it is difficult to estimate the actual number of genetic individuals at a particular site. NatureServe (2003) estimates that the actual number of genets (genetic individuals) is small, but there are many thousands of ramets of it across its range. The total number of plants estimated from the 41 occurrences in Region 2 is between 8,000 and 17,000. There are no rigorous data from which to determine population trends for *Epipactis gigantea*.

Sexual reproduction results in a large number of miniscule seeds in mid to late summer that are dispersed by wind and water. Vegetative reproduction in *Epipactis gigantea* occurs by means of short, fibrous rhizomes (Brown and Argus 2002) that grow laterally across the substrate to form either a dense monoculture or a looser colony within dense stands of other vegetation such as spikerush (*Eleocharis* spp.) or sedge (*Carex* spp.).

Observations of known occurrences suggest several potential threats to *Epipactis gigantea*. In order of greatest to least concern, these threats include recreation, exotic species invasion, water development, domestic livestock grazing, urban development, timber harvest, and utility line construction/ maintenance. Not all threats are equally valid for every occurrence, and some threats may interact and influence each other. For example, recreation can affect hydrology, introduce non-native species, or result in habitat loss (e.g., hot spring development). In many localities, it is difficult to consider these threats in isolation from one another, both temporally and spatially. Specific impacts to *E. gigantea* and its habitat should not be considered in isolation from the cumulative impacts to an area.

Erigeron kachinensis (from Kram et al. 2005)

Erigeron kachinensis is a Colorado Plateau endemic known from western Colorado and eastern Utah. Colorado records are from two locations in the Dolores River Canyon in Montrose County: Coyote Wash, and the Dolores Canyon below Sewemup Mesa. The occurrence at Coyote Wash is near the border of the San Juan Resource Area and the Uncompahgre Basin Resource Area.

Habitat is on saline soils in alcoves and seeps in canyon walls at elevations from 4800 to 5600 ft. In Colorado, all occurrences are in low elevation seeps and hanging gardens; however in Utah there are also occurrences in high elevation mesic sandstone outcrops in aspen and ponderosa pine communities.

The Kachina daisy is a perennial plant from a branching caudex.

This species occurs in seeps, which, if visited frequently, are very vulnerable to disturbance. However, most occurrences documented are inaccessible and rarely visited (CNHP 1998). Survival of the plants depends on the supply of water to the site. Any disruption of the hydrology on the mesas above the occurrences, such as diversions or prolonged drought, could threaten the hanging garden community. Known occurrences are not near current development, but mining, energy development, or water projects could affect water supplies to habitat.

Eriophorum altaicum* var. *neogaeum (from Ladyman, J.A.R. 2004, October 29)

Eriophorum altaicum var. *neogaeum* occurs in the Rocky Mountains of Colorado. Discounting those occurrences where specimens have been annotated to indicate *E. chamissonis,* there are 25 occurrences on National Forest System lands: White River National Forest (2), Rio Grande National Forest (1), San Juan National Forest (18), Pike National Forest (2), Uncompahgre National Forest (1), and Gunnison National Forest (1).

Eriophorum altaicum var. neogaeum grows in the sub-alpine and alpine tundra zones of the Rocky Mountains. Associated species include *Picea engelmanii, Salix planifolia* (diamondleaf willow), moss, and lichen. It is always associated with water-saturated soils. Individuals grow in bogs, fens, wetlands, and along very wet streamsides. It is reported at elevations between 3,097 and 4,023 m with the majority of occurrences located between 3,500 m and 3,749 m. *E. altaicum* var. *neogaeum* grows in soils that always have a high level of organic matter usually described as humus, peat, or fine organic sphagnum matter. Soils are hydric.

Eriophorum altaicum var. neogaeum is a perennial species. It is exceptionally rhizomatous (Weber and Wittmann 2001a and 2001b), and vegetative propagation is likely critical to population sustainability. It also reproduces sexually. The flowers are hermaphroditic.

E. altaicum var. neogaeum has been placed in synonymy with *E. chamissonis*. However, there are herbarium specimens in Colorado identified as *E. altaicum var. neogaeum* that do not possess all of the characteristics of *E. chamissonis*; they therefore cannot be consigned to this taxon. Until this situation is resolved, this assessment strictly refers to these specimens as *E. altaicum var. neogaeum.*

The information currently available suggests that several *Eriophorum altaicum* var. *neogaeum* occurrences are relatively secure in Colorado because they occur in areas that are afforded protection either by land use designation, for example USDA Forest Service wilderness area, or by their remote, relatively inaccessible location. There are insufficient data in the literature, associated with herbarium specimens, or at the Colorado Natural Heritage Program to determine the long-term population trends for *Eriophorum altaicum* var. *neogaeum*. There is indication that plants persist in the same general area for many decades.

Activities and events that change the hydrology of its habitat are primary threats to *Eriophorum altaicum var. neogaeum.* Recreational use of habitat, such as foot traffic, off-road recreational vehicles, and activities related to skiing, may pose a threat to some occurrences throughout its range. As the human population grows in areas within easy access to *E. altaicum var. neogaeum* habitat and as recreational use increases, the impacts may become substantially more significant. Mineral and peat mining activities are not perceived as threats to any of the currently known occurrences although individual occurrences may have been impacted in the past. Introduced mountain goats and domestic sheep are likely to have adversely impacted habitat in some parts of its range. Invasive weeds are not currently believed to be a concern at any of the known occurrence sites but may pose a threat in the future. Wet nitrogen deposition (acid rain) and air pollution are likely to change the composition of many communities in alpine tundra, especially in some regions where *E. altaicum var. neogaeum* occurs in Colorado. The specific effect on *E. altaicum var. neogaeum* is unknown. Global warming is a potential threat to all species currently restricted to sub-alpine and alpine-tundra zones.

Eriophorum chamissonis (Decker, K. et al. 2006, January 25)

Eriophorum chamissonis occurrences are known from alpine and subalpine wetlands and fens of the central and southwestern mountains of Colorado and northern Wyoming's Bighorn Mountains and Absaroka Range. All 12 documented occurrences in Region 2 are on National Forest System lands. Two occurrences are on the San Juan National Forest, five are on the White River National Forest, three are on the Bighorn National Forest, and two are on the Shoshone National Forest.

In Region 2, *E. chamissonis* is typically found in subalpine wet meadows and fens with saturated peat soils, where graminoids and forbs dominate the vegetation. It is associated with the Rocky Mountain Alpine-Montane Wet Meadow and Rocky Mountain Subalpine-Montane Fen ecological systems as defined by NatureServe (2003). These two systems are defined as "small patch" types that usually have distinct boundaries, require specific environmental conditions, and are strongly linked to and dependent upon the landscape around them

Because most documented occurrences have not been counted more than once, information is insufficient to allow an assessment of range-wide population trends. Occurrences in Region 2 are generally small and disjunct and so are probably more vulnerable to environmental stochasticity and anthropogenic disturbance than occurrences in the center of the range. Although population monitoring data are lacking, there is evidence to suggest that some occurrences have disappeared. In Region 2, *Eriophorum chamissonis* is confined to a few isolated instances of unique and relatively rare habitat. Extirpation of these occurrences will not necessarily endanger the persistence of the species. However, a steady but gradual loss of occurrences over time could contribute to a contraction of the known range. Loss of the disjunct occurrences in Region 2 could reduce the genetic diversity of the species as a whole, as well as depress its resilience in the face of genetic, demographic, and environmental stochasticity.

Eriophorum chamissonis is a perennial graminoid that reproduces both sexually by seed and vegetatively by long, creeping rhizomes. Like most other species in the Cyperaceae, *E. chamissonis* is monoecious, having separate male and female flowers on the same plant.

Probable threats to *Eriophorum chamissonis* in Region 2 include, in order of decreasing priority, hydrologic alterations, grazing, motorized vehicle use, peat mining, fire, and global climate change. The small, disjunct nature of populations of E. chamissonis in Region 2 and the lack of knowledge of the species' biology contribute to the possibility that one or more of these factors may threaten the long-term persistence of the species without anyone being aware of it.

Eriophorum gracile (from Decker, K. et al. 2006, February 6).

Eriophorum gracile is a circumpolar species that occurs as a relictual disjunct in USDA Forest Service (USFS) Region 2. Occurrences are known from mountainous areas of Colorado and Wyoming and the Sandhills region of north-central Nebraska and southern South Dakota. Thirty-six documented occurrences include 15 on National Forest System lands in Colorado and Wyoming. The only Region 2 occurrences on National Forest System lands are in Colorado and Wyoming. These include nine in Colorado (four on the Routt National Forest, two on the Grand Mesa-Uncompahgre-Gunnison National Forest, and one each on the Arapaho-Roosevelt National Forest, Pike-San Isabel National Forest, and White River National Forest).

In Region 2, *E. gracile* is typically found in fens and subalpine wet meadows with saturated soils where vegetation is dominated by graminoids and forbs. These habitats are often described as bogs or marshes in the original source material. Elevations of occurrences range from about 7,000 to 11,140 ft. in Colorado. In Region 2, *Eriophorum gracile* is associated with the Rocky Mountain Alpine-Montane Wet Meadow, Rocky Mountain Subalpine-Montane Fen, and the Northwestern Great Plains Open Freshwater Depression ecological systems as defined by NatureServe (2003). These three systems are defined as "small patch" types, that usually have distinct boundaries, require specific environmental conditions, and are strongly linked to and dependent upon the landscape around them.

Because occurrences records do not include repeated stem counts, information is insufficient to allow an assessment of current population trends. Although trend data for individual occurrences are lacking, evidence suggests that some occurrences were extirpated during the past century. About one fourth of the documented occurrence locations in Region 2 are considered historical, and unlikely to be relocated because of habitat alteration at those sites. It is not clear that these disappearances represent a general downward population trend in Region 2. In Region 2, *Eriophorum gracile* is confined to a few islands of unique and relatively rare habitat. Extirpation of these isolated occurrences will not necessarily endanger the persistence of the species; however, a gradual loss of occurrences will eventually result in a contraction of its known range. Loss of the disjunct populations in Region 2 could reduce the genetic diversity of the species as a whole, as well as depress its resilience in the face of genetic, demographic, and environmental stochasticity.

Eriophorum gracile is a perennial graminoid that reproduces both sexually by seed and vegetatively from long, creeping rhizomes (Ball and Wujek 2002). Like most other species in the Cyperaceae, *E. gracile* is monoecious, having separate male and female flowers on the same plant.

Known occurrences of *Eriophorum gracile* on National Forest System lands in Region 2 are reasonably well protected. It is very likely that additional populations will be located in the future; their status is uncertain. Probable threats to this species include, in order of decreasing priority, hydrologic alterations, grazing, motorized vehicle use, peat mining, invasive species, and global climate change. The small, isolated nature of occurrences of *E. gracile* in Region 2 and the lack of basic information about the biology of the species contribute to the possibility that one or more of these threats will decrease the probability of its long-term persistence in the region.

Gilia sedifolia (from Anderson, D.G. 2004, August 9).

Gilia sedifolia (stonecrop gilia) is a narrow endemic known from two occurrences in the San Juan Mountains of southwestern Colorado. The type locality ("Sheep Mountain") was last seen in 1892, and its location is uncertain. The other occurrence, known from Half Peak in Hinsdale County, Colorado, consists of two stands and approximately 1,100 individuals. It was last seen in 2003. The Half Peak occurrence is on the Gunnison National Forest, and the type locality may be on the San Juan National Forest.

Information on the habitat of *Gilia sedifolia* is sparse. Collections of this species were in sites at or above treeline. It is apparently restricted to dry, rocky or gravelly talus of tuffaceous sandstone (Porter 1998, Komarek personal communication 2002, Komarek 2003). *Gilia sedifolia* was collected on a shallow south-facing slope on Half Peak (Komarek 1995). On Half Peak, *Gilia sedifolia* is found exclusively in gravelly patches that are surrounded by denser vegetation dominated by *Geum rossii* (Ross's sedge; ash-flow tuff (sensu Tweto 1979) throughout the San Juan Mountains above 11,700 ft. This is included as a rough estimate of possible habitat for *Gilia sedifolia*. Alpine areas on ash-flow tuff parent material that are not occupied may be suitable but unoccupied habitat,

Gilia sedifolia appears to be a biennial (Porter 1998) or a short-lived monocarpic perennial (Inouye personal communication 2003). The biennial life history is an adaptation to a short growing season because it makes it

possible for plants to produce a much larger seed crop than they could in only one year (Barbour et al. 1987). There is, however, a cost to this strategy since there is a significant chance that the second year will not be favorable for growth or that a disturbance will occur.

