USDA Forest Service
U.S. DEPARTMENT OF AGRICULTURE

Southwestern Region / Carson National Forest

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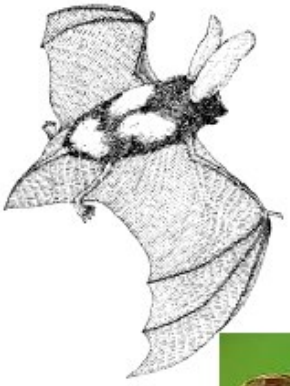
Potential Species of Conservation Concern

Carson National Forest
New Mexico



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Commonly Used Acronyms

ALP	Alpine and Tundra (ecological response unit)
BASI	best available scientific information
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BP	Bristlecone Pine (ecological response unit)
Cb	Cruces Basin (local zone)
Cr	Camino Real (local zone)
CWCS	Comprehensive Wildlife Conservation Strategy
CWD	coarse woody debris
DOI	Department of Interior
ERU	ecological response unit
FSH	Forest Service Handbook
FVS	Forest Vegetation Simulator
FWS	Fish Wildlife Service
HERB	Herbaceous Riparian (riparian ecological response unit)
Ji	Jicarilla (local zone)
MCD	Mixed Conifer, with Frequent Fire (ecological response unit)
MCW	Mixed Conifer, with Aspen (ecological response unit)
MSG	Montane Subalpine Grassland (ecological response unit)
NSHR	Narrowleaf Cottonwood Shrub (riparian ecological response unit)
NSPR	Narrowleaf Cottonwood-Spruce (riparian ecological response unit)
NEPA	National Environmental Policy Act
NF	National Forest
NFMA	National Forest Management Act
NFS	National Forest System
NM	New Mexico
NMBCC	New Mexico Biodiversity Collection Consortium
NMCHAT	New Mexico Crucial Habitat Assessment Tool
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMRPTC	New Mexico Rare Plants Technical Council
NRV	natural range of variation
PJO	Piñon-Juniper Woodland (ecological response unit)
PJS	Piñon-Juniper Sagebrush (ecological response unit)
PPF	Ponderosa Pine Forest (ecological response unit)
RAD	Risk Assessment Database
Rc	Rio Chama (local zone)

RD	Ranger District
Rg	Rio Grande (local zone)
RGCS	Rio Grande Cottonwood-Shrub (riparian ecological response unit)
RGCT	Rio Grande cutthroat trout
Rr	Red River (local zone)
SAGE	Sagebrush (ecological response unit)
SCC	species of conservation concern
SEINet	Southwest Environmental Information Network
SFF	Spruce-Fir Forest (ecological response unit)
USDA	United States Department of Agriculture
UMCW	Upper Montane Conifer-Willow (riparian ecological response unit)
Vc	Vallecitos (local zone)
VDDT	Vegetation Dynamics Development Tool
Vv	Valle Vidal (local zone)
WTLA	Willow-Thinleaf Alder (riparian ecological response unit)

Introduction

This report focuses on identifying federally recognized threatened, endangered, proposed, and candidate species, as well as potential species of conservation concern (SCC). This report also documents information gaps relevant to at-risk species that may be filled through inventories, plan monitoring, or research. Other species of interest on the Carson National Forest (NF), such as popular game species, are addressed in Chapter III. Contributions of Commonly Enjoyed Species to Social and Economic Sustainability (p. 309) of the assessment report.[1]

Under the National Forest Management Act, the Forest Service is directed to:

> *provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet multiple-use objectives, and within the multiple-use objectives of a land management plan adopted pursuant to this section [of this Act], provide, where appropriate, to the degree practicable, for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan. (NFMA, 16 U.S.C. 1604(g)(3)(B))*

To meet this objective, the 2012 Planning Rule adopts a complementary ecosystem and species-specific approach to maintaining species diversity, known as coarse-filter/fine-filter (36 CFR § 219.9). The premise behind the coarse-filter approach is that native species evolved and adapted within the limits established by natural landforms, vegetation, and disturbance patterns prior to extensive human alteration. Therefore, maintaining or restoring ecological conditions and functions similar to those under which native species have evolved, offers the best assurance against losses of biological diversity and maintains habitats for the vast majority of species in an area. However, for some species, this approach may not be adequate, either because the reference condition is not achievable or because of non-habitat risks to species viability.

The fine-filter approach recognizes that for many species, ecological conditions or additional specific habitat features (key ecosystem characteristics) are required, and these may not be met by the coarse-filter approach. To determine which animal and plant species may require this fine-filter approach, the Carson NF has identified federally listed threatened, endangered, proposed, and candidate species and developed a list of potential SCC that occur within the Carson NF (Figure 1). This list will be used at later stages of the plan revision process to develop specific plan components that ensure species diversity in the plan area. Maintaining species that are vulnerable to decline within the Carson NF will maintain the diversity of the forest and thus, comply with the National Forest Management Act diversity requirement.

Plant and animal species are highly dependent on the function of ecosystems with specific conditions, such as local soil, air, water, aspect, elevation, precipitation, etc., which create areas favorable or unfavorable for a particular species. The most important direct drivers of biodiversity loss and ecosystem service changes are habitat changes (e.g., land use changes, physical modification of rivers, or water withdrawal from rivers), climate change, invasive species, overexploitation, and pollution (MEA 2005). Therefore, this section builds on the reference and current ecological conditions of other assessed terrestrial and aquatic ecological resources. It relies very heavily on the description of current ecological condition described

[1] The Assessment Report of Ecological, Social, and Economic Conditions, Trends, and Sustainability for the Carson National Forest can be found on the forest's website at http://www.fs.usda.gov/carson/.

within the terrestrial vegetation types, known as ecological response units (ERUs) (p. 17 of assessment), on the Carson NF and the Integration and Risk Assessment (p. 298 of assessment) of these ERUs. Additional information can be found in the Terrestrial Vegetation (p. 34) and Riparian Vegetation (p. 116) sections of the assessment report.

Figure 1. Vicinity Map of the Carson National Forest

Species Ecosystem Services

The Carson NF is home to hundreds of animal, plant, and fungi species. For some of these species, changing land use patterns outside of the forest have reduced potential habitat availability and increased their reliance on Carson NF managed lands. These species provide many ecosystem services that, in turn, benefit society as a whole. This includes:

- **Supporting** ecosystem services from species provide nutrient cycling (by both plants and animals), soil formation and manipulation (e.g., burrowing insects and mammals), primary production (plants), and seed dispersal (e.g., animals).

- **Regulating** ecosystem services from species provide carbon sequestration (plants), pollination (both forest plants and adjacent croplands by both vertebrates and invertebrates), and erosion control (plants).

- **Provisioning** ecosystem services from species supply food (e.g., forage, game, and wild foods), fiber, medicine, and forest products.

- **Cultural** ecosystem services from species offer recreation (e.g., hunting and bird-watching), opportunities for scientific discovery and education, and cultural, intellectual, or spiritual inspiration.

Because this document focuses on at-risk species that occur in the Carson NF, it follows that the ecosystem services provided by these species are decreasing and/or at risk.

Federally Recognized Species

The Endangered Species Act (Act; 16 U.S.C. Sec. 1531-1544), administered by the U.S. Fish and Wildlife Service (FWS), recognizes imperiled species and provides for their protection and recovery. Table 1 identifies the five federally endangered and four threatened species listed for the four counties (Rio Arriba, Taos, Colfax, and Mora) of the Carson NF (USDI FWS 2015). However, there are only three of the endangered species and three threatened species that are relevant to the Carson NF and to the planning process. There are no proposed or candidate species listed for the counties of the Carson NF.