There are insufficient data to make any inferences regarding the population trend for *Gilia sedifolia*.

Observations and opinions of experts show that there are several tangible threats to the persistence of *Gilia sedifolia*. In order of decreasing priority these threats are off-road vehicle use and other recreation, sheep grazing and its secondary impacts, mining, exotic species invasion, effects of small population size, global climate change, and pollution.

Ipomopsis polyantha (from Anderson, D.G. 2004, December 21).

Ipomopsis polyantha is an extremely narrow endemic whose global distribution is limited to a 13-mile range in Archuleta County, Colorado. It is known from three occurrences in the vicinity of Pagosa Springs, Colorado, two of which consist of small population sizes. It is ranked globally critically imperiled (G1S1) by NatureServe and the Colorado Natural Heritage Program. *Ipomopsis polyantha* is a sensitive species in Region 2 of the USDA Forest Service and is included on the Bureau of Land Management Colorado State Sensitive Species List in the San Juan Field Office. It is currently being evaluated for candidate status under the Endangered Species Act.

Ipomopsis polyantha grows among the southern foothills of the San Juan Mountains. *Ipomopsis polyantha* is apparently restricted to Mancos Shale where the soils are heavy, gray, fine-textured, and clayey. The elevation range of *I. polyantha* is 6,800 to 7,300 feet. *Ipomopsis polyantha* is found in a wide variety of vegetation types. *Ipomopsis polyantha* has been documented from *P. ponderosa*-dominated forests, pinyon pine/juniper/oak scrub communities, and a pine-oak community.

There are no quantitative data that could be used to infer the population trend of *Ipomopsis polyantha.* Human impacts to individuals and habitat for *I. polyantha* resulting from the establishment, growth, and development of Pagosa Springs strongly suggest that there has been a downward trend. Loss of habitat and anthropogenic disturbance of remaining habitat has probably caused a downward trend since the area was settled 120 years ago.

Observations and quantitative data have shown that there are several threats to the persistence of *Ipomopsis polyantha*. In order of decreasing priority these are residential and commercial development, livestock grazing, exotic species invasion, right-of-way management, effects of small population size, recreation, wildflower gathering, global climate change, and pollution. The entire global range of *I. polyantha* is planned for residential development in the Archuleta County Community Plan. *Ipomopsis polyantha* does not tolerate livestock grazing and is thus largely limited to highway rights-of-way. Given the serious nature of the threats to *I. polyantha*, it is among the most endangered species in Colorado.

Lesquerella pruinosa (from Anderson, D.G. 2006, August 29).

*Lesquerella pruinosa (*Pagosa bladderpod) is currently known from 21 occurrences in Archuleta and Hinsdale counties in southwestern Colorado and from one newly discovered occurrence in northern Rio Arriba County, New Mexico. *Lesquerella pruinosa* is found on federal lands managed by the USFS (San Juan National Forest) and the BLM. It is also found on private land and on the Southern Ute Reservation. Six (possibly seven) occurrences are known from National Forest System land on the San Juan National Forest, including the two largest known occurrences at O'Neal Hill Botanical SIA and Turkey Mountain

Published accounts of the habitat of Lesquerella pruinosa include "Mancos slate or shale, meadows, and gentle slopes" (Rollins 1993), "in fine-textured soils derived from Mancos Shale" (O'Kane 1988), "on dry soils" (Rollins and Shaw 1973), and "narrowly endemic on clay-shale" (Weber and Wittmann 2001). *Lesquerella pruinosa* is limited to soils derived from the Upper Cretaceous Mancos Shale Formation. Most reports note the highest densities of L. pruinosa on exposed, gray clay barrens within montane grasslands or with small hills and ridges above them. Smaller occurrences are found in open ponderosa pine (*Pinus ponderosa*) stands and Gambel oak (*Quercus gambelii*) communities; numbers of plants apparently decrease under a forest canopy. *Lesquerella pruinosa* can be associated with Douglas-fir (*Pseudotsuga menziesii*) and Engelmann spruce (*Picea engelmannii*) communities at the upper limits of its range. *Lesquerella pruinosa* is concentrated between 6,890 and 8,800 ft.

Anthropogenic disturbance and gradual loss of habitat since European settlement of the Pagosa Springs area 120 years ago have probably caused a steady population decline of *Lesquerella pruinosa*. Declining habitat quantity

and quality on federal and private land are likely to result in continued downward trends for *L. pruinosa* range-wide (Redders 2001, Lyon personal communication 2004).

There are several threats to the persistence of *Lesquerella pruinosa* in Region 2. In approximate order of decreasing priority, threats to *L. pruinosa* include residential and commercial development, off-road vehicle recreation, other recreational activities, energy resource development, exotic species invasion, use of herbicides and pesticides for weed management and range improvement, effects of small population size, grazing, prairie dog herbivory, fire, global climate change, and pollution.

Parnassia kotzebuei (from Panjabi, S.S. and D.G. Anderson. 2007, January 17)

Parnassia kotzebuei in Region 2 of the USDA Forest Service (USFS) is quite limited relative to its overall range. Within Region 2, this species is found only in Wyoming and Colorado. It is known from 27 locations in Region 2, and these occurrences contain an estimated 1,135 plants occupying less than 27 acres. *Parnassia kotzebuei* occurs on land administered by six national forests (Arapaho-Roosevelt, Pike-San Isabel, San Juan, and White River national forests in Colorado.

Habitat descriptions in Region 2 are documented through the work of botanists reporting to the Colorado Natural Heritage Program (Colorado Natural Heritage Program 2004a), or on labels of specimens deposited at the University of Colorado Herbarium and the Rocky Mountain Herbarium. Weber and Wittmann (2001) describe the habitat for *Parnassia kotzebuei* in Colorado as "rocky ledges and rills, subalpine, alpine." Spackman et al. (1997a) add that the species is found in "wet areas along streamlets and in moss mats." *Parnassia kotzebuei* is found primarily above tree line, and also in subalpine forest openings, on rocky coniferous slopes, and in deep spruce forests.

Very little is known about the reproductive ecology and autecology of *Parnassia kotzebuei*. While the plants are probably pollinated by insects, it is not known if this species is self-incompatible and an obligate outcrosser, or if it is capable of self-pollination. Plants have both male and female sexual organs.

There are no quantitative data that could be used to infer the population trend of *Parnassia kotzebuei* in Region 2.

Although *Parnassia kotzebuei* occurrences in Colorado and Wyoming are exposed to threats, the severity and extent of the threats are moderately low. In order of decreasing severity, potential threats to this species include effects of small population size, global climate change, motorized recreation, grazing, non-motorized recreation, exotic species invasion, mining, and pollution.

Machaeranthera coloradoensis (from Beatty, B.L. et al. 2004, January 30)

Machaeranthera coloradoensis (Colorado tansyaster) is a regional endemic species with populations located in central, west-central, and southwestern Colorado and south-central Wyoming. Of the 33 occurrences of *M. coloradoensis* worldwide, 21 occurrences are on lands managed by the U.S. Forest Service in Colorado and Wyoming. In Colorado, *Machaeranthera coloradoensis* occurs in the central, west-central, and southwestern portions of the state. Specifically, Colorado NHP records (2003) indicate that this species has been recorded from 21 occurrences in Gunnison, Hinsdale, La Plata, Lake, Park, Pitkin, Rio Grande, Saguache, and San Juan counties. Of the 24 occurrences of *Machaeranthera coloradoensis* in Colorado, six occurrences are with the Grand Mesa, Uncompahgre, and Gunnison National Forest, five are within the San Juan National Forest, five are within the Rio Grande National Forest, two are within the Pike-San Isabel National Forest, and one is within the White River National Forest. In the San Juan National Forest, one population may occur within the Weminuche Wilderness Area, but there is some uncertainty concerning the precise location of this population

Machaeranthera coloradoensis is a perennial forb species that occurs in a variety of habitats in Colorado from montane to alpine areas. It is found 7,675 to 12,940 feet in elevation. *Machaeranthera coloradoensis* macrohabitats range from plains/park grassland, to dry grassland communities within ponderosa pine (*Pinus ponderosa*) or bristlecone pine (*Pinus aristata*) areas, to pinyon/juniper (*Pinus*/*Juniperus*) woodlands, to alpine fellfields and meadows. Within these areas, this species grows on slopes, bluffs, ridges, flats, or roadsides on sedimentary and calcareous substrates (e.g., limestone, dolomite, shale), volcanic substrates (e.g., volcanic ash), or granitic substrates. This species is consistently found in areas with open exposure, but the slope, aspect, and moisture vary from site to site.

There are no data on population trends for *Machaeranthera coloradoensis*. Although several populations have been counted, multi-year population or quantitative demographic monitoring has not been initiated for any occurrences of this species.

There is no information concerning the extent of sexual or vegetative reproduction in Machaeranthera coloradoensis. Machaeranthera species tend to have several short rhizomes arising from the caudex (Hartman 1990), which may or may not function in vegetative reproduction.

Machaeranthera coloradoensis is vulnerable because of its restricted geographic range and small number of documented occurrences. Direct or indirect negative impacts to *M. coloradoensis* populations or habitats by human-related activities could occur from motorized and non-motorized recreation, trail or road construction and maintenance, reservoir expansion, housing development, changes to natural disturbance regimes, domestic livestock activities, invasive species introduction, or small-scale mining. Lower elevation populations and those populations closest to roads and trails are likely at the most risk. Other environmental or biological threats to populations or habitats of *M. coloradoensis* could include inadequate pollination, genetic isolation, herbivory, landscape fragmentation, hybridization, global climate changes, or changes to the natural disturbance regime that would affect natural succession, erosion, or precipitation patterns.

Mimulus eastwoodiae (from Kram et al. 2005)

Mimulus eastwoodiae is endemic to the Canyon Lands of southeastern Utah and adjacent Colorado and Arizona (Cronquist et al. 1984). It has also been reported from Nevada. In Colorado, *Mimulus eastwoodiae* is known from Delta, Mesa, Montrose, and San Miguel counties. The Colorado Natural Heritage database has two occurrences in the San Juan Public Lands in San Miguel County: one is located on the Anderson Mesa quadrangle in a seep above the Dolores Canyon, and the other on the Horse Range Mesa quadrangle in two seeps on the north side of McIntyre Canyon, a tributary of the Dolores River. The species is also mentioned in the record for *Erigeron kachinensis* in Bull Canyon as being present at that location.

Mimulus eastwoodiae grows in hanging garden communities in shallow caves, alcoves and seeps on steep canyon walls at elevations from 4700 to 5800 ft. Adjacent uplands have scattered pinyon, juniper, and sagebrush. The habitat is somewhat naturally protected by its inaccessibility, but it can be fragile.

Mimulus eastwoodiae is a stoloniferous perennial plant with leaves less than 1 cm long. New plants are produced wherever roots take hold.

This species occurs in seeps, which, if visited frequently, are very vulnerable to disturbance. However, most occurrences documented are inaccessible and rarely visited (CNHP 1998). Survival of the plants depends on the supply of water to the site. Any disruption of the hydrology on the mesas above the occurrences, such as diversions or prolonged drought, could threaten the hanging garden community.

Pediomelum aromaticum

Pediomelum aromaticum occurs in Arizona, Utah, and Colorado (Mesa and Montrose counties). Its habitat includes adobe hills, and semi-desert shrublands and sagebrush shrublands.

Population trend data that would allow an evaluation of this species are not available. Potential threats are trails and livestock grazing.

Physaria pulvinata (from Anderson and Spackman Panjabi. February 12, 2006).

Physaria pulvinata was described in 2006 and is currently known from two occurrences in San Miguel and Dolores Counties, Colorado. One of these is (in part) on the San Juan National Forest. It is found on scattered outcrops of grayish, argillaceous shale at elevations between 7600 an 8500 ft.

This species is known from approximately 4000 individuals. Populations have not been monitored or revisited to assess population trend. The habitat and habitat quality is currently in a downward trend due to extensive human impacts in this area.

Physaria pulvinata is subject to immediate and on-going threats from over-grazing, intense recreational use, and soil disturbance. It is the latter that has had the greatest impact on the extant populations, as the shale to which the

plant is confined is mined and used to surface local gravel roads. Portions of populations are presently protected from active soil removal because they are near lakeshores or along power line right-of-ways. Nonetheless, off-road vehicle traffic still takes a toll. Until a thorough search for the cushion bladderpod is conducted, federal and state agencies should curtail their use of the shale where the plant occurs.

Salix arizonica (from Decker, K. 2006, April 20).

Salix arizonica occurrences are concentrated near the margins of the Colorado Plateau in Utah, Arizona, New Mexico, and Colorado. In Region 2, a single occurrence is known from the southern San Juan Mountains in Conejos County, Colorado.

Throughout its range, *Salix arizonica* is typically associated with high elevation wet meadows, streamsides, and cienegas. Habitat often occurs as a narrow, linear strip associated with perennial water in seeps, springs, stream sides, and wet meadows. Plants are also sometimes found in drier sites adjacent to forest edges or within the riparian zone where subsurface channels provide moisture. *S. arizonica* is frequently associated with substrates of volcanic origin, and it appears to favor coarse-textured and well-watered soils, including those associated with alluvial deposits.

Salix arizonica is a perennial, deciduous shrub that reproduces sexually by seed. Plants also form dense thickets when stems are buried by alluvial sediments, making identification of genetic individuals difficult. However, plants are not producing subterranean rhizomes (Maschinski personal communication 2005). Nearly all willows, including *S. arizonica*, are dioecious; an individual plant has either male flowers or female flowers, but not both.

Population trends have not been rigorously determined for *Salix arizonica*, but the species appears to be primarily declining throughout its range.

Primary threats to the persistence of *Salix arizonica* in Region 2 are grazing by domestic and wild ungulates, hydrologic alterations, impacts from timber harvesting, impacts from recreational use, consequences arising from small population sizes, and global climate change. The detrimental effects of grazing and altered hydrology have been documented in occurrences outside Region 2. Information on the incidence and potential severity of other threats is less well known, due to the relatively recent discovery of both the species and many of its occurrences.

Salix candida (from Decker, K. 2006, September 18

Salix candida is known from 32 locations within Region 2; 15 occurrences are known from Colorado, 10 from Wyoming, and 7 from South Dakota. Of these 32 occurrences, 16 are located on National Forest System lands. In Colorado, one occurrence is on the Arapaho-Roosevelt National Forest, and four are at least in part on the Pike-San Isabel National Forest. Spackman et al. (1997) indicated that Salix candida is also known from Hinsdale and LaPlata counties, on the Gunnison and San Juan National Forests.

Throughout its range, *Salix candida* is typically associated with fens, bogs, marshes, and other areas of permanently saturated soils where peat is present. These habitats often have high mineral content and alkaline pH (Lesica 1986, Cooper 1996) and are characterized as “rich” or “extreme rich” fens.

Data that would allow a detailed description of population trends are generally lacking. Of the 32 occurrences in Region 2, only 12 have been clearly documented as having been visited multiples times, and none has been counted systematically more than once.

Salix candida primarily reproduces sexually by seed, although most willows can be easily propagated from cuttings.

The primary and immediate threat to the persistence of *Salix candida* in Region 2 is hydrologic alteration. The pervasive nature of this threat could drastically reduce or eliminate suitable habitat for *S. candida* in Region 2. Global climate change or consequences arising from small population sizes could also eliminate *S. candida* from Region 2 over longer periods. Less immediate threats include grazing, road construction and maintenance, peat mining, recreational use, alteration of natural fire regime, and invasive species. These threats are more likely to decrease the vigor and number of occurrences rather than eliminate the species from Region 2.

Salix serissima (from Decker, K. 2006, March 9).

Salix serissima (autumn willow) is a boreal willow and an obligate wetland species whose distribution is concentrated in the northeastern United States and in Canada from Newfoundland to British Columbia. It is found in disjunct populations within USDA Forest Service (USFS) Region 2. Known occurrences in Region 2 include four in the Black Hills of South Dakota (two on the Black Hills National Forest); one in the Sherman Mountains of Albany County, Wyoming (on the Medicine Bow National Forest); seven in north-central Colorado (one on the Arapaho-Roosevelt National Forest); and one in southwestern Colorado (potentially on the San Juan National Forest).

Throughout its range, Salix serissima is typically associated with areas of permanently saturated soils where peat is present. In Region 2, these areas frequently have a high mineral content and an alkaline pH (Froiland 1962, Lesica 1986, Cooper 1996), and they are classified as calcareous or rich fens.

Salix serissima reproduces primarily sexually by seed, and it can be easily propagated from cuttings. *S. serissima* is dioecious; an individual plant has either male flowers or female flowers, but not both.

The foremost threat to the persistence of *Salix serissima* in Region 2 is hydrologic alteration of the peatland habitats where it is found; any activity that disrupts saturated soils and peat formation is likely to have a negative impact on *S. serissima.* Hydrological alteration has occurred in the past at several S. serissima sites and is a current threat to some occurrences. This threat interacts to some degree with all other threats to this species. Other activities currently threatening *S.serissima* occurrences include grazing and road construction. The effects of global climate change and small population sizes have the potential to eliminate the species from Region 2; these effects are gradual, unpredictable, and difficult to control or evaluate. Potential threats to the species include peat mining, recreational use, alteration of fire regimes, and competition from invasive plant species.

Sphagnum angustifolium

Sphagnum angustifolium occurs in Colorado (San Juan County). Its habitat includes fens and other wetlands.

Population trend data that would allow an evaluation of this species are not available. Direct impacts currently appear to pose a relatively small threat to most Region 2 populations. A variety of activities are known to indirectly impact wetland structure and function and thus potentially reduce the suitability of sites for this species. Activities like logging and road construction can significantly alter hydrologic or sediment dynamics in wetlands and consequently have a negative impact on any *S. angustifolium* that may occur there.

Triteleia grandiflora (from Ladyman, J.A.R. 2007, January 29).

Triteleia grandiflora has been documented in Colorado only from one location on the San Juan National Forest in Montezuma County where 700 to 2,000 individuals are distributed over approximately 10.8 ha. In 2005, surveys for T. grandiflora were completed on an additional 445 ha in the San Juan National Forest, but no additional occurrences of the taxon were found (Gildar personal communication 2006). This occurrence in Region 2 is in a *Pinus ponderosa* (ponderosa pine) - *Quercus gambelii* (Gambel oak) community, where the pines are less than 80 years old (Stewart personal communication 2005). *Triteleia grandiflora* plants are found in patches in open to partially shaded areas. At this occurrence, the total tree canopy cover is approximately 30 percent, shrub canopy cover is approximately 30 percent, forb canopy cover is approximately 40 percent, grass and grass-like plants cover is approximately 25 percent, moss and lichen cover is approximately 3 percent, and bare ground is approximately 10 percent (Stewart 1998).

The data in the literature, associated with herbarium specimens, or at the state Natural Heritage Programs are insufficient to determine accurately long-term population trends for *Triteleia grandiflora*.

Triteleia grandiflora is a perennial species. Plants are iteroparous, flowering in multiple years before they die. They reproduce vegetatively through division of the corm and proliferation of cormlets, as well as by seed.

Habitat loss, fragmentation, and degradation caused by human recreation, livestock grazing, resource development (timber and mineral), and invasive non-native plant species are potential threats to the long-term persistence of *Triteleia grandiflora* throughout its range, including Region 2. Soil disturbance from all of these sources is a potential threat to occurrence viability. *Triteleia grandiflora* occurrences are also vulnerable to the direct effects of herbivory, especially in areas where pressures from livestock grazing may be in addition to those from wildlife. If

T. grandiflora relies on cross-pollination to produce seed, then a change in the assemblage of pollinator species or a decline in pollinator abundance is a potential threat. The role of fire in the life history of *T. grandiflora* is unknown. Although the species may occur in forested areas, it is typically found in areas with low or no tree canopy. Past fire suppression policies may have reduced the amount of *T. grandiflora* habitat available. Natural or prescribed fires that burn with high intensity may kill the buried corms and are potential threats to occurrence viability. Rangewide, threats from habitat loss and degradation are likely to be more significant in the near future as the human population increases. As for all species, environmental stochasticity poses potential threats to *T. grandiflora*. Direct and indirect consequences of global climate change (e.g., extended periods of drought and periodic increases in rodent populations above the evolutionary average) may negatively affect the taxon. Elements of genetic and demographic stochasticities are also potential threats, especially to small and isolated occurrences. *Triteleia grandiflora* corms can be transplanted, so an occurrence may be translocated if destruction of the occurrence site is unavoidable. However, translocation in itself involves threats to the plants being moved. Urbanization also leads to habitat loss, fragmentation, and degradation, and has been and continues to be a threat to some occurrences outside of Region 2. The current level of threats to the occurrence on National Forest System land in Region 2 does not appear to be substantially impacting overall population viability.

Utricularia minor (from Neid, S.L. 2006, May 15).

Utricularia minor occurs on the Routt, San Juan, and Grand Mesa national forests. On the San Juan National Forest, *U. minor* occurs in a small creek that is the outflow from a lake. The creek winds through an alkaline wetland with *C. viridula*

Utricularia minor is an affixed (as opposed to free-floating) aquatic species that grows in a variety of low-energy aquatic environments. It grows in shallow water (up to approximately 12 inches deep) with a penetrable substrate. Individuals tend to grow in places like inundated mudflats or areas with emergent vegetation. Certain wetland habitats of *Utricularia minor* are categorized as peatlands; these include bogs, poor fens, and extremely rich fens**.** In Region 2, *Utricularia minor* is generally associated with two different types of wetland systems. It is associated with montane fen ecological systems (Rondeau 2001) and in small localized seeps at higher elevations in Colorado and Wyoming, whereas it is associated with freshwater marsh systems at lower elevations and in the Plains states. These systems correspond to the Rocky Mountain Subalpine-Montane Fen and North American Arid West Emergent Marsh ecological systems of NatureServe (2003), respectively.

There is no information on trends within individual populations of *Utricularia minor* and little or no information about trends for the species as a whole throughout its global range.

Its primary mode of reproduction is presumably vegetative although its sexual reproductive features are largely unstudied.

Direct threats to *Utricularia minor* are hydrologic impacts, especially degradation of water quality and hydrologic alteration, habitat loss, and invasive species. Indirect threats include land use practices that impact water quality and habitat integrity. *Utricularia minor* is sensitive to habitat perturbations, both on local and landscape scales. Further, its primary habitat, peatlands, is sensitive to environmental change, restricted in distribution and abundance, and essentially beyond restoration in the face of certain types of habitat degradation. Every effort should be made to prevent the degradation of the quality and quantity of water reaching habitat of *U. minor*.

Direct and Indirect Impacts to all Sensitive Plant Species for All Alternatives

Potential effects to the sensitive plant species associated with SJPL could occur in the future for all alternatives when specific projects are identified and implemented. Effects assume that direction and design criteria in the land management plan will be followed and implemented. Design criteria are environmental protection measures that will be applied at the project level to protect resources.

Management activities with the greatest potential to affect sensitive plant species on SJPL are those that involve active management and the ground disturbance or vegetation removal associated with it including oil and gas development, livestock grazing, timber harvest, mechanical fuels treatments, fire management, recreation development, off-road-vehicle use, utility corridors, road construction and maintenance, invasive species control (herbicides), and solid minerals development. Most lands and their associated vegetation types and plant species will be unaffected by active management since it won't occur on them. Active management could affect sensitive plant species on SJPL through habitat modification (including changes to soils and litter) by direct contact

resulting in injury or mortality of individual plants, and through the establishment of invasive plant species that can compete with these species for habitat resources, but since sensitive plants and their habitat will be surveyed for and avoided in most cases they are likely to experience no effects or only negligible effects that will not result in a major change in their abundance or distribution. In the case of livestock grazing, the potential threat for animals to eat or trample sensitive plants exists, but most of the sensitive plants on SJPL occur in places that are inaccessible to livestock, and for the ones that are accessible there is no specific information to suggest that livestock will have major adverse effects to any sensitive plant species on SJPL.

The implementation of the alternatives could also have some beneficial effects to the sensitive plant species described above. These include the use of fire, both wildland fire use and human ignited, that could benefit those species who are adapted to fire and may even need it for their long-term survival. The invasive species program could also benefit sensitive species by eliminating invasive species and preventing the introduction and spread of them, as invasive plant species compete with sensitive plant species for space, water, and nutrients.