The FWS lists the Jemez Mountain salamander, least tern, and piping plover for Rio Arriba or Colfax counties, but their range does not include the Carson NF (USDI FWS 2012a); therefore, these species will not be carried forward as federally listed species for the Carson NF. Mexican spotted owl, black-footed ferret, western yellow-billed cuckoo, and New Mexico meadow jumping mouse are not known to currently occupy any suitable habitat on the Carson NF, but they have been documented to occur on the forest in the past and are currently evaluated during project level analysis under the National Environmental Policy Act (NEPA). Canada lynx is not presently recognized to den or breed on the Carson NF, but it can sporadically use the forest for foraging. Southwestern willow flycatcher is a known resident on the Carson NF and has long-standing records documenting its presence on the forest. The six federally listed species for the Carson NF are denoted with an asterisk (*) in Table 1.

Section 4 of the Endangered Species Act requires the FWS to identify and protect all lands, water, and air necessary to recover an endangered species; this is known as critical habitat. Critical habitat are areas that have been determined to be needed for life processes for a species, including space for individual and population growth and for normal behavior; cover or shelter; food, water, air; light, minerals, or other nutritional or physiological requirements; sites for breeding and rearing offspring; and habitats that are protected from disturbances or are representative of the historical geographical and ecological distributions of a species. The Mexican spotted owl and southwestern willow flycatcher have designated critical habitat on the Carson NF and these are described in more detail in Chapter III. Designated Areas of the assessment report (p. 442).

Section 7 of the Endangered Species Act requires Federal agencies to ensure actions they authorize, fund, or carry out are not likely to destroy or adversely modify designated critical habitat. Section 7 of the Act also requires that any federal agency that carries out, permits, licenses, funds, or otherwise authorizes activities that may affect a listed species must consult with the Fish and Wildlife Service to ensure that its actions are not likely to jeopardize the continued existence of any listed species.

Table 1. Federally listed threatened or endangered species listed for the counties (Rio Arriba, Taos, Colfax, and Mora) of the Carson National Forest (USDI FWS 2015). An asterisk (*) denotes species carried forward as federally listed species for the Carson NF.

Common Name	Scientific Name	Federal Status	Critical Habitat
Amphibians and Reptiles			
Jemez Mountain salamander	*Plethodon neomexicanus*	Endangered	No
Avians			
Least tern	*Sterna antillarum*	Endangered	No
Mexican spotted owl*	*Strix occidentalis lucida*	Threatened	Yes
Piping plover	*Charadrius melodus*	Threatened	No
Southwestern willow flycatcher*	*Empidonax traillii extimus*	Endangered	Yes
Western yellow-billed cuckoo*	*Coccyzus americanus occidentalis*	Threatened	No
Mammals			
Black-footed ferret*	*Mustela nigripes*	Endangered	No
Canada lynx*	*Lynx canadensis*	Threatened	No
New Mexican meadow jumping mouse*	*Zapus hudsonius luteus*	Endangered	No

Potential Species of Conservation Concern

A species of conservation concern (SCC) is defined in the 2012 Planning Rule as "a species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long-term in the plan area." The guidance provided in the final directives for the 2012 planning regulations (Forest Service Handbook [FSH] 1909.12 – Land Management Planning, Chapter 10) is used to develop the SCC list for the Carson NF. The criteria for identifying species of conservation concern are also the criteria for identifying potential species of conservation concern, which are (FSH 1909.12, 12.52c):[1]

1. The species is native to, and known to occur in, the plan area.

   A species is known to occur in a plan area if, at the time of plan development, the best available scientific information indicates that a species is established or is becoming established in the plan area. A species with an individual occurrences in a plan area that are merely "accidental" or "transient," or are well outside the species' existing range at the time of plan development, is not established or becoming established in the plan area. If the range of a species is changing so that what is becoming its "normal" range includes the plan area, an individual occurrence should not be considered transient or accidental.

2. The best available scientific information about the species indicates substantial concern about the species' capability to persist over the long term in the plan area. See FSH 1909.12, zero code, section 07, for guidance on best available scientific information.

   If there is insufficient scientific information available to conclude there is a substantial concern about a species' capability to persist in the plan area over the long-term that species cannot be identified as a species of conservation concern.

   If the species is secure and its continued long-term persistence in the plan area is not at risk based on knowledge of its abundance, distribution, lack of threats to persistence, trends in habitat, or responses to management that species cannot be identified as a species of conservation concern.

Scales of Analysis

Three scales of analysis were used for the assessment of at-risk species: context, plan, and local. These roughly correspond with evaluating species within the state of New Mexico (context); species that occur somewhere on the Carson NF (plan); and finally associating species with individual local zones (Figure 2). The local scale of analysis breaks the plan scale into eight local zones, delineated along HUC12 watershed boundaries, and differentiated by level or type of management, and level of public visitation and types of use (p. 28 of assessment). The minimum zone size/maximum number of zones was based on recommendations provided by the Regional Office (USDA FS 2014a).

[1] More detailed guidance for selecting SCC is presented in chapter 10 of the final directives (FSH 1909.12, 12.52).

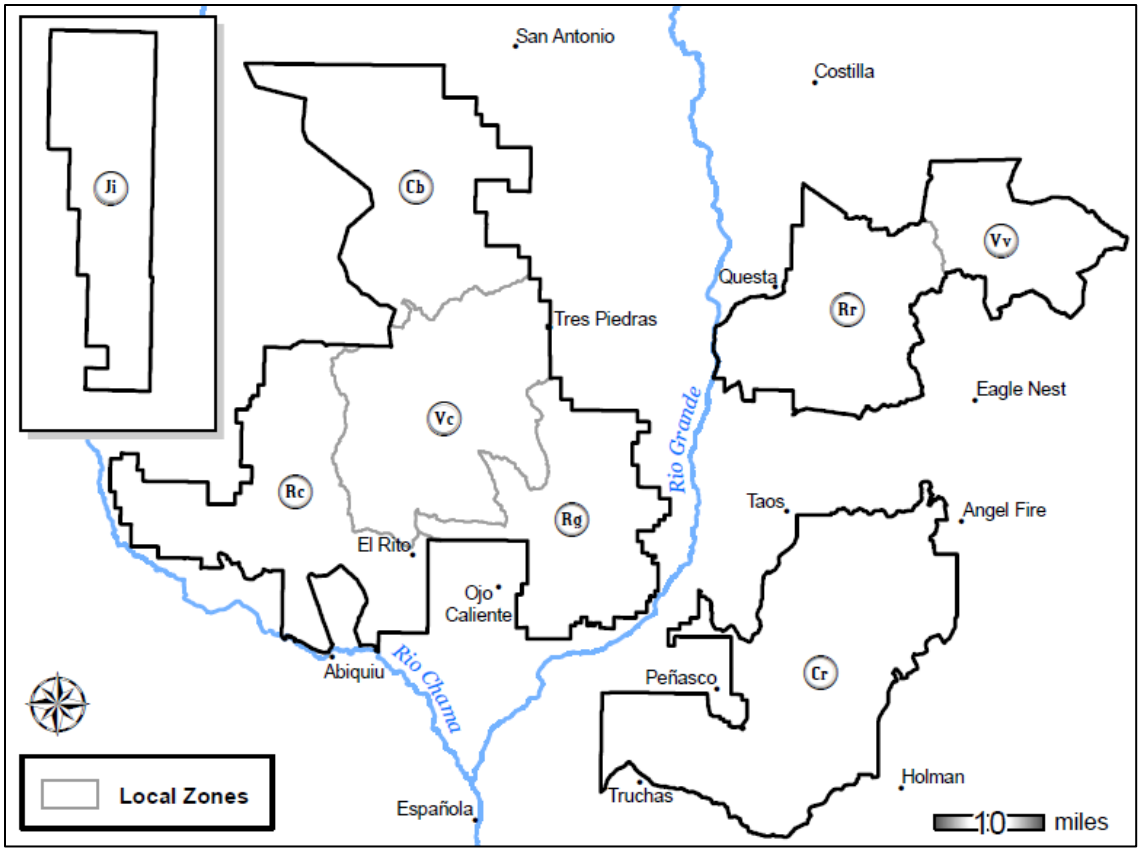

Figure 2: Carson National Forest Local Zones

Evaluating Relevant Information for At-Risk Species

A Microsoft Access database (Species Risk Assessment Database) was designed to evaluate potential SCC on the Carson NF through a four-step process:

1. Review and screen species that meet number 1 described above, and determine which species have been documented to occur on the Carson NF.