The potential for adverse effects to sensitive plant species from management could occur under all of the alternatives. Since Alternative D proposes the most active management, it has the greatest potential to affect sensitive plant species as described above, compared to the other alternatives. Alternative A has the next highest potential to adversely affect sensitive plant species since it proposes the 2nd most active management, followed by Alternative B. Alternative C has the least potential to adversely affect sensitive plant species as described above, since it proposes the least active management. The beneficial effects to sensitive plant species would be the same for all alternatives.

Cumulative Impacts to all Sensitive Plant Species for All Alternatives

Past management activities on SJPL had no or only negligible effects on sensitive plant species as far as we know because most of these species occur in places where active management did not occur and, in the case of places where active management did occur, these species and their habitat were avoided from these activities. In the case of livestock grazing, there is no information to suggest that it caused adverse effects to any sensitive plant species on SJPL. Foreseeable future management activities on SJPL are likely to have no or only negligible effects on sensitive plant species since these species and their habitats will be avoided in most cases. In the case of livestock grazing, most of the sensitive plants on SJPL occur in places that are inaccessible to livestock, and for the ones that are accessible there is no specific information to suggest that livestock will have major adverse effects to any sensitive plant species on SJPL.

The attainment of desired conditions and the implementation of design criteria described in the land management plan will help to minimize potential effects to sensitive species associated with all management activities, and will help to maintain sustainable ecological conditions and existing habitat for sensitive species.

Determinations for Sensitive Plant Species

It is my determination that implementation of any of the alternatives for this project, as described above, may adversely impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing for any of the sensitive plant species known to occur or likely to occur on SJPL as described above. These species include *Astragalus missouriensis var. humistratus, Astragalus proximus, Calochortus flexuosus, Cypripedium parviflorum*, *Draba smithii*, *Epipactis gigantea, Eriophorum altaicum* var. *neogaeum, Eriophorum chamissonis, Eriophorum gracile, Lesquerella pruinosa, Machaeranthera coloradoensis, Parnassia kotzebuei, Salix candida, Astragalus naturitensis, Erigeron kachinensis, Ipomopsis polyantha, Lesquerella pruinosa, Mimulus eastwoodiae, Pediomelum aromaticum, Carex viridula, Cryptogramma stelleri, Gilia sedifolia, Ipomopsis polyantha, Carex diandra, Salix arizonica*, and *Salix serissima.*

This determination is based on the recognition of known occurrences and/or suitable habitat for all the sensitive plant species within the SJPL, and the possibility that these species could occur in future project areas and be affected by the actions associated with those projects. It also takes into account that site-specific pre-disturbance plant surveys will be implemented on SJPL that contain potential habitat for these species, and if any sensitive plant species are found avoidance measures will be implemented unless the management action could improve habitat conditions for sensitive plant species without adversely affecting the viability of the affected sensitive plant species populations.

References and Literature Cited – Grouped by Animals, Fish, Plants

Animals

Abele, S. C., V. A. Saab, and E. O. Garton. 2004. Lewis's woodpecker (Melanerpes lewis): a technical conservation assessment. USDA Forest Service Rocky Mountain Region.

Adams, R. A. 2003. Bats of the Rocky Mojntain west: natural history, ecology, and conservation. University Press of Colorado, Boulder, CO. 289 pp.

Allen, A. W. 1983. Habitat suitability index models: Southern red-backed vole (Western United States). U.S.D.I. Fish and Wildlife Service. FWS/OBS-82/10.42. 14 pp.

Altman, B. 1997. Olive-sided flycatcher in western North America: status review. Unpublished report. U.S.D.I Fish and Wildlife Service, Portland, Oregon. 59 pp.

Altman, B. 1999a. Nest success and habitat relationships of the Olive-sided Flycatcher in managed forests of northwestern Oregon. Unpublished report submitted to U.S. Fish and Wildlife Service, Oregon State Office, Portland, OR.

Altman, B., and R. Sallabanks. 2000. Olive-sided flycatcher *Contopus cooperi. In* the birds of North America, No. 502. A. Poole and F. Gill, eds. Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

American Ornithologists' Union. 1983. Check-list of North American Birds, 6th edition. Allen Press, Inc., Lawrence, Kansas. 877 pp.

Andrews R. and R. Righter. 1992. Colorado birds: A reference to their distribution and habitat. Denver Museum of Life History. Denver, Co. 442 p.

Arizona Game and Fish Department. 1993. Bats of Arizona. Arizona Wildlife Views, Special Heritage Edition, Volume 36.. 36 pp.

Arizona Game and Fish Department. 2005. *Speyeria nokomis nokomis*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, Arizona. 5 pp.

Armstrong D.M, R.A. Adams, and J. Freeman. 1994. Distribution and ecology of bats of Colorado. Natural History Inventory of Colorado No. 15. University of Colorado Museum. Boulder, CO. 83 pp.

Bailey, A.M., and R.J. Niedrach. 1965. Black swift *(Cypseloides niger borealis)*. Pages 455-463 *in* the birds of Colorado. Denver Museum of Natural History, Denver, Colorado.

Banci, V. 1994. Wolverine. Pages 99-127 i*n* L. F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, eds. The scientific basis for conserving forest carnivores, American marten, fisher, lynx and wolverine in the United States. USDA Forest Service General Technical Report GTR-RM-254.

Banfield, A. W. F. 1947. A study of the winter feeding habits of the Short-eared Owl in the Toronto region. Canadian Journal of Research 25:45-65.

Barrett, N. M. 1998a. Sharp-tailed grouse. Pages 142-143 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Beecham, J.J., C.P. Collins, et al. (2007). Rocky Mountain Bighorn Sheep (Ovis Canadensis): A Technical Conservation Assessment. //www.fs.fed.us/r2/projects/scp/assessments/ rockymountainbighornsheep.pdf.

Behnke, R.J. and Benson, D.E. 1983. Endangered and Threatened Fishes of the Upper Colorado River Basin. Ext. Serv. Bull. 503A, Colorado State University, Fort Collins, Colorado. 38pp

Beidleman, C.A. (facilitator). 2000. Colorado Partners In Flight Land Bird Conservation Plan. 320 p.

Belsky, A.J., A. Matzke, and S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. Journal of Soil and Water Conservation. First Quarter 1999: 419-431.

Bennett, L.A. 1984. Marten ecology and habitat management in the Central Rocky Mountains: Problem analysis. Department of Fishery and Wildlife Biology, Colorado State University and Colorado Division of Wildlife.

Bent, A. C. 1938. Life histories of North American birds of prey. Part 2. U.S. National Museum Bulletin 170. 482 pp.

Bildstein, K. L., and J. B. Gollop. 1988. Northern harrier. Pages 251-303 *in* R. S. Palmer, ed. Handbook of North American birds, vol. 4, diurnal raptors. Yale University Press, New Haven, Connecticut.

Boal, C.W. and R.W. Mannan. 1994. Northern goshawk diets in ponderosa pine forests on the Kaibab Plateau. Studies in Avian Biology 16:97-102.

Bock, C. E. 1970. The ecology and behavior of the Lewis' Woodpecker (Asyndesmus Lewis). University of California Publ. Zool. 94:1-100.

Bock, C. E., V. A. Saab, T. D, Rich, and D. S. Dobkin. 1993. Effects of livestock grazing on Neotropical migratory landbirds in western North America. Pages 296-309 in D. M. finch and P. W. Stangel, eds. Status andmanagement of Neotropical migratory birds. USDA Forest Service General Technical Report RM-229.

Bock, C.E and J.H. Bock. 1974. On the geographical ecology and evolution of the three-toed woodpeckers, *Picoides tridactylus* and *P. arcticus*. American Midland Naturalist 92:397-406.

Bosakowski, T. 1986. Short-eared owl winter roosting strategies. American Birds 40(2):237-240.

Bowyer, R. T., J. W. Testa, and J. B. Faro. 1995. Habitat selection and home ranges of river otters in a marine environment: effects of the Exxon Valdez oil spill. Journal of Mammalogy 76:1-11.

Boyle, S. 1998. Black swift. Pages 236-237 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Boyle, S. 1998. Short-eared Owl. Pages 226-227 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Bradley P. and M. Ports, 2003. Fringed Myotis (Myotis thysanoides). in Colorado Bat Conservation Plan. Colorado Committee of the working bat group, 107 pp.

Braun, C. E. 1971. Habitat requirements of Colorado white-tailed ptarmigan. Proceedings of the Western Association of Game and Fish Commissioners. 51:284-292.

Braun, C.E. 1993. White-tailed ptarmigan habitat investigations in northeast Oregon. Oregon Birds 19(3):72-73.

Braun, C. E., K. Martin, and L. A. Robb. 1993. White-tailed Ptarmigan (*Lagopus leucurus*). *In* The birds of North America, No. 68 (A. Poole and F. Gill, editors). The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.

Braun, C. E., M. F. Baker, R. L. Eng, J. S. Gashwiler, and M. H. Schroeder. 1976. Conservation committee report on effects of alteration of sagebrush communities on the associated avifauna. Wilson Bulletin 88:165-171.

Braun, C.E., J.H. Fuller, Y.B. Linhart, and C.D. Marti. 1996. Northern goshawk and forest management in the southwestern United States. Wildlife Society Technical Review 96-2.

Brown, C.R. 1997. Purple Martin *(Progne subis)*. *In:* The Birds of North America, No. 287 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

Buckhouse, J.C., and G.F. Gifford. 1976. Water quality implications of cattle grazing on a semi-arid watershed in southeastern Utah. Journal of Range Management 29: 109-113.

Buskirk, S. W., and L. F. Ruggerio. 1994. American marten. Pages 7-37 i*n* L. F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, eds. The scientific basis for conserving forest carnivores, American marten, fisher, lynx and wolverine in the United States. USDA Forest Service General Technical Report GTR-RM-254.

Campbell, J.B. 1970. Life History Of Bufo Boreas Boreas in the Colorado Front Range. Ph.D. Dissertation. Univ. Of Colorado.

Carey, C., N. Cohen, and L. Rollins-Smith. 1999. Amphibian declines: An immunological perspective. Developmental and Comparative Immunology 23: 459-472.

Carroll, J. R. 1988. Status and breeding ecology of the Black Tern (*Chlidonias niger*) in New York. Kingbird 38(3): 159-172.

Carter, M. F. 1998a. Loggerhead shrike. Pages 300-301 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Carter, M. F. 1998b. Northern harrier. Pages 110-111 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Chantler and Driessens. 1995. Swifts: - a guide to the swifts and treeswifts of the world. Russel Friedman Books.

Clark, R.J. 1975. A field study of the short-eared owl (*Asio flammeus*) Pontoppidan in North America. Wildife Monographs 47:1-67.

Colorado Partners in Flight. 2000. Colorado Land Bird Conservation Plan.

Copeland, J. and H. Hudak. 1995. Conservation strategy for wolverine in Idaho (draft). ID. Dept. of Fish and Game and others. 9 pp.

Corn, P.S., and L.J. Livo. 1989. Leopard frog and wood frog reproduction in Colorado and Wyoming. Northwestern Naturalist 70: 1-9.

Craig, G. 1986. Peregrine falcon. Pages 807-824 *in* R.L. DiSilvestro, ed. Audubon Wildlife Report 1986. National Audubon Society, New York, New York.

Cramp, S., editor. 1985. Handbook of the birds of Europe, the Middle East, and North Africa. The birds of the western Palearctic. Vol. 4, terns to woodpeckers. Oxford University Press, Oxford, England.Cully, J. F., Jr., and E. S. Williams. 2001.

Crocker-Bedford, D. C. 1998. The value of demographic and habitat studies in determining the status of northern goshawks (*Accipiter gentilis atricapillus*) with special reference to Crocker-Bedford (1990) and Kennedy (1997). Journal of Raptor Research 32:329-336.

Dawson, W.R., C. Carey, C.S. Adkisson, and R.D. Ohmart. 1979. Responses of Brewer's and chipping sparrow to water restriction. Physiological Zoology 52:529-541.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, A. L. Zimmerman, and B. R. Euliss. 2001a. Effects of management practices on grassland birds: American bittern. Northern Prairie Wildlife Research Center, Jamestown, ND.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, M. P. Nenneman, A. L. Zimmerman, and B. R. Euliss. 2001b. Effects of management practices on grassland birds: loggerhead shrike. Northern Prairie Wildlife Research Center, Jamestown, ND. 19 pp.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, A. L. Zimmerman, and B. R. Euliss. 2002. Effects of management practices on grassland birds: northern harrier. Northern Prairie Wildlife Research Center, Jamestown, ND. 15 pp.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, A. L. Zimmerman, and B. R. Euliss. 2003. Effects of management practices on grassland birds: ferruginous hawk. Northern Prairie Wildlife Research Center, Jamestown, ND. 23 pp.

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

Delehanty, David J. and W. Daniel Svedarsky. 1993. Black Tern Colonization of a Restored Prairie Wetland in Northwestern Minnesota. Prairie Nat.; 25(3):213-218. WR 243.

Durango Bird Club. 1992. A checklist of the birds of southwestern Colorado. Durango Bird Club, Colorado Division of Wildlife and the U.S.D.A. Forest Service San Juan National Forest. 3 pp.

Ehrlich, P. R., D. S. Dobkin, and D. Wheye. 1992. Birds in Jeopardy: the Imperiled and Extinct Birds of the United States and Canada, Including Hawaii and Puerto Rico. Stanford University Press, Stanford, California. 259 pp.

Enderson, J.H. and J. Craig. 1974. Status of the Peregrine Falcon in the Rocky Mountains in 1973. Auk 91: 727-736.

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

Fitzgerald, J. P., C. A. Meaney, and D. M. Armstrong. 1994 [1995]. Mammals of Colorado. Denver Museum of Natural History and University Press of Colorado, Denver, Coloraod. 467 pp.

Freeman, P.W. (1984). Functional cranial analysis of large animalivorous bats (Microchiroptera). Biol. J. Linn. Soc. 21: 387-408.

FWS (U.S. Fish and Wildlife Service). 2002. Candidate and listing priority assignment form. Internet source: https://ecos.fws.gov/tess_public/candforms_pdf/r6/bufborbo.pdf.

FWS (U.S. Fish and Wildlife Service). 1994. Endangered and threatened wildlife and plants; animal candidate review for listing as endangered or threatened species; proposed rule. 50 CFR Part 17. Tuesday, November 15, 1994. Federal Register. 59(219): 58982-59028.

Geist, Valerius. 1971. Mountain sheep, a study in behavior and evolution. University of Chicago Press, Chicago and London. 140 pp.

Gibbs J.P., Reid F.A., Melvin S. 1992. Least Bittern. Pp 1–12 *In* Poole A., Stettenheim P., Gill F. (Eds.) *The Birds of North America, Number 17*. The Academy of Natural Sciences. Philadelphia, PA, and The American Ornithologists' Union, Washington, DC

Giesen, K. M. 1997. Seasonal movements, home ranges, and habitat use by Columbian sharp-tailed grouse in Colorado. Special report number 72, Colorado Division of Wildlife. DOW-R-S-72-97.16 pp.

Giesen, K. M., and C. E. Braun. 1992. Winter home range and habitat characteristics of White-tailed Ptarmigan in Colorado. Journal of Wildlife Management 57:72-77.

Giesen, K. M., and J. W. Connelly. 1993. guidelines for management of Columbian sharp-tailed grouse. Wildlife Society Bulletin 21:325-333.

Gunnison Sage-Grouse Range-wide Steering Committee. USDA Forest Service 2005. Gunnison Sage-Grouse Range-wide Conservation Plan. Colorado Division of Wildlife, Denver, CO.

Hammerson, G.A. 1999. Amphibians and Reptiles in Colorado. 2nd ed. University Press of Colorado, Niwot, CO. 484pp.

Hamerstrom, F. 1986. Harrier, hawk of the marshes: the hawk that is ruled by a mouse. Smithsonian Institution Press, Washington, D.C. 171 pp.

Hamerstrom, F., F. N. Hamerstrom, and C. J. Burke. 1985. Effects of voles on mating systems in a central Wisconsin population of harriers. Wilson Bulletin 97:332-346.

Hands, H. M., R. D. Drobney, and M. R. Ryan. 1989. Status of the northern harrier in the northcentral United States. U.S. Fish and Wildlife Service, Twin Cities, Minnesota. 18 pp.

Haug, E. A. 1985. Observations on the breeding ecology of Burrowing Owls in Saskatchewan. M.S. thesis. University of Saskatchewan, Saskatoon, Saskatchewan. 89 pages.

Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. Burrowing owl (*Speotyto cunicularia*). *In* The Birds of North America, no. 61 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

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

Hayward, G.D. and J. Verner. 1994. Flammulated, boreal, and great gray owls in the United States: a technical conservation assessment. USDA Forest Service General Technical Report RM-253. Fort Collins, Colorado.. 214 pp.

Hayward, G.D., P.H. Hayward and E.O. Garton. 1993. Ecology of Boreal Owls in the northern Rocky Mountains, USA. Wildlife Monographs 124. 59 pp.

Hayward, P. H. and G. D. Hayward. 1989. Lone rangers of the Rockies. Natural History Magazine, November 1989:79-85.

Hayward, G.D.; Hayward, P.H. 1993. Boreal Owl. *In*: Poole, A.; Gill, F ., eds. The birds of North America. Philadelphia, P A: The Academy of Natural Sciences and Washington, DC: The American Ornithologists'Union.

Heinemeyer, K.S., B.C. Aber, and D.F. Doak. 2001. Aerial survey for wolverine presence and potential winter recreation impacts to predicted wolverine denning habitats in the southwestern Yellowstone Ecosystem. Unpulb. Report. Univ. of Calif., Santa Cruz Department of Environmental Studies. http://gis.ucsc.edu/Projects/gulo@000.htm.

Heinemeyer, Kim; Copeland, Jeffrey P. 1999. Wolverine Denning Habitat and Surveys on the Targhee National Forest, 1998-1999 Annual Report.

Unpublished Report. GIS/ISC Laboratory, Dept. of Environmental Studies, University of California, Santa Cruz 95064. 13 p.

Hennessy, S. P. 1978. Ecological relationships of *Accipiters* in northern Utah with special emphasis on the effects of human disturbance. M.S. Thesis, Utah State University, Logan Utah. 66 pp.

Hickey, J.J. 1969. Peregrine falcon populations: their biology and decline. University of Wisconsin Press, Madison, Wisconsin. 596 pp.

Hoffman, R.W. (2006, April 4). 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

Hoffman, R. W. 2001. Columbian sharp-tailed grouse conservation plan, Routt, Moffat, and Rio Glanco Counties, northwest Colorado. Unpublished Report, Northwest Colorado Columbian Sharp-tailed Grouse Work Group. 84 pp.

Hoffman, R. W., and K. M. Giesen. 1983. Demography of an introduced population of white-tailed ptarmigan. Canadian Journal of Zoology 61:1758-1764.

Holland, T. and C. Schultz. 1993. Grand Mesa, Uncompahgre and Gunnison National Forests: 1993 boreal owl nest box project summary of results. Unpublished report. USDA Forest Service, Delta, Colorado.

Holland, T. and C. Schultz. 1994. Grand Mesa, Uncompahgre and Gunnison National Forests: 1994 boreal owl nest box project summary of results. Unpublished report. USDA Forest Service, Delta, Colorado.

Holmes, A.L. 2007. Short-term effects of a prescribed burn on songbirds and vegetation in mountain big sagebrush. Western North American Naturalist 67(2): 292-298.

Holt, D.W. 1992. *Short-eared Owl (Asio flammeus) nest sites, reproduction, and territory sizes in coastal Massachusetts.* Can. Field-Nat. 106: 352-356.

Hornocker, M.G., and H.S. Hash. 1981. Ecology of the wolverine in northwestern Montana. Canadian Journal of Zoology 59: 1286-1301.

Hoyt, J.S. and S.J. Hannon. 2002. Habitat associations of black-backed and three-toed woodpeckers in the boreal forest of Alberta. Canadian Journal of Forest Resources 32: 1881-1888.

Hubbard, J.P. 1978. Revised checklist of the birds of New Mexico. New Mexico Ornithological Society Publication No. 6, Silver City, New Mexico.

Hunter, W. F., and P. H. Baldwin. 1962. Nesting of the Black Swift in Montana. Wilson Bulletin 74:409-416.

Hutto, R.L. 1995. Composition of bird communities following stand-replacement fires in northern Rocky Mountain forests. Conserv. Biol. 9: 1041-1058.

Inman, R.M., K.H. Inman, R.R. Wigglesworth, and J.J. Beechman. 2003. Greater Yellowstone Wolverine Program. Includes Annual Report July 1, 2000 – June 30, 2001, and Current Year Progress Reports (through July 19, 2002). http://www.wolverine foundation.org/research/gywpo2.htm.

Johnsgard, P.A. 1990. Hawks, eagles, and falcons of North America. Smithsonian Institution Press, Washington D.C.

Jones, M. S. 2003. Boreal toad research in Colorado. Colorado Division of Wildlife webpage. www.wildlife.state.co.us/aquatic/boreal/toadtext.asp.

Breeding Birds Atlas. Denver Museum of Natural History and Colorado Division of Wildlife, Denver, CO. 636 p.

Jones, S. L. 1998b. Olive-sided flycatcher. Pages 268-269 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Jones, Stephen R. 1998a. Burrowing owl. Pages 220-221 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Joy, S.M. 1990. Feeding ecology of sharp-shinned hawks and nest-site characteristics of Accipiters in Colorado. M.S. Thesis. ColoradoState University.

Kauffman, J., and W.C. Krueger. 1984. Livestock impacts on riparian ecosystems and streamside management implications: a review. Journal of Range Management 37: 430-437.

Keinath, D. and J. Bennett. 2000. Distribution and status of the boreal toad *(Bufo boreas boreas)* in Wyoming. *Prepared for:* USFWS, Wyoming Field Office. Internet source: http://uwadmnweb.uwyo.edu/wyndd/PDF_files/pdf_keinath/Boreal%20Toad%20Status.pdf.

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

Kingery, H.E. 1998. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife. 636 p.

Knick, S.L., D.S. Dobkin, J.T. Rotenberry, M.A. Schroeder, W.M. Vander Haegen, and C. van Riper III. 2003. Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. Condor 105:611-634.

Knorr, O. A. 1961. The geographical and ecological distribution of the black swift in Colorado. Wilson Bulletin 73:155-170.

Knorr, O.A., and A. Lang. 1950. First breeding record of black swift, *Nephoecetes n. borealis* in Colorado. Auk 67:516.

Knorr. O. A. 1993. Black Swift (*Cypseloides niger*) nesting site characteristics: some new insights. Avocetta 17:139-140.

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

Krueper, D.J. 1992. Effects of land use practices on western riparian systems. Pp. 321-330 *in* D.M. Finch and P.W. Stangel, eds.; Status and Management of Neotropical Migratory Birds. USDA Forest Service General Technical Report RM-229. Fort Collins, CO. 422 p.

Kuenning, R. R. 1998. Lewis's woodpecker. Pages 248-249 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Kyle, C.J. and C. Strobeck. 2002. Connectivity of peripheral and core populations of North American wolverines. Journal of Mammalogy 83(4): 1141-1150.

Leonard, D.L, Jr. 2001. Three-toed woodpecker *(Picoides tridactylus) In:* The Birds of North America, No. 588 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Leukering, T., M.F. Carter, A. Panjabi, D. Faulkner and R. Levad. 2000. Monitoring Colorado's birds: the plan for count-based monitoring. Colorado Bird Observatory. Brighton, Co. 22 p.

Leukering, T., D. Faulkner, R. Levad and A. Panjabi. 2001. Monitoring Colorado's Birds: The year 2000 final report. Rocky Mtn. Bird Observatory, Brighton, CO. 50 p.

Leukering, T., D. Faulkner, R. Levad, C. L. Wood, and J. Beason. 2002. Monitoring Colorado's Birds: The year 2001 field season. Rocky Mtn. Bird Observatory, Brighton, CO. 20 pp. + append.

Levad, R. 1998. Purple martin. Pages 334-335 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Linder, K.A. 1994. Habitat utilization and behavior of nesting Lewis' woodpeckers in the Laramie range southeast Wyoming, M.S. thesis, University of Wyoming, Laramie, Wyoming.

Livo, L. 2002. Life history of the boreal toad. U.S. Geological Survey web page. http://www.mesc.nbs.gov/borealtoad/tadpoles.htm

Loeffler, C. (ed.). 2001. Conservation plan and agreement for the management and recovery of the southern Rocky Mountain population of the boreal toad (*Bufo boreas boreas*), Boreal Toad Recovery Team. 76 pp. + appendices.