2. Determine which of the potential SCCs meet number 2 described above.

3. Associate the remaining potential SCC species with current ecological condition and key ecosystem characteristics described within ERUs on each of the Carson NF local zones.

4. Perform a risk assessment analysis on the remaining species, with their associated ERU.

Federally listed species (Table 1) are also tracked throughout this process, but in a separate way to potential SCC. Both the Rule and final directives mandate the use of best available scientific information (BASI) for each of the resource parameters evaluated in the assessment. To form the list of potential SCC, BASI was used.

Step 1: Identify species that are native to and known to occur in the plan area.

The first step of this criteria was to assess a wide variety of sources to compile the BASI for species considered. According to NatureServe (Natureserve 2015), there are more than 7,000 unique animal, plant, and fungi species found in New Mexico. Species records were exported from NatureServe[1] for all species occurring in New Mexico that had status ranks of G or T 1, 2, or 3 and S 1 and 2. These are species that have been identified by state natural heritage programs, the U.S. Fish and Wildlife Service, the International Union for Conservation of Nature, the Canadian Wildlife Service, and others as facing possible risk of extinction. This list also includes:

- Species that are identified as recently delisted or have a positive 90-day finding in New Mexico by the USFWS (77 FR 69994);
- Species listed as threatened or endangered by New Mexico Department of Game and Fish (NMDGF) (BISON-M 2014) and State Forestry Division (NM EMNRD 2006);
- Species on the Southwestern Regional Forester's Sensitive Species List (USDA FS 2013);
- Species listed as sensitive species on adjacent federal agency lands (SLV Public Land Center 2013; USDI BLM 2009);
- Species listed as threatened or endangered by adjacent Tribes (Navajo Nation 2008, Taos Pueblo Warchief 2018; USDA FS Carson NF 2014a);
- Species identified as those of greatest conservation need by the New Mexico Comprehensive Wildlife Conservation Strategy (NMDGF 2006b);
- Rare plants as identified by the New Mexico Rare Plants Technical Council (NMRPTC 1999); and
- Migratory Birds List by the USFWS (USDI FWS 2015)

This list of approximately 1,384 species formed the basis of the potential SCC list within the context area and was comprised of 694 vascular and non-vascular plants, 11 fungi, 341 invertebrates, and 338 vertebrates. The vertebrates comprised of 13 amphibians, 28 reptiles, 53 fish, 110 mammals, and 134 birds.

The next part of step 1 involved identifying which of these species occur on the Carson NF (FSH 1909.12, 12.52c (1)). Where possible, published location information was used to filter out species that were not reported in one of the four counties (Rio Arriba, Colfax, Taos, and Mora) encompassing the Carson NF or within the forest itself.

Internal databases (USDA FS 2014b) breeding bird species survey data (Beason et al. 2006, 2007) and museum databases, including Arctos Collection Management Information System (Arctos 2014), Biota Information System of New Mexico (BISON-M 2014), Natural Heritage New Mexico (NHNM 2014), New Mexico Biodiversity Collections Consortium (NM BCC 2009), Southwest Environmental Information Network (SEINet 2014) were queried for forest-specific observations.

[1] NatureServe conservation status ranks are based on a scale of one to five, ranging from critically imperiled (G1) to demonstrably secure (G5). Status is assessed and documented at three distinct geographic scales -global (G), national (Na), and state/province (S). Infraspecific taxa (subspecies or other designations below the level of species) are indicated by "T rank." The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by a letter reflecting the appropriate geographic scale of the assessment report (G=Global, Na=National, and S =State), or infraspecific (T) where appropriate. The numbers have the following meaning: 1=Critically Imperiled, 2=Imperiled, 3=Vulnerable, 4=Appraently Secure, and 5=Secure.

In addition to the databases and lists cited above, Forest Service biologists at the Carson NF Supervisor's Office and ranger districts, as well as the Southwestern Regional Office were consulted in the development of the potential SCC list. Subject matter experts were interviewed via personal communications. Staff at Natural Heritage New Mexico (R. McCollough); New Mexico Department of Game and Fish (J. Stuart, N. Quintana, L Pierce, C. Hayes, S. Liley, R. Hansen, J. Caldwell, R. Winslow, E Goldstein, B. Lang, E. Rominger, J. Davidson); New Mexico Museum of Natural History (J.T. Giermakowski); New Mexico State University (J. Frey); U.S. Fish and Wildlife Service (E. Hein); and others were able to review internal records and databases or rely on agency specialists to further filter the list.

The New Mexico Comprehensive Wildlife Conservation Strategy (CWCS) has older information and will be updated in 2015, to reflect recent knowledge and status of species. Some species in the New Mexico CWCS did not meet the ranking criteria for SCC, thus reducing the number of species to be considered. For highly visible and high-interest species (e.g., birds), reliable collection and observation data were readily available. In addition, the current Carson forest plan requires monitoring for management indicator species and federally listed species (USDA FS Carson NF 1986).

Another potentially valuable source of BASI is the recently released New Mexico Crucial Habitat Assessment Tool (NMCHAT). This web-based map tool provides spatial information on the conservation of animals, plants, and their habitats across New Mexico (NMCHAT 2013). This tool calculates a crucial habitat rank (a score between 1, most crucial, and 6, least crucial) for the entire state of New Mexico at a resolution of one square mile. This rank considers a number of factors when assigning rank scores, including presence species of concern (determined by a number of state and federal agencies, similar to but not duplicative of the SCC process described here), wildlife corridors (using models generated in a least-cost path analysis for cougars (Menke 2008)), terrestrial and aquatic species of economic and recreational importance (habitat models developed by NMDGF, wetland and riparian areas, large natural areas (areas greater than 1,000 hectares that are minimally fragmented by roads, power lines, railroads, pipelines, and other human impacts) and a number of other data sources. Much more information can be found at NMCHAT. Much of the Carson NF ranks "3" or lower in terms of overall crucial habitat, in most part because of presence of species of concern, presence of wetlands and riparian areas, and presence of large natural areas. While the wildlife corridor layer is promising, at this point in time the only information contained within it is the cougar model described above. It is expected NM CHAT will be an important resource in the upcoming phases of plan revision.

While compiling relevant species information, several sources of data that appeared to fill gaps in the BASI were encountered. Citizen science is a growing movement in conservation and allows volunteers to collect and submit data to online databases including eBird (eBird 2014), iNaturalist (iNaturalist 2014), and BugGuide.Net (BugGuide 2014). These resources were used where it was possible to verify observations.

For many other species, however, this information was simply not available. In many cases, it was not possible to determine if this was because surveys had been conducted, but the species were not found (negative surveys), or surveys had not been conducted at all. No fungi, lichen, or snail species were carried forward, because it is not known which of those identified as potentially at-risk occur on the Carson NF. This is a data gap that should be addressed through future inventories, plan monitoring, or research. Also, the Sangre de Cristo pea clam (*Pisidium sanguinichristi*), and swift fox (*Vulpes velox*) will not be considered as potential SCC, as the pea

clam has not been determined as a valid species (Lang 2013) and the swift fox is considered "accidental" for the Carson NF (Apker and Navo 2013).

From the initial 1,384 potential SCC identified for the State of New Mexico, 202 potential SCC were identified for the counties of the Carson NF, but 136 of these species are not documented as occurring within the Carson NF. Table 2 lists the 66 species that are reliably documented on the Carson NF and assessed in Step 2.