Martin, S.K. 1994. Feedinf ecology of American martens and fishers. Pp. 297-315. in Martens, sables, and fischers : biology and conservation. Cornell University Press, Ithica, NY. 484 pp.

McCallum, D.A. 1994. Flammulated Owl. *In* the birds of North America, No. 93. A. Poole and F. Gill, Eds. Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

McCallum, D.A., P. Morgan, J. Verner and G.D. Hayward. 1994. Conservation status of Flammulated Owl in the United States. Pages 74-78 *in* forest owl conservation assessment: flammulated, boreal and great gray owls in the United States,G. D. Hayward and J. Verner, eds. USDA Forest Service General Technical Report RM-253, Fort Collins Colorado.

McGarigal, K., W.H. Romme, M. Crist, and E. Roworth. 2001. Cumulative effects of roads and logging on landscape structure in the San Juan Mountains, Colorado (USA). Landscape Ecology 16: 327-349.

Meints, D. R., J. W. Connelly, K. P. Reese, A. R. Sands, and T. P. Hemker. 1992. Habitat suitability index procedure for Columbian sharp-tailed grouse. Station Bulletin 55 of the Idaho Forest, Wildlife and Range Experiment Station, College of Forestry, Wildlife and Range Sciences, University Of Idaho, Moscow, Idaho. 27 pp.

Merrell D. J., and C. F. Rodell. 1968. Seasonal selection in the leopard frog *Rana pipiens*. Evolution. 22:284–288.

National Geographic Society (NGS). 1983. Field guide to the birds of North America. National Geographic Society, Washington, DC.

NatureServe. 2005. NatureServe Explorer: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: January 13, 2005).

Naugle, D.E. 2004. Black Tern (Chlidonias niger surinamensis): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/blacktern.pdf [Accessed Nov 2004].

Navo, K. W., 2003. Big free-tailed bat (Nyctinops macrotis). in Colorado Bat Conservation Plan. Colorado Committee of the working bat group, 107 pp.

NDIS Natural Diversity Information Source. 2005. Colorado Division of Wildlife: An online web application. Denver, Colorado.

Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, ID. 332 p.

O'Farrell, M. J., and E. H. Studier. 1980. *Myotis thysanodes*. Mammalian Species 137:1-5.

Oregon State University (OSU). 2001. The Oregon birds forum - birds of Oregon: a general reference.

Pagel, J.E. 1995. American peregrine falcon status of species, Columbia River Basin. Unpublished report. USDA Forest Service, Pacific Northwest Region. 21 pp.

Paige, C., and S.A. Ritter. 1999. Birds in a sagebrush sea: managing sagebrush habitats for bird communities. Partners in Flight Western Working Group, Boise, Idaho.

Paige, C., and S.A. Ritter. 1999. Birds in a sagebrush sea: managing sagebrush habitats for bird communities. Partners in Flight Western Working Group, Boise, Idaho.

Pakkala, T., I. Hanski, and E. Tomppo. 2002. Spatial ecology of the three-toed woodpecker in managed forest landscapes. Silva Fennica 36(1): 279-288.

Palmer, D.A. 1986. Habitat selection, movements and activity of boreal and saw-whet owls. Dept. of Fishery and Wildlife Biology, Colorado State University, Fort Collins, Colorado. M. S. Thesis. 30 pp.

Pasitschniak-Arts, M., and S. Larivière. 1995. *Gulo gulo*. American Society of Mammalogy, Mammalian species No. 499. 10 pp.

Peterson, R. T. 1990. A Field Guide to Western Birds, 3rd ed. Houghton Mifflin Company. New York, New York. 432 pp.

Plumpton, D.L. 1992. Aspects of nest site selection and habitat use by burrowing owls at the Rocky Mountain Arsenal, Colorado. M.S. thesis, Texas Tech University, Lubbock, Texas.

Preston, C. R. 1998. Ferruginous hawk. Pages 122-123 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Price, J., S. Droege, and A. Price. 1995. The summer atlas of North American birds. Academic Press, London.

Raphael, M.F., and M. White. 1984. Use of snags by cavity-nesting birds in the Sierra Nevada. Wildlife Monographs. 86:1-66.

Reynolds, R. T, R.T., M. Graham, H. Rieser, , 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. USDA Forest Service General Technical Report RM-217.

Reynolds, R.T. and B.D. Linkhart. 1987. Fidelity to territory and mate in Flammulated Owls. Pages 239-248 *in* Biology and conservation of northern forest owls, proceedings of a symposium, R.W. Nero, R.J. Clark, R.J. Knapton, and R. H. Hamre, editors. USDA Forest Service General Technical Report RM-142.

Reynolds, R.T. and B.D. Linkhart. 1992. Flammulated Owls in ponderosa pine: evidence of preference for old-growth. Pages 166-169 *in* old-growth forests in the Southwest and Rocky Mountain regions, proceedings of a workshop. USDA Forest Service General Technical Report RM-213.

Reynolds, R.T., D.P. Kane, and D.M. Finch. 1991. Tree-nesting habitat of Purple Martins in western Colorado. Unpublished report.

Rogers G. E. 1969. The sharp-tailed grouse in Colorado. State of Colorado, Division of Game, Fish and Parks, Technical Publication Number 23. GFP-R-T-23. 94 pp.

Romme, W.H., M. L. Floyd, D. Hanna, H. Grissino-Mayer, and D. Green. 1997. Landscape condition analysis for the South Central Highlands Section of southwestern Colorado and northwestern New Mexico: ponderosa pine. Draft Final Report.

Rotenberry, J.T., and S.T. Knick. 1999. Multiscale habitat associations of the Sage sparrow: implications for conservation biology. Studies in Avian Biology 19:95-103.

Rowland, M.M., M.J. Wisdom, D.H. Johnson, B.C. Wales, J.P. Copeland, and F.B. Edelmann. 2003. Evaluation of landscape models for wolverines in the Interior Northwest, United States of America. Journal of Mammalogy 84(1): 92-105.

Ryder, R.A. 1998. Boreal owl. Pages 228-229 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Ryder, R.A., and D.E. Manry. 1994. White-faced ibis (*Plegadis chihi*). A. Poole and F. Gill, editors. *In* The Birds of North America, No. 130. The Academy of Natural Sciences, Philadelphia, Pennsylvania.

Ryder, R.A., D.A. Palmer, and J.J. Rawinski. 1987. Distribution and status of the boreal owl in Colorado. Pages 169-174 *in* biology and conservation of northern forest owls, symposium proceedings, R.W. Nero, C.R. Knapton, R.J. Hamre, eds. USDA Forest Service General Technical Report RM-142, Fort Collins, Colorado.

Saab, V. A., and J. S. Marks. 1992. Summer habitat use by Columbian sharp-tailed grouse in western Idaho. Great Basin Nat. 52:166-173.

Sares, M.A., D.L. Gusey, and J.T. Newbert. (2005). Abandoned mines and naturally occurring acid rock drainage on National Forest System Lands in Colorado. Available on the Colorado Geological Survey website. http://geosurvey.state.co.us/Default.aspx?tabid=138. Accessed: 27 September 2005.

Sauer, J. R., J. E. Hines, and J. Fallon. 2004. The North American Breeding Bird Survey, Results and Analysis 1966 - 2003. Version 2004.1. USGS Patuxent Wildlife Research Center, Laurel, MD. Available on the world wide web at: *http://www.mbr-pwrc.usgs.gov/bbs/.*

Schenk, M., and D. Powers. 2006. Guanella Pass Visitor Use and White-Tailed Ptarmigan Survey. 24 p.

Schultz, C. 1996a. Boreal owl surveys on the Mancos-Dolores Ranger District, San Juan National Forest: autumn 1996. Unpublished report on file at San Juan Public Lands Center, Durango, Colorado. 15 pp.

Schultz, C. 1996b. Lewis' woodpecker distribution and ecology in Southwestern Colorado. Unpublished report on file at San Juan Public Lands Center, Durango, Colorado. 2 pp.

Sedgwick, J.A. 1987. Avian habitat relationships in pinyon-juniper woodland. Wilson Bulletin 99:413-431.

Seidel, J.; B. Andree; S. Berlinger; K. Buell; G. Byrne; B. Gill; D. Kenvin; and D. Reed. 1998. Draft strategy for the conservation and reestablishment of lynx and wolverine in the Southern Rocky Mountains. Colorado Division of Wildlife, Denver, Colorado. 116 pp.

Shuster, W. Unpublished reports of goshawk surveys in the 1980s on San Juan National Forest. On file at the Supervisor's Office Monte Vista, CO.

Shuster, W.C. 1980. Northern goshawk nest site requirements in the Colorado Rockies. Western Birds 11:89-96.

Slater, G.L. and C. Rock. (2005, September 30). Northern Harrier (*Circus cyaneus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/northernharrier.pdf

Small, A. 1994. California birds: their status and distribution. Ibis Publishing Company, Vista, California.

Smith, A.R. 1996. Atlas of Saskatchewan birds. Nature Sakatchewan Special Publication No. 22 Regina, SK. 456 pp.

Smith, B.E. 2003. Conservation Assessment for the Northern Leopard Frog in the Black Hills National Forest, South Dakota and Wyoming.

Spomer, R. 1987. In sharp decline: the Columbian sharp-tailed grouse. The Nature Conservancy Magazine 37:13-17.

Steenhof, K., L. Bond, K.K. Bates, and L.L. Leppert. 2002. Trends in midwinter eagle counts of bald eagles in the contiguous United States, 1986-2000. Bird Populations 6: 21-32.

Strickland, M.A., C.W. Douglas, M. Novak, and N.P. Hunziger. 1982. Marten Martes americana.Pages 599-612 *in* J.A. Chapman and G.A. Feldhamer, ed. Wild mammals of North America. The John Hopkins University Press, Baltimore, Maryland.

Tate, G. R. 1992. Short-eared owl, *Asio flammeus*. Pages 171-189 *in* migratory nongame birds of management concern in the Northeast, K. J. Schneider and D. M. Pence, eds. USDI Fish and Wildlife Service, Newton Corner, Massachusetts. 400 pp.

Tausch, R.J. 1997. Historic piñon and juniper woodland development. In Ecology and Management of Piñon-Juniper Communities Within the Interior West. Brigham Young University.

Terres, J. K. 1980. The Audubon Society encyclopedia of North American birds. Alfred A. Knopf, New York, New York.

The Nature Conservancy. 2005. Species management abstract, olive-sided flycatcher *(Contopus cooperi)*. Unpublished abstract compiled and edited by The Nature Conservancy, Arlington, Virginia. 11 pp.

Thompson, R.W., T.J. Watts, and J.C. Halfpenny. 1992. Wolverine study in the vicinity of the proposed East Fork Ski Area. Report prepared for the East Fork Joint Venture by Western Ecosystems, Inc. Boulder, CO. 21 p. + maps and tables.

Tobalske, B.W. 1997. Lewis's woodpecker (*Melanerpes lewis). In* A. Poole and F. Gill, eds., the birds of North America, No. 284. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.

Towry, R.K., Jr. 1984. Wildlife habitat requirements. Chapter 3 *in* managing forested lands for wildlife, R.L. Hoover and D.L. Wills, eds. Colorado Division of Wildlife, Denver, Colorado. 459 pp.

Trombulak, S.C., and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14(1): 18-30.

USDA Forest Service. 2004f. Northern Goshawk Species Assessment for the San Juan National Forest. San Juan National Forest. Durango, CO.

USDA Forest Service. 2004g. Olive-sided Flycatcher Species Assessment for the San Juan National Forest. San Juan National Forest. Durango, CO.

USDA Forest Service 2002. Pinyon-Juniper Habitat Assessment: San Juan National Forest. 9 p.

USDA Forest Service 2002. Sagebrush Habitat Assessment: San Juan National Forest. 6 p.

USDA Forest Service 2002. Riparian and Wetland Habitat Assessment: San Juan National Forest. 9 p.

USDA Forest Service 2003. Spruce-fir Habitat Assessment: San Juan National Forest. 18 p.

USDA Forest Service 2003. Mixed-conifer Habitat Assessment: San Juan National Forest. 20 p.

USDA Forest Service 2004. Aspen Habitat Assessment: San Juan National Forest. 16 p.

USDA Forest Service 2004. Ponderosa Pine Habitat Assessment: San Juan National Forest. 12 p.

USDA Forest Service 2004. Mountain Shrublands Habitat Assessment: San Juan National Forest. 10 p.

USDA Forest Service 2005. Bald Eagle Species Assessment: San Juan National Forest. 17 p. + 3 appendices.

USDA Forest Service 2005. Northern River Otter Species Assessment: San Juan National Forest. 14 p.

USDA Forest Service 2006. Columbian Sharp-tailed Grouse Species Assessment: San Juan National Forest. 12 p.

USDA Forest Service 2006. Northern Goshawk Species Assessment: San Juan National Forest. 21 p

USDI Fish and Wildlife Service. 2003. Monitoring Plan for the American Peregrine Falcon, a Species Recovered Under the Endangered Species Act. U.S. Fish and Wildlife Service, Divisions of Endangered Species and Migratory Birds and State Programs, Pacific Region, Portland, OR. 48 p.

USDI Fish and Wildlife Service. 1998. Final Biological Opinion for the TransColorado Gas Tranmission Line Project. 61pp.U.S. Fish and Wildlife Service (unpublished). Habitat Use Characteristics of Fishes in the Upper Colorado River Basin. U.S. Fish and Wildlife Service, Region 6; Denver, Colorado.

U.S. Fish and Wildlife Service. 1998. Status review of the northern goshawk in the forested west. Unpublished report. Office of Technical Support, Forest Resources, Portland Oregon. Available on the world wide web at: *http://www.pacific.fws.gov/news/pdf/gh_sr.pdf.*

USDI (Rocky Mountain/Southwestern Peregrine Falcon Recovery Team). 1977. American Peregrine Falcon Recovery Plan: Rocky Mountain and Southwest Populations. USDI Fish and Wildlife Service. 183 pp.

USDI Fish and Wildlife Service. 1998. Final Biological Opinion for the TransColorado Gas Tranmission Line Project. 61pp.

USDI Fish and Wildlife Service. 1984. American Peregrine Falcon Recovery Plan (Rocky Mountain/Southwest Population). Prepared in cooperation with the American Peregrine Falcon Recovery Team. U.S. Fish and Wildlife Service. Denver, CO. 105 p.

Wai-Ping, V., and M.B. Fenton. 1989. Ecology of the spotted bat (*Euderma maculatum*) roosting and foraging behavior. Journal of Mammalogy 70(3): 617-622.

Welsh, H.H., Jr., and L.M. Oliver. 1998. Stream amphibians as indicators of ecosystem stress: a case study from California's redwoods. Ecological Applications 8: 1118-1132.

Western Working Bat Group. 1998. Ecology, conservation and management of western bat species – bat species accounts. Unpublished document distributed at the Western Bat Working Group Workshop, Reno, Nevada.

Wiens, J.A., and J.T. Rotenberry. 1981. Habitat associations and community structure of birds in shrubsteppe environments. Ecological Monographs 51:21-41.

Wiens, J.A., and J.T. Rotenberry. 1981. Habitat associations and community structure of birds in shrubsteppe environments. Ecological Monographs 51:21-41.

Winn, R. 1998. Flammulated owl. Pages 210-211 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Wisdom, M.J., Holthausen, R.S., B.C. Wales, C.D. Hargis, V.A. Saab, D.C. Lee, W.J. Hann, T.D. Rich, M.M. Rowland, W.J. Murphy and M.R. Eames. 2000. Source habitats for terrestrial vertebrates of focus in the interior Columbia Basin: broad-scale trends and management implications. USDA Forest Service General Techniacl Report PNW-GTR-485.

Wright, J.M. 1997. Preliminary study of olive-sided flycatchers, July 1994-April 1997. Alaska Department of Fish and Game. Final research report. Endangered species conservation fund federal aid studies SE-3-3, 4 and 5. Juneau, Alaska. 34 pp.

Yaeger, M. 1998. American Bittern. Pages 52-53 *in* Colorado breeding bird atlas, H. E. Kingery, ed. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

Yanishevsky, R., and S. Petring-Rupp. 1998. Management of breeding habitat for selected bird species in Colorado. Colorado Division of Wildlife, Denver, Colorado. 791 pp.

Yosef, R. 1996. Loggerhead Shrike (*Lanius ludovicianus*). *In* A. Poole and F. Gill, eds., the birds of North America, No. 231. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C

Fish

American Sportfishing Association. 2006. State and National Economic Impacts of Fishing, Hunting, and Wildlife-Related Recreation on US Forest Service-Managed Lands. Prepared for USDA, Forest Service. 79 pages.

Andreasen, J.K and J.R. Barnes. 1975. Reproductive life history of *Catostomus ardens* and *C. discobolus* in the Weber River, Utah. Copeia 1975(4):645-648.

Behnke, R.J. 1979. Monograph of the native trouts of the genus *Salmo* of western North America. USDA Forest Service, Rocky Mountain Region, Denver, Colorado.

Behnke, R.J. 1992. Native trout of western North America. American Fisheries Society Monograph 6.

Behnke, R.J. and D.E. Benson. 1980. Endangered and threatened fishes of the upper Colorado River Basin. Cooperative Extension Service, Colorado State University, Fort Collins. Bulletin 503A.

Behnke, R.J. and M. Zarn. 1976. Biology and management of threatened and endangered western trouts. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. General Technical Report RM-28.

Bestgen, K.R. and L.W. Crist. 2000. Response of the Green River fish community to construction and re-regulation of Flaming Gorge Dam, 1962-1996. Colorado River Recovery Implementation Program Project Number 40, Fort Collins, CO.

Beyers, D.W., C. Sodergren, J.M. Bundy, and K.R. Bestgen. 2001. Habitat use and movement of bluehead sucker, flannelmouth sucker, and roundtail chub in the Colorado River. Department of Fishery and Wildlife Biology, Colorado State University, Fort Collins, CO.

Bezzerides, N. and K. Bestgen. 2002. Status review of roundtail chub *Gila robusta*, flannelmouth sucker *Catostomus latipinnis*, and bluehead sucker *Castostomus discobolus* in the Colorado River basin. 2002. Colorado State University Larval Fish Laboratory, Fort Collins, CO.

Binns, N.A. 1977. Present status of indigenuous populations of cutthroat trout (*Salmo clarki*) in southwest Wyoming. Wyoming Game and Fish Department, Cheyenne. Fisheries Technical Bulletin 2.

Bozek, M.A. and F.J. Rahel. 1991. Assessing habitat requirements of young Colorado River cutthroat trout by use of macrohabitat and microhabitat analyses. Transactions of the American Fisheries Society 120:571-581.

Brooks, J.E., M.J. Buntjer, and J.R. Smith. 2000. Nonnative species interactions: Management implications to aid in recovery of the Colorado pikeminnow (*Ptychocheilus lucius*) and razorback sucker (*Xyrauchen texanus*) in the San Juan River, CO-NM-UT. Final report. US Fish and Wildlife Service, Albuquerque, NM.

Carlson, C.A., C.G. Prewitt, D.E. Snyder, E.J. Wick, E.L. Ames, and W.D. Fronk. 1979. Fishes and macroinvertebrates of the White and Yampa Rivers, Colorado. Final Report prepared for the Bureau of Land Management. Colorado State University, Fort Collins, CO.

Carter, J.G., V.A. Lamarra, and R.J. Ryel. 1986. Drift of larval fishes in the upper Colorado River. Journal of Freshwater Ecology 3:567-577.

Chart, T.E. and E.P. Bergersen. 1992. Impact of mainstream impoundment on the distribution and movements of the resident flannelmouth sucker (Catostomidae: *Catostomus latipinnis*) population in the White River, Colorado. Southwestern naturalist 37(1):9-15.

Colorado Division of Wildlife. 2002. Threatened and Endangered Species [Web Page]. Located at www.wildlife.state.co.us/T&E/list. Accessed: January 2002.

Colorado Natural Heritage Program. 2002. CNHP Status and Ranking [Web Page]. Located at www.cnhp.colostate.edu/docs/splist. Accessed: January 2002.

Colorado River Cutthroat Trout Task Force. 2001. Conservation agreement and strategy for Colorado River cutthroat trout (*Oncorhychus clarki pleuriticus*) in the States of Colorado, Utah, and Wyoming. Colorado Division of Wildlife, Fort Collins. 87p.

Deacon, J.R. and S.V. Mize. 1997. Effects of water quality and habitat on composition of fish communities in the Upper Colorado River Basin. Technical Report by the Upper Colorado River Basin NAWQA, US Geological Survey, Denver, CO.

DeStaso J. and F.J. Rahel. 1994. Influence of water temperature on interactions between juvenile Colorado River cutthroat trout and brook trout in a laboratory stream. Transactions of the American Fisheries Society 123:289-297.

Durango Herald. 2007. Feds reject putting cutthroat on endangered species list. June 15, 2007.

Fausch, K.D. 1989. Do gradients and temperature affect distributions of, and interactions between, brook charr (*Salvelinus fontinalis*) and other resident salmonids in streams? Physiology and Ecology Japan, Special Volume 1:303-322.

Haines, G.B. and H.M. Tyus. 1990. Fish associations and environmental variables in age-0 Colorado squawfish habitats, Green River, Utah. Journal of Freshwater Ecology 5:427-435.

Herger, L.G. 1993. Assessment of the basin-wide habitat inventory technique to Colorado River cutthroat trout. Master's thesis, University of Wyoming, Laramie.

Holden, P.B. 1973. Distribution, abundance, and life history of the fishes of the Upper Colorado River Basin. Ph.D. Dissertation, Utah State University, Logan, UT.

Holden, P.B. and C.B. Stalnaker. 1975. Distribution and abundance of mainstream fishes of the middle and Upper Colorado River Basins, 1967-1973. Transactions of the American Fisheries Society 104:217-231.

Holden, P.B., editor. 1999. Flow Recommendations for the San Juan River. San Juan River Basin Recovery Implementation Program, U.S. Fish and Wildlife Service. Albuquerque, New Mexico.

Hubbs, C.L. and L.C. Hubbs. 1947. Natural hybrids between two species of *Catostomid* fishes. Papers of the Michigan Academy of Science, Arts, and Letters 31:147-167.

Hubbs, C.L. and R.R. Miller. 1953. Hybridization in nature between the fish genera *Catostomus* and *Xyrauchen*. Papers of the Michigan Academy of Science, Arts, and Letters 38:207-233.

Jespersen, D.M. 1981. A study of the effects of water diversion on the Colorado River cutthroat trout (*Salmo clarki pleuriticus*) in the drainage of the North Fork of the Little Snake River in Wyoming. Master's thesis, University of Wyoming, Laramie.

Joseph, T.W., J.A. Sinning, R.J. Behnke, and P.B. Holden. 1977. An evaluation of the status, life history, and habitat requirements of endangered and threatened fishes of the upper Colorado River system. FWS/OBS-77-62. U.S. Fish and Wildlife Service, Fort Collins, CO.

Lentsch, L.D., C.A. Toline, T.A. Crowl, and Y. Converse. 1998. Endangered fish interim management objectives for the Upper Colorado River Basin recovery and implementation program. Utah Division of Wildlife Resources, Salt Lake City, UT.

Maddux, H.R. and W.G. Kepner. 1988. Spawning of bluehead sucker in Kanab Creek, Arizona (Pisces: Catostomidae). The Southwestern Naturalist 33(3): 364-365.

Marcus, M.D., M.K. Young, L.E. Noel, and B.A. Mullan. 1990. Salmonid Habitat Relationships in the Western United States: A Review and Indexed Bibliography. USDA Forest Service General Technical Report, RM-188. 84 pages.

McAda, C.W. 1977. Aspects of the life history of three catostomids native to the Upper Colorado River Basin. M.S. Thesis. Utah State University, Logan, UT.

McAda, C.W., C.R. Berry, Jr., and C.E. Phillips. 1980. Distribution of fishes in the San Rafael River system of the Upper Colorado River Basin. The Southwestern Naturalist 25:41-50.

McAda, C.W. and R.S. Wydoski. 1980. The razorback sucker, *Xyrauchen texanus*, in the Upper Colorado River Basin. US Fish and Wildlife Service Technical Paper 99:1-15.

Meehan, W.R., F.J. Swanson, and J.R. Sedell. 1977. Influences of riparian vegetation on aquatic ecosystems with particular reference to salmonid fishes and their food supply. P.137-145 in Proceed. Symp. On the Importance, Preservation, and Management of the Riparian Habitat, July 9, 1977, Tucson, AZ.