Table 2. Species known to historically occur in the Carson NF and carried forward for consideration as species of conservation concern

Common Name	Scientific Name	Rationale for Consideration[1]	Presence in Carson NF Documented? (source)
Amphibians and Reptiles			
Northern leopard frog	*Lithobates pipiens*	CN, NN, NG5/Na5/S2, RF	Yes (Christman 2010)
Western boreal toad	*Anaxyrus boreas*	CN, NG4/T1/Na4, S, F	Yes (USDA FS Carson NF 2014b)
Western diamondback rattlesnake	*Crotalus atrox*	CN, NG5/Na5/S5	Yes (USDA FS Carson NF 2014b)
Avians			
American dipper	*Cinclus mexicanus*	NG5/Na5/S3, NN	Yes (USDA FS Carson NF 2014b)
American goldfinch	*Spinus tristis*	NG5/Na5/S2	Yes (USDA FS Carson NF 2014b)
American peregrine falcon	*Falco peregrinus anatum*	CN, NG4/T4/Na3/S2, NN, RF, S	Yes (USDA FS Carson NF 2014b)
Bald eagle	*Haliaeetus leucocephalus*	CN, NG5/NA5/S2, NN, RF, S	Yes (USDA FS Carson NF 2014b)
Band-tailed pigeon	*Patagioenas fasciata*	CN, NG4/Na4/S3, NN	Yes (USDA FS Carson NF 2014b)
Bendire's thrasher	*Tomostoma bendirei*	CN, NG5/Na4, RF	Yes (eBird 2014)
Boreal owl	*Aegolius funereus*	CN, S, NG5/Na4/S2, RF	Yes (NMDGF 2010)
Brown-capped rosy finch	*Leucosticte australis*	NG4/Na4/S2	Yes (USDA FS Carson NF 2014b)

[1] CN = Identified as a species of greatest conservation need in the New Mexico Comprehensive Wildlife Conservation Strategy Report; F = Federally delisted within last 5 years; PF= Federally petitioned for listing; N = NatureServe Global (G), Taxonomic (T), National (Na), or State (S) Ranking; NN = Navajo Nation Endangered; RF = Regional Forester's Sensitive Species List and Adjacent federal agency's Sensitive Species List; RP = Rare Plant; and S = State-listed as threatened or endangered, LT=Local Tribe.

Common Name	Scientific Name	Rationale for Consideration[1]	Presence in Carson NF Documented? (source)
Ferruginous hawk	*Buteo regalis*	CN, NG4/Na4/S2, RF, NN	Yes (USDA FS Carson NF 2014b)
Golden eagle	*Aquila chrysaetos*	CN, NG5/Na5, NN	Yes (USDA FS Carson NF 2014b)
Gray vireo	*Vireo vicinior*	CN, NG4/Na4, RF, S	Yes (Beason et al. 2006)
Juniper titmouse	*Baeolophus ridgwayi*	CN, NG5/Na5, RF	Yes (Beason et al. 2007)
Lincoln's sparrow	*Melospiza lincolnii*	NG5/Na5/S2	Yes (Beason et al. 2007)
Loggerhead shrike	*Lanius ludovicianus*	CN, NG4/Na4, RF	Yes (eBird 2014)
Northern goshawk	*Accipiter gentilis*	CN, NG5/Na4/S2, RF	Yes (USDA FS Carson NF 2014b)
Northern harrier	*Circus cyaneus*	CN, NG5/Na5/S2	Yes (eBird 2014)
Pine grosbeak	*Pinicola enucleator*	NG5/Na5/S2	Yes (Beason et al. 2007)
Pinyon jay	*Gymnorhinus cyanocephalus*	CN, NG5/Na5	Yes (Beason et al. 2007)
Short-eared owl	*Asio flammeus*	NG5/Na5/S2	Yes (NMDGF 2010)
Western burrowing owl	*Athene cunicularia hypugaea*	CN, NG4/T4/Na4, RF, NN	Yes (USDA FS Carson NF 2014b)
White-tailed ptarmigan	*Lagopus leucura*	CN, NG5/Na5/S1, S, RF	Yes (Wolfe et al. 2012)
Wilson's warbler	*Cardellina pusilla*	NG5/Na5/S2	Yes (Beason et al. 2006)
Fish			
Rio Grande chub	*Gila pandora*	CN, NG3/Na3, RF	Yes (USDA FS Carson NF 2014b)
Rio Grande cutthroat trout	*Oncorhychus clarkii virginalis*	CN, NG4/T3/Na2/S2, RF	Yes (USDA FS Carson NF 2014b)
Rio Grande sucker	*Catostomus plebeius*	CN, NG4/Na3/S2, RF	Yes (USDA FS Carson NF 2014b)
Invertebrates			
Monarch	*Danaus plecippus*	PF, NG5/NA3	Yes, but not since 1990's (Lotts and Naberhaus 2014)
Nokomis fritillary butterfly	*Speyeria nokomis nokomis*	CN, NG3/T1/Na1/S1, RF	Yes (Selby 2007)
Spalding's blue butterfly	*Euphilotes spalding*	CN, NG4/Na4	Yes (Lotts and Naberhaus 2014)

Common Name	Scientific Name	Rationale for Consideration[1]	Presence in Carson NF Documented? (source)
Mammals			
American marten	*Martes americana*	CN, NG5/Na5/S2,RF, S	Yes (Long 2001)
American pika	*Ochotona princeps*	RF, NG5/S2	Yes (USDA FS Carson NF 2014b)
Dwarf shrew	*Sorex nanus*	NG4/Na4/S2	Yes (Frey 2003)
Gunnison's prairie dog	*Cynomys gunnisoni*	CN,RF,NG5/Na5/S2	Yes (USDA FS Carson NF 2014b)
Masked shrew	*Sorex cinereus*	RF, NG5/Na5/S2	Yes (Frey 2003)
Pale Townsend's big-eared bat	*Corynorhinus townsendii*	RF, NG4/T3/Na4	Yes (Gannon et al. 1998)
Rocky Mountain bighorn sheep	*Ovis canadensis canadensis*	CN, NG4/T4/Na4/LT	Yes (USDA FS Carson NF 2014)
Snowshoe hare	*Lepus americanus*	CN, NG5/Na5/S2	Yes (USDA FS Carson NF 2014b)
Spotted bat	*Euderma maculatum*	CN, NG4/Na4, RF, S	Yes (Geluso 2006)
Water shrew	*Sorex palustris*	RF, NG5/Na5/S2	Yes (Frey 2003)
White-tailed jackrabbit	*Lepus townsendii*	CN, NG5/Na5/S2	Yes (USDA FS Carson NF 2014b)
Yellow-bellied marmot	*Marmota flaviventris*	NG5/Na5/S2	Yes (USDA FS Carson NF 2014b)
Plants			
Alpine bluebells	*Mertensia alpina*	NG4/S2	Yes (SEINet 2014)
Alpine larkspur	*Delphinium alpestre*	NG2/Na2/S2, RF, RP	Yes (Larson 2008)
Altai chickweed	*Stellaria irrigua*	NG4/S2	Yes (SEINet 2014)
Arctic harebell	*Campanula uniflora*	NG4/S2	Yes (SEINet 2014)
Arizona willow	*Salix arizonica*	NG3/Na3/S2, RF, RP	Yes (USDA FS Carson NF 2014b)
Chaco milkvetch	*Astragalus micromerius*	NG3/Na3/S2, RF, RP	Yes (Larson 2008)
Chama blazing star	*Mentzelia conspicua*	NG2/Na2/S2, RF, RP	Yes (SEINet 2014)
Eastwood's podistera	*Podistera eastwoodiae*	NG3/Na3/S2	Yes (Larson 2008)
Golden saxifrage	*Saxifraga chrysantha*	NG4/S2?	Yes (SEINet 2014)
Gunnison's mariposa lily	*Calochortus gunnisonii*	NG5/T4?/Na4?, RF, RP	Yes (USDA FS Carson NF 2014b)
Moosewort	*Botrychium tunux*	NG3?/Na3?	Yes (SEINet 2014)