Miller, W.J., J. Hogle, and D.E. Rees. 1995. Final report, Animas-LaPlata Project native fish studies. Miller Ecological Consultants, Inc., Fort Collins, CO.

Miller, W.J. and D.E. Rees. 2000. Ichthyofaunal surveys of tributaries of the San Juan River, New Mexico. Miller Ecological Consultants, Inc., Fort Collins, CO.

Minckley, W.L. 1973. Fishes of Arizona. Arizona Game and Fish Department, Phoenix, AZ.

Otis, E.O. 1994. Distribution, abundance, and composition of fishes in Bright Angel and Kanab Creeks, Grand Canyon National Park, Arizona. M.S. Thesis. University of Arizona, Tucson, AZ.

Platania, S.P. 1990. Biological summary of the 1987-1989 New Mexico-Utah ichthyofaunal study of the San Juan River. US Bureau of Reclamation, editor. Salt Lake City, UT.

Platania, S.P., and D.A. Young. 1989. A Survey of the Ichthyofauna of the San Juan and Animas Rivers from Archuleta and Cedar Hill (respectively) to their Confluence at Farmington, New Mexico. Department of Biology, University of New Mexico, Albuquerque, New Mexico.

Propst, D.L. and A.L. Hobbes. 1999. Seasonal abundance, distribution, and population size-structure of fishes in San Juan River secondary channels: 1991-1997. New Mexico Department of Game and Fish, Santa Fe, NM.

Ptacek, J.A., D.E. Rees, and W.J. Miller. 2005. Bluehead Sucker (*Catostomus discobolus*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/blueheaducker.pdf.

Quinlan, R.E. 1980. A study of the biology of the Colorado River cutthroat trout (*Salmo clarki pleuriticus)* population in the North Fork of the Little Snake River drainage in Wyoming. Master's thesis, University of Wyoming, Laramie.

Rees, D.E., J.A. Ptacek, and W.J. Miller. 2005. Roundtail Chub (*Gila robusta robusta*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/roundtailchub.pdf.

Rees, D.E., J.A. Ptacek, R.J. Carr, and W.J. Miller. 2005. Flannelmouth Sucker (*Catostomus latipinnis*): a technical conservation assessment. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/flannelmouthsucker.pdf.

Robinson, A.T., R.W. Clarkson, and R.E. Forrest. 1998. Dispersal of larval fishes in a regulated river tributary. Transactions of the American Fisheries Society 127:772-786.

Ruppert, J.B., R.T. Muth, and T.P. Nesler. 1993. Predation on fish larvae by adult red shiner, Yampa and Green Rivers, Colorado. The Southwestern Naturalist 38:397-399.

Sigler, W.F. and R.R. Miller. 1963. Fishes of Utah, Utah Department of Game and Fish, Salt Lake City, UT.

Sigler, W.F. and J.W. Sigler. 1996. Fishes of Utah; a natural history. University of Utah Press, Salt Lake City, UT.

Simon, J.R. 1935. A survey of the waters of the Wyoming National Forest. U.S. Department of Commerce, Bureau of Fisheries, Washington, D.C.

Simon, W., B. Horn, D. Wegner. 2000. Appendix 6A, Fisheries Report, Current and Historical Review of Animas Watershed Fisheries. Prepared for Animas River Stakeholders Group. 77 pages.

Smith, G.R. 1966. Distribution and evolution of the North American Catostomid fishes of Subgenus *Pantosteus*, Genus, *Catostomus*. Miscellaneous Publications of the Museum of Zoology, University of Michigan, No. 129. University of Michigan, Ann Arbor, MI.

Snyder, D.E. and R.T. Martin. 1990. Descriptions and identification of razorback , flannelmouth, white, Utah, bluehead, and mountain sucker larvae and early juveniles. Colorado Division of Wildlife, Fort Collins, CO.

Sublette, J.E., M.D. Hatch, and M. Sublette. 1990. The fishes of New Mexico. University of New Mexico Press, Albuquerque, N.M.

Tyus, H.M., B.D. Burdick, R.A. Valdez, C.M. Hayes, T.A. Lytle, and C.R. Berry. 1982. Fishes of the Upper Colorado River Basin: distribution, abundance, and status. In W.H. Miller, H.M. Tyus, and C.A. Carlson, editors. Fishes of the Upper Colorado River System: Present and Future. American Fisheries Society, Western Division, Bethesda, MD.

Tyus, H.M. and C.A Karp. 1990. Spawning and movements of razorback sucker, *Xyrauchen texanus*, in the Green River basin of Colorado and Utah. Southwestern Naturalist 35:427-433.

USDA Forest Service. 2005. R2 Regional Forester's sensitive species list. Rocky Mountain Region; FSM Supplement No. 2600-2005-1, April 28, 2005

U.S. Fish and Wildlife Service. 1994. Endangered and Threatened Wildlife and Plants: Determination of Critical Habitat for Four Colorado River Endangered Fishes: Razorback Sucker, Colorado Squawfish, Humpback Chub, and Bonytail Chub; Final Rule. *Federal Register*, March 21, 1994.

U.S. Fish and Wildlife Service. 1995. San Juan Basin Recovery Implementation Program. U.S. Fish and Wildlife Service. Albuquerque, New Mexico.

U.S. Fish and Wildlife Service. 2002. Endangered and threatened wildlife and plants; review of plant and animal taxa that are candidate dot proposed for listing as endangered or threatened; annual notice of findings on recycled petitions; annual description of progress on listing actions. *Federal Register* 67(114): 40657-40679.

U.S. Fish and Wildlife Service. 2003. San Juan River Basin Recovery Implementation Program. Program Highlights 2002-2003 [Web Page]. Located at: http://southwest.fws.gov/sjrip/2002%20%202003%20Briefing%20Book%-20final.pdf. Accessed: July 3, 2003.

Vanicek, C.D. 1967. Ecological studies of native Green River fishes below Flaming Gorge Dam, 1964-1966. Ph.D. Thesis, Utah State University, Logan, UT.

Vanicek, C.D. and R.H. Kramer. 1969. Life history of the Colorado squawfish, *Ptychocheilus lucius*, and Colorado chub, *Gila robusta*, in the Green River in Dinosaur national Monument, 1964-1966. Transcations of the American Fisheries Society 98:193-208.

Vanicek, C.D., R.H. Kramer, and D.R. Franklin. 1970. Distribution of Green River fishes in Utah and Colorado following closure of Flaming Gorge Dam. Southwestern Naturalist 14:297-315.

Weiss, S.J. 1993. Spawning. movement, and population structure of flannelmouth sucker in the Paria River. M.S. Thesis. University of Arizona, Tucson, AZ.

Weitzel, D.L. 2002. Conservation and status assessments for the bluehead sucker (*Catostomus discobolus*), flannelmouth sucker (*Catostomus latipinnis*), roundtail chub (*Gila robusta*), and leatherside chub (*Gila copei*): rare fishes west of the Continental Divide, Wyoming. Wyoming Fish and Game Department, Cheyenne, WY.

Wheeler, C.A. 1997. Current distributions and distributional changes of fish in Wyoming west of the Continental Divide. M.S. Thesis, University of Wyoming, Laramie, WY.

Whiteman, S.L. 2000. 1999 fish studies on Animas and La Plata Rivers. Southern Ute Indian Tribe, Ignacio, CO.

Woodling, John. 1985. Colorado's Little Fish; A Guide to the Minnows and Others Lesser Known in the State of Colorado. Colorado Division of Wildlife, Department of Natural Resources, Denver, Colorado.

Young, M.K. 1989. Effect of substrate composition on the survival to emergence of Colorado River cutthroat trout and brown trout. Doctoral dissertation, University of Wyoming, Laramie.

Young, M.K., tech. ed. 1995. Conservations assessments for inland cutthroat trout. General Technical Report RM-256. Fort Collins, CO: U.S. Department of Agriculture, Forest Service.

Young, M.K., W.A. Hubert, and T.A. Wesche. 1991. Selection of measures of substrate composition to estimate survival to emergence of salmonids and to detect changes instream substrates. North American Journal of Fisheries Management 11:339-346.

Plants

Anderson, D.G. (2006, August 29). *Lesquerella pruinosa* Greene (Pagosa bladderpod): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Anderson, D.G. (2004, August 9). *Gilia sedifolia* Brandeg. (stonecrop gilia): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Anderson, D.G. (2004, December 21). *Ipomopsis polyantha* (Rydberg) V. Grant (Pagosa ipomopsis): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Anderson and Susan Spackman Panjabi. February 12, 2006. Species Evaluation for *Physaria pulvinata*.

Beatty, B.L., W.F. Jennings, and R.C. Rawlinson (2004, January 30). *Machaeranthera coloradoensis* (Gray) Osterhout (Colorado tansyaster): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Colorado Natural Heritage Program, 2007. Element Occurrance Records for San Juan National Forest: GIS files and Database Reports.

Decker, K. (2006, July 13). *Astragalus missouriensis* Nutt. var. *humistratus* Isely (Missouri milkvetch): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Decker, K. (2005, September 7). *Astragalus proximus* (Rydberg) Wooton & Standley (Aztec milkvetch): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Decker, K. (2006, April 20). *Salix arizonica* Dorn (Arizona willow): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Decker, K. (2006, September 18). *Salix candida* Flueggé ex Wild. (sageleaf willow): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Decker, K. (2006, March 9). *Salix serissima* (Bailey) Fern. (autumn willow): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Decker, K., D.R. Culver, and D.G. Anderson. (2006, January 25). *Eriophorum chamissonis* C.A. Mey. (Chamisso's cottongrass): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Decker, K., D.R. Culver, and D.G. Anderson. (2006, February 6). *Eriophorum gracile* W. D. J. Koch (slender cottongrass): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Forest Service Manual. R2 Supplement No. 2600-2007-1, June 8, 2007

Gage, E. and D.J. Cooper. (2006, June 2). *Carex diandra* Schrank (lesser panicled sedge): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Kram, M., K. Decker, M. Dimmitt, D. Gann, P. Lyon, B. Neely, C. Pague, R. Rondeau, K. Sochi, and C. Supples. 2005. *San Juan Planning for Biodiversity Model Project: Phase 1 Report to BLM.* Prepared by The Nature Conservancy of Colorado with extensive support from the Colorado Natural Heritage Program and guidance form the Bureau of Land Management.

Ladyman, J.A.R. (2004, February 3). *Draba smithii* Gilg ex O.E. Schulz (Smith's draba): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Ladyman, J.A.R. (2007, January 29). *Triteleia grandiflora* Lindley (largeflower triteleia): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Ladyman, J.A.R. (2004, October 29). *Eriophorum altaicum* Meinshausen var. *neogaeum* Raymond (whitebristle cottongrass): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Mergen, D.E. (2006, July 17). *Cypripedium parviflorum* Salisb. (lesser yellow lady's slipper): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

NatureServe. NatureServe Explorer: An online encyclopedia of life [web application]. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer.

Neid, S.L. (2006, May 15). *Utricularia minor* L. (lesser bladderwort): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

O'Kane, S.L. and J.L. Reveal. 2006. *Physaria pulvinata* (Brassicaceae), a new species from southwestern Colorado. Brittonia 58(1): 74-77.

Panjabi, S.S. and D.G. Anderson. (2007, January 17). *Parnassia kotzebuei* Chamisso ex Sprengel (Kotzebue's grass-of-Parnassus): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Panjabi, S.S. and D.G. Anderson. (2006, July 24). *Calochortus flexuosus* S. Watson (winding mariposa lily): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

R2 Regional Forester's Sensitive Species List, found in FSM - R2 Supplement 2672.11 – Exhibit 01

Redders, Jeff, Dean Erhard, Leslie Stewart, Sara Brinton, Sandy Friedley; 2001. A CONSERVATION STRATEGY FOR *Lesquerella pruinosa*

Rocchio, J., M. March, and D.G. Anderson. (2006, March 20). *Epipactis gigantea* Dougl. ex Hook. (stream orchid): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Weber, William A. and Ronald C. Wittmann. 2001. Colorado Flora Western Slope, Third Edition. University Press of Colorado.

Wolf, E.C., E. Gage, and D.J. Cooper. (2006, December 14). *Drosera anglica* Huds. (English sundew): a technical

conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.