Common Name	Scientific Name	Rationale for Consideration[1]	Presence in Carson NF Documented? (source)
New Mexico stickweed	*Hackelia hirsuta*	NG4, RP	Yes (Larson 2008)
Nodding saxifrage	*Saxifraga cernua*	NG5/S2?	Yes (SEINet 2014)
Pagosa milkvetch	*Astragalus missouriensis var. humistratus*	NG5/T1/Na1, RF, RP	Yes (SEINet 2014)
Pecos fleabane	*Erigeron subglaber*	NG3/Na3/S3, RF,RP	Yes (SEINet 2014)
Ripley's milkvetch	*Astragalus ripleyii*	NG3/Na3, RF, RP	Yes (Larson 2008)
Robust larkspur	*Delphinium robustum*	NG2?/Na2?, RF, RP	Yes (SEINet 2014)
Rocky Mountain nailwort	*Paronychia pulvinata*	NG3?/Na3?	Yes (Larson 2008)
Rocky Mountain spike-moss	*Selaginella weatherbiana*	NG4/Na4/S2	Yes (Larson 2008)
Showy alpine groundsel	*Senecio amplectens var. amplectens*	NG4/T3?	Yes (Larson 2008)
Small-headed goldenweed	*Ericameria microcephala*	NG2/Na2/S2, RF	Yes (USDA FS Carson NF 2014b)
Stiff beardtongue	*Penstemon strictifromis*	NG3?	Yes (Larson 2008)
Tufted sand verbena	*Abronia bigelovii*	NG3/Na3, RF, RP	Yes (Larson 2008)

Step 2: Identify species that are at risk of persisting over the long term in the plan area.

The second step of the SCC analysis process determined which species can be removed from the potential SCC list, because it is secure and its continued long-term persistence in the Carson NF is not at risk. Step 2 consisted of evaluating each species through the following filters (FSH 1909.12, 12.52 d (3f)):

A. Species is “transient” species that is documented to use the Carson NF occasionally?

   i. if answer is yes then species cannot be identified as a species of conservation concern

B. There is insufficient population or abundance information to evaluate whether or not a species is at risk for persistence within the Carson NF?

   i. If answer is yes then species cannot be identified as a species of conservation concern

C. Species’ has stable to upward population trend?

D. Species’ habitat trend is stable to upward and abundant?

E. Species inhabiting plan area are not known to be affected by significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions (habitat) they depend upon?

Based on knowledge of the species' abundance, distribution, lack of threats to persistence, trends in habitat, or responses to management, 40 of the 66 species identified as potential SCC were evaluated as secure and their continued long-term persistence in the Carson NF are not at risk. As such, these species are no longer considered for further analysis as potential SCCs. Table 3 lists the species removed and the summarized rationale for removing them. Further detailed rationale for removing the 40 species from the potential SCC list are discussed after the table.

Table 3. Potential species of conservation concern removed from further analysis, and rationale for removal

Common Name	Rationale for Removal from Potential SCC List
Amphibians and Reptiles	
Western diamondback rattlesnake	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (Degenhardt et al. 1996).
Avians	
American dipper	Inhabits rocky, cliff riparian that has not changed from historical reference condition and that are not affected by any threats (Poole 2014).
American goldfinch	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (Poole 2014).
Bald eagle	Transient (Cartron 2010).
Band-tailed pigeon	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (Poole 2014) .
Bendire's thrasher	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (Poole 2014).
Black rosy-finch	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (Poole 2014).
Boreal owl	The SFF ERU is common and has a stable to upward habitat trend on the Carson NF and most is in wilderness areas. There is insufficient information on species populatin and distribution to evaluate whether or not the species is at risk for persistance within the Carson.
Brown-capped rosy-finch	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (Poole 2014).
Flammulated owl	According to a Carson NF wildlife biologist, when conducting Mexican spotted owl (MSO) surveys, flammulated owl was the most detected owl during these surveys. Detection of this owl has been documented on MSO forms for the last several years (personal communication with Jay Gatlin, Camino Real Ranger District, 2015-2016). According to NM Partners in Flight (2016c), population estimates for the state are unknown.
Ferruginous hawk	Transient (Cartron 2010).

Common Name	Rationale for Removal from Potential SCC List
Golden eagle	Population trends for NM are holding at stable, and this species was detected every year during survey on the Carson NF (Beason et al. 2006).
Grace's warbler	According to Carson NF migratory bird surveys (Beason et al. 2006, 2007), this warbler was detected in high numbers every year within all suitable habitats and had a stable population trend. Also according to NMDGF (2016 and 2017), Grace's warbler was the most commonly detected species during the surveys of Sandia, Manzano, Magdalena, San Mateo, Zuni, Jemez, San Juan, and Sangre de Cristo mountain ranges.
Gray vireo	Population trends for NM are holding at stable, and this species was detected every year during survey on the Carson NF (Beason et al. 2006).
Juniper titmouse	There is an overabundance of snags in PJO and PJS on the Carson NF. PJO not departed and has a stable to upward habitat trend.
Lincoln's sparrow	Population trends for NM are holding at stable, and this species was detected every year during survey on the Carson NF (Beason et al. 2006).
Loggerhead shrike	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (Poole 2014).
Northern harrier	Transient (Cartron 2010).
Pine grosbeak	The SFF ERU is common and has a stable to upward habitat trend on the Carson NF and most is in wilderness areas.
Short-eared owl	Transient (Cartron 2010).
Virginia's warbler	Population trends for NM are holding at stable, and this species was detected every year during survey on the Carson NF (Beason et al. 2006).
Invertebrates	
Monarch	Transient (Lotts and Naberhaus 2014).
Spalding's blue butterfly	Inhabits rocky, talus slopes that has not changed from historical reference condition and that are not affected by any threats (Lotts and Naberhaus 2014).
Mammals	
American marten	The SFF ERU is common and has a stable to upward habitat trend on the Carson NF and most is in wilderness areas.
American pika	Inhabits rocky, talus slopes that has not changed from historical reference condition and that are not affected by any threats (BISON-M 2014).
Dwarf shrew	Inhabits rocky, talus slopes that has not changed from historical reference condition and that are not affected by any threats (BISON-M 2014).

Common Name	Rationale for Removal from Potential SCC List
Rocky Mountain bighorn sheep	Population trend is increasing (NMDGF 2018), habitat is not normally subject to impacts from management activities, likelihood of contact is low, and habitat trend is stable. (Reference Appendix 1)
Snowshoe hare	The SFF ERU is common and has a stable to upward habitat trend on the Carson NF and most is in wilderness areas.
White-tailed jackrabbit	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (Natureserve 2015).
Yellow-bellied marmot	Inhabits rocky, talus slopes that has not changed for historical reference condition and that are not affected by any threats (BISON-M 2014).
Plants	
Alpine bluebells	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (NMRPTC 1999).
Altai chickweed	Inhabits rocky/talus areas that has not changed from historical reference condition and that are not affected by any threats (SEINet 2014).
Arctic harebell	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (SEINet 2014).
Eastwood's podistera	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (SEINet 2014).
Golden saxifrage	Inhabits rocky/talus areas that has not changed from historical reference condition and and that is not affected by any threats (SEINet 2014).
Gunnison's mariposa lily	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (NMRPTC 1999).
Moosewort	Inhabits rocky, talus slopes that has not changed from historical reference condition and that is not affected by any threats (SEINet 2014).
New Mexico stickweed	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (NMRPTC 1999).
Nodding saxifrage	Inhabits rocky/talus areas that has not changed from historical reference condition and that is not affected by any threats (SEINet 2014).
Pecos fleabane	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (NMRPTC 1999).
Rocky Mountain nailwort	Inhabits rocky, talus slopes not changed from historical reference condition and are not affected by any threats (SEINet 2014, NMRPTC 1999).
Rocky Mountain spike-moss	Inhabits rocky/talus areas that has not changed from historical reference condition and that is not affected by any threats (SEINet 2014).
Showy alpine groundsel	Inhabits rocky/talus areas that has not changed from historical reference condition and that is not affected by any threats (SEINet 2014).
Stiff beardtongue	There is insufficient information to evaluate whether or not the species is at risk for persistence within the Carson NF (SEINet 2014).

Western Diamondback Rattlesnake

Only one record of the western diamondback rattlesnake has been confirmed on the Carson National Forest (NF). This species is normally found below the 36° parallel in New Mexico (Degenhardt et al. 1996), which is south of the Carson NF (37° parallel). The western diamondback that was identified on the Carson NF was located near a major highway. It is not known whether this species inhabits the Carson NF or if this one individual was accidently transported from further south. There is insufficient evidence as to whether this species is established within the Carson NF.

American Goldfinch, Golden Eagle, Gray Vireo, Grace's warbler, Virginia's warbler, and Lincoln's Sparrow

American goldfinch, golden eagle, gray vireo, Grace's warbler, Virginia's warbler, and Lincoln's sparrow have been detected every year during surveys and are well distributed within their associated habitats on the Carson NF (Beason et al. 2006, 2007; USDA FS Carson NF 2014b). According to breeding bird surveys (2014), population trends for these species within New Mexico are stable or increasing. The agency is required by law to protect golden eagle in accordance with the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c) and this species appears secure within the Carson NF. Since American goldfinch, golden eagle, gray vireo, Grace's warbler, and Lincoln's sparrow habitat is well distributed across the forest and their populations are stable or increasing, they appear secure within the Carson NF and their continued long-term persistence is not at risk.

American Dipper, Spalding's Blue Butterfly, American Pika, Dwarf Shrew, Yellow-Bellied Marmot, Altai Chickweed, Golden Saxifrage, Moosewort, Nodding Saxifrage, Rocky Mountain Spike-moss, Rocky Mountain Nailwort, and Showy Alpine Groundsel

American dipper, Spalding's blue butterfly, American pika, dwarf shrew, yellow-bellied marmot, Altai chickweed, golden saxifrage, moosewort, nodding saxifrage, Rocky Mountain spike-moss, Rocky Mountain nailwort, and showy alpine groundsel inhabit rocky outcrops and/or talus key ecosystem characteristics within various vegetation ecosystem response units (ERUs) across the Carson NF that are relatively isolated, in remote areas, and not normally subject to impacts from management activities (BISON-M 2014; NMRPTC 1999; Poole 2014). These key ecosystem characteristics are well distributed throughout the Carson NF and have not changed from historic reference condition (pp. 31-34 of assessment). Additionally, American pika, yellow-bellied marmot, Altai chickweed, Rocky Mountain spike-moss, Rocky Mountain nailwort, golden saxifrage, moosewort, and showy alpine groundsel are generally found in the Alpine and Tundra (ALP) ERU (p. 34 of assessment). ALP on the Carson NF is very susceptible to climate change, and given its current limited extent and elevation constraints is likely to decline in western mountain systems generally (USDA FS 2010a). However, ALP is lowly departed from reference conditions on the Carson NF, and when intensified by climate change is still only moderately departed into the future. (p. 298 of assessment). Also, 86 percent of ALP on the Carson NF already receives the highest level of protection, having been designated as wilderness. Designated wilderness areas provide high quality and contiguous alpine tundra habitat and are less influenced by human and management activities. There is no population or abundance distribution data for these species. Since the habitat is well distributed across the forest, the key ecosystem characteristic trend is stable, and the species are not normally subject to impacts from management activities due to

remoteness, these species appear secure within the Carson NF and their continued long-term persistence is not at risk.

Bald Eagle, Ferruginous Hawk, Short-eared Owl, Northern Harrier, and Monarch Butterfly

Bald eagle, ferruginous hawk, short-eared owl, northern harrier, and monarch butterfly are considered occasional transients, possibly accidental on the Carson NF (Cartron 2010; Lotts and Naberhaus 2014). The occurrence of resident or nesting bald eagles on the Carson NF is unlikely, since they generally require large open water areas as a source of food and none exist within the forest (Cartron 2010). An individual bald eagle is occasionally observed during the winter on the Carson NF (USDA FS Carson NF 2014b), but does not stay on the forest the entire winter. The bald eagle appears secure within the Carson NF and its continued long-term persistence is not at risk. Additionally, the agency is required by law to protect bald eagle in accordance with the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c). On rare occasions, an individual ferruginous hawk utilizes grasslands of the Carson NF, during the winter months (USDA FS Carson NF 2014b). In the summer, this species is found in open grasslands at lower elevations than the Carson NF (Cartron 2010). The short-eared owl and northern harrier have rarely been observed on Carson NF during the breeding season; however, breeding has not been confirmed (Cartron 2010). Breeding for these species has mostly been verified at lower elevations than the Carson NF. The monarch butterfly has been observed once in 1950 during the spring, as this species migrates between summer and winter ranges. Breeding and occurrence of this species during the summer has not been documented on the Carson NF (Lotts and Naberhaus 2014). In general, bald eagle, ferruginous hawk, short-eared owl, and northern harrier, are mostly observed occasionally observed the Carson NF during the winter, but do not stay on the forest the entire winter. There is insufficient population, abundance, and summer occurrence information to accurately evaluate whether the monarch butterfly's long-term persistence is currently at risk on the Carson NF. These species are transient and will be removed from further evaluation.

Band-tailed Pigeon

According to the New Mexico Department of Game and Fish, the band-tailed pigeon is available for hunting within New Mexico (NMDGF 2014). According to breeding bird surveys (Sauer et al. 2014), the band-tailed pigeon is declining within the State of New Mexico; however, there is still a hunting season for this bird. For the Carson NF, there is no band-tailed pigeon population or abundance data. Furthermore, there are no analyses throughout its range on whether changes in land use, structural land changes, or agricultural practices have affected band-tailed pigeon population or abundance (Poole 2014). There is insufficient population and abundance to accurately evaluate whether the band-tailed pigeon's long-term persistence is currently at risk on the Carson NF.

Flammulated Owl

According to NatureServe (2016), flammulated owl has a ranking of G5/N5B/S3. As stated in the directives 12.52d, species in the following categories should be considered: Species with status ranks of G1-3/T1-3 or S1 or S2 on the NatureServe ranking system. Also, according to a Carson NF wildlife biologist, when conducting Mexican spotted owl (MSO) surveys, flammulated owl was the most detected owl during these surveys. Detection of this owl has been documented on MSO forms for the last several years (personal communication with Jay Gatlin, Camino Real

Ranger District, 2015-2016). According to NM Partners in Flight (2016c), population estimates for the state are unknown. Therefore, this species appears secure within the Carson NF and its continued long-term persistence is not at risk.

Rocky Mountain Bighorn Sheep

Please see Appendix 1 for the qualitative risk assessment of Rocky Mountain bighorn sheep. Population trends for Rocky Mountain bighorn sheep within the Carson NF have been increasing since 2004 (NMDGF 2018; Rominger 2015, Step 2, Filter C), and bighorn sheep transplant trapping and hunting have occurred on the Carson bighorn sheep herd for several years to maintain desired carrying capacity (NMDGF 2014,). Also, the habitat trend for bighorn sheep is stable and abundant (Step 2, Filter D). Screes, cliffs, and rock features are widespread microsites within all vegetation communities. These ecological characteristics are inherently stable for long periods of time because they are changed primarily by geologic forces. The majority of the Rocky Mountain bighorn sheep on the Carson NF are found in the Alpine and Tundra (ALP) ERU (Assessment p. 34) and wilderness. ALP's departure from reference condition is low on the Carson NF, and when intensified by climate change it is still only moderately departed into the future (Assessment p. 298). Also, 86% of ALP on the Carson NF already receives the highest level of protection, having been designated as wilderness. Designated wilderness areas provide high quality and contiguous alpine tundra habitat and are less influenced by human and management activities. According to a 4-step qualitative bighorn sheep assessment (Appendix 1) the overall likelihood of contact for all of the Carson NF bighorn sheep is low (Step 2, Filter E). Rocky Mountain bighorn sheep are secure within the Carson NF and their continued long-term persistence is not at risk, since their population trend is increasing, habitat is stable and abundant, and the overall likelihood of contact for the Carson NF bighorn sheep population is low.

Bendire's Thrasher

Distribution of the Bendire's thrasher within New Mexico is spotty and, in some areas, poorly understood (Poole 2014). This species inhabits extremely arid piñon-juniper/desert habitat, which does not exist within the Carson NF. This species was sighted once on the forest by e-bird observers; however, species identification was performed through a process of elimination instead of a positive identification of the individual. Specifically, this observation was only determined to be a Bendire's thrasher, because elevation was too high for curve-billed thrasher (eBird 2014). Currently, it is unknown whether this thrasher truly inhabits the Carson NF as there is no habitat; therefore, it is removed from further evaluation.

Boreal Owl, Pine Grosbeak, American Marten, and Snowshoe Hare

Population and abundance data for boreal owl, pine grosbeak, American marten, and snowshoe hare is unknown state-wide and within the forest; however, these species have been observed within the Spruce-fir Forest (SFF) ERU (p. 46 of assessment) throughout the Carson NF. Currently there are 289,929 acres (18%) of SFF within the forest, of which 103,205 acres (36%) are in wilderness and inventoried roadless areas. The wilderness and inventoried roadless areas provide high quality, contiguous spruce-fir habitat that is less influenced by human activities. Currently, SFF is moderately departed from reference conditions at both the plan and context scales, mostly due to legacy timber harvests that removed old trees and built roads (p. 46 of assessment). However, the current disturbance regime is not significantly different from that of reference condition (Schoennagel et al. 2004; Vankat 2013). Over the next 100 years, spruce-fir

habitat on the Carson NF will approach reference condition, because of natural levels of disturbance and proper management activities (p. 46 of assessment); therefore, the future trend for SFF on the Carson NF is stable to increasing (p. 46 of assessment). For the following reasons boreal owl, pine grosbeak, American marten, and snowshoe hare are secure within the Carson NF and their continued long-term persistence is not at risk: (1) their preferred habitat (spruce-fir) is secure and increasing; (2) spruce-fir forest are well distributed across the forest; and (3) and habitat is not normally subject to impacts from management activities due to habitat remoteness.

Black and Brown-capped Rosy Finch

Little is known about the black and brown-capped rosy finch within New Mexico, because these species inhabits high mountain meadows in the winter and alpine tundra in the summer, making detection difficult (Poole 2014). These species has been observed on the Carson NF year around (USDA FS Carson NF 2014b, BirdConservancy 2018). ALP on the Carson NF is very susceptible to climate change, and given its current limited extent and elevation constraints is likely to decline in western mountain systems generally (USDA FS 2010a). However, ALP is lowly departed from reference conditions on the Carson NF, and when intensified by climate change is still only moderately departed into the future. (p. 298 of assessment). Also, 86 percent of ALP on the Carson NF already receives the highest level of protection, having been designated as wilderness. Designated wilderness areas provide high quality and contiguous alpine tundra habitat and are less influenced by human and management activities. There are no population or abundance data for these species on the Carson NF or New Mexico. Because these species breed in relatively isolated alpine habitat, especially in steep, rocky terrain, it is unlikely that human or management activities on its breeding grounds will occur or influence its status in the future (Poole 2014). There is insufficient population and abundance to accurately evaluate whether the black or brown-capped rosy finch's long-term persistence is currently at risk on the Carson NF.

Juniper Titmouse

Juniper titmouse has been detected during annual surveys on the Carson NF and is well distributed within the Pinon-Juniper Woodland (PJO) ERU (p. 65 of assessment) (Beason et al. 2006, 2007; USDA FS Carson NF 2014b). According to the Carson NF migratory bird surveys, this species' population is stable (Beason et al. 2006, 2007). Juniper titmouse utilizes standing dead trees (snags), which are abundant in their preferred PJO across the Carson NF (p. 80 of assessment). The future trend for PJO on the Carson NF is stable or increasing (p. 65 of assessment); therefore, this species appears secure within the Carson NF and its continued long-term persistence is not at risk.

Loggerhead Shrike

In New Mexico, the loggerhead shrike is found within desert grasslands and shrublands that are generally at lower elevations than the Carson NF (NMPIF 2012). Little is known about the loggerhead shrike population or abundance on the Carson NF, but this species has been observed occasionally within open grassland habitats of the forest (USDA FS Carson NF 2014b). This species population is declining across New Mexico; however, the cause is unknown (Poole 2014; Sauer et al. 2014). There is insufficient evidence as to whether this species is established within the Carson NF, population information, and abundance information to accurately evaluate whether the loggerhead shrike's long-term persistence is currently at risk on the Carson NF.

White-tailed Jackrabbit

The white-tailed jackrabbit has been observed on the Tres Piedras and Questa Ranger Districts (BISON-M 2014). The jackrabbit is associated with Montane Subalpine Grassland (MSG) and Sagebrush (SAGE) ERUs (pp. 37 and 73 of assessment)(BISON-M 2014). Population status across its entire distribution is not known, but assumed to be stable (IUCN 2015). The white-tailed jackrabbit prefers areas of disturbance with short grasses, which increases its visibility to detect predators. Most management actions on the Carson NF directly or indirectly benefit this species (BISON-M 2014). Because the white-tailed jackrabbit's population is considered secure and positively responds to management activities, the continued long-term persistence of this species on the Carson NF is not at risk.

Alpine Bluebells, Arctic Harebells, Eastwood's Podistera, and Pecos Fleabane

Alpine bluebells, arctic harebells, Eastwood's podistera, and Pecos fleabane inhabit the Alpine and Tundra (ALP) ERU (p. 34 of assessment) (New Mexico Native Plant Protection Advisory Committee 1984; NMRPTC 1999; SEINet 2014), but their populations and abundance are currently unknown within the Carson NF. Additionally, management threats (including grazing) to these species are not known (New Mexico Native Plant Protection Advisory Committee 1984; NMRPTC 1999). ALP on the Carson NF is very susceptible to climate change, and given its current limited extent and elevation constraints is likely to decline in western mountain systems generally (USDA FS 2010a). However, ALP is lowly departed from reference conditions on the Carson NF, and when intensified by climate change is still only moderately departed into the future. (p. 298 of assessment). Also, 86 percent of ALP on the Carson NF already receives the highest level of protection, having been designated as wilderness. Designated wilderness areas provide high quality and contiguous alpine tundra habitat and are less influenced by human and management activities. There is insufficient population and abundance information for these species and these species are not known to be impacted by management activities due to habitat remoteness, to accurately evaluate whether these species' long-term persistence is at risk on the Carson NF.

Gunnison's Mariposa Lily

Gunnison's mariposa lily, also known as Pecos mariposa lily (*Calochortus gunnisoni* var. *perpulcher*), has been observed on the Carson NF (NMRPTC 1999). However, it is extremely difficult to distinguish from common Gunnison's mariposa lily (*Calochortus gunnisoni*), which is also found on the Carson NF (NMRPTC 1999). This species may only be a different color form, instead of another variety, and needs further study. It occurs in meadows and aspen glades above 9,500 feet (NMRPTC 1999; SEINet 2014). The Gunnison's mariposa lily's abundance within its habitat and population is unknown for the Carson NF. Impacts from management threats on this species are also not currently known (NMRPTC 1999). There is insufficient abundance, population, and management threats information, as well as the inability to distinguish from other varieties, to evaluate whether the Gunnison's mariposa lily's long-term persistence is at risk on the Carson NF.

New Mexico Stickweed

New Mexico stickweed is found in disturbed shale or igneous based soils within montane coniferous forest (p. 46 of assessment) (NMRPTC 1999; SEINet 2014). Abundance and population information for this species on the Carson NF is unknown. Since New Mexico stickweed has spines, it is unpalatable and not impacted by grazing. Other land management uses would

benefit this species, as it thrives in disturbed or exposed soils (NMRPTC 1999). There is insufficient abundance, population, and management threats information to evaluate whether New Mexico stickweed's long-term persistence is at risk on the Carson NF.

Stiff Beardtongue

Stiff beardtongue inhabits Piñon-Juniper Woodland (PJO) ERU (p. 65 of assessment) (NatureServe 2015; SEINet 2014) only within the Jicarilla Ranger District. PJO is considered stable or increasing across the Carson NF (USDA FS Carson NF 2015). There is insufficient abundance, population numbers, and management threats information (NatureServe 2015); to accurately evaluate whether this species' long-term persistence is at risk on the Carson NF.

There are 26 potential SCC that meet the criteria of not being capable of persisting in the Carson NF over the long term. Western burrowing owl and Gunnison's prairie dog remained on the potential SCC list, as these species have concerns for persistence in the Carson NF; however, the concerns for persistence are due to actions or activities outside of agency control, authority, or capability.

In summary, Table 4 lists the potential 26 SCC that are documented to occur on the Carson NF and that the best available scientific information indicates substantial concern about their capability to persist over the long term in the Carson NF.

Table 4. Potential species of conservation concern for the Carson National Forest

Common Name	Scientific Name	NatureServe Ranking[1]
Amphibians and Reptiles		
Northern leopard frog	*Lithobates pipiens*	G4/Na5/S2
Western boreal toad	*Anaxyrus boreas*	G4/T1/Na4
Avians		
American peregrine falcon	*Falco peregrinus anatum*	G4/T4/Na3/S2
Northern goshawk	*Accipiter gentilis*	G5/Na4/S2
Pinyon jay	*Gymnorhinus cyanocephalus*	G5/Na5
Western burrowing owl	*Athene cunicularia hypugaea*	G4/T4/Na4
White-tailed ptarmigan	*Lagopus leucura*	G5/Na5/S1
Wilson's warbler	*Cardellina pusilla*	G5/Na5/S2
Fish		
Rio Grande chub	*Gila pandora*	G3/Na3
Rio Grande cutthroat trout	*Oncorhychus clarkii virginalis*	G4/T3/Na2/S2
Rio Grande sucker	*Catostomus plebeius*	G4/Na3/S2

[1] NatureServe Ranking - Global (G), Taxonomic (T), National (Na), or State (S)

Common Name	Scientific Name	NatureServe Ranking[1]
Invertebrates		
Nokomis fritillary butterfly	*Speyeria nokomis nokomis*	G3/T1/Na1/S1
Mammals		
Gunnison's prairie dog	*Cynomys gunnisoni*	G5/Na5/S2
Masked shrew	*Sorex cinereus*	G5/NA5/S2
Pale Townsend's big-eared bat	*Corynorhinus townsendii*	G4/T3/Na4
Spotted bat	*Euderma maculatum*	G4/Na4
Water shrew	*Sorex palustris*	G5/Na5/S2
Plants		
Alpine larkspur	*Delphinium alpestre*	G2/Na2/S2
Arizona willow	*Salix arizonica*	G3/Na3/S2
Chaco milkvetch	*Astragalus micromerius*	G3/Na3/S2
Chama blazing star	*Mentzelia conspicua*	G2/Na2/S2
Pagosa milkvetch	*Astragalus missouriensis var. humistratus*	G5/T1/Na1
Ripley's milkvetch	*Astragalus ripleyii*	G3/Na3
Robust larkspur	*Delphinium robustum*	G2?/Na2?
Small-headed goldenweed	*Ericameria microcephala*	G2/Na2/S2
Tufted sand verbena	*Abronia bigelovii*	G3/Na3

Step 3:

Associate the federally listed (Table 1) and potential species of conservation concern (Table 4) with current ecological conditions and key ecosystem characteristics described within ERUs on each of the Carson NF local zones.

The third step associated the 26 remaining potential SCC and 6 federally listed species with ecological condition and key ecosystem characteristics described within ERUs on the Carson NF, at the local scale (Figure 2). Vegetation is one of the primary factors that influences species diversity and abundance and is one of the more obvious habitat components influenced by management, land use, and natural disturbance. To make the species risk assessment relevant to other ecological risk assessments presented in this document and because vegetation is such a significant habitat component for species, vegetation types and key ecosystem characteristics were categorized following ecological response units (ERUs), as applied in the Terrestrial Vegetation (p. 34) and Riparian Vegetation (p. 116) sections of the assessment report. These ERUs are a stratification of ecosystem settings that are each similar in indicator plant species, succession patterns, and disturbance regimes that, in concept and resolution, are most useful to management. In other words, ERUs are the range of plant associations (USDA FS 1997), along

with structure and process characteristics that would occur when natural disturbance regimes and biological processes prevail (Schussman and Smith 2006).

A departed ERU may not contain the vegetation that would have existed under the natural range of variation (NRV) and historical disturbance regime. However, the assessment of vegetation characteristics within each ERU quantifies the current ecological conditions of each ERU. Species presence and absence on the forest is, in many cases, directly tied to availability, current ecological condition, and key ecosystem characteristics of ERUs. Associating particular ERUs with specific species is critical for assessing future management needs. The description of current ecological condition for each ERU is within Terrestrial Vegetation (p. 34) and Riparian Vegetation (p. 116) sections of the assessment report and were use to discern the status of the ecological conditions on the forest that are necessary to recover federally listed species, conserve proposed and candidate species, and maintain viable populations of species of conservation concern.

Wildlife and plant species were associated with up to 9 dominant ERU types (Table 5). These associations were informed by a number of different sources, including the Biota Information System of New Mexico (BISON-M 2014), the New Mexico Rare Plants Website (NMRPTC 1999), NatureServe Data Explorer (Natureserve 2015), and personal communications with species experts and agency biologists.

In many cases, species' habitat needs were not represented solely by the overall ecological conditions of ERUs, but by more specific ecosystem characteristics required by the species (e.g., avians requiring snags or rocky outcrops for perching or nesting). In these cases, specific ecosystem characteristics were recorded and assessed separately from the ERU model (Table 5). Overall, an effort was made to associate species with ERUs (based on current ecological conditions described therein) whenever possible, because later stages of forest plan revision and development will center on the management of ERUs. This relationship between species and ERUs is the premise of the coarse-filter approach discussed above and appropriate management of ERUs is expected to benefit at-risk and common and abundant species. The relationship between species and key ecosystem characteristics will help to identify fine-filter approaches necessary for preserving species diversity on the Carson NF.

Table 5. Federally listed (*) and potential species of conservation concern currently known to occur in the Carson NF and associated ecological response unit types. An "X" in a column indicates presence in that ERU.

Common Name	ALP	MSG	BP	SFF	MCW	MCD	PPF	PJO	PJS	SAGE	HERB	WTLA	UMCW	NSPR	NSHR	RGCS	Aquatics
Amphibians and Reptiles																	
Northern leopard frog		X									X						X
Western boreal toad																	X
Avians																	
American peregrine falcon	X	X			X	X	X	X	X	X	X						
Mexican spotted owl*					X	X	X							X	X	X	
Northern goshawk				X	X	X	X										
Southwestern willow flycatcher*												X			X	X	
Pinyon jay								X	X								
Western burrowing owl		X								X							
Western yellow-billed cuckoo*															X	X	
White-tailed ptarmigan	X																
Wilson's warbler												X	X	X			
Fish																	
Rio Grande chub																	X
Rio Grande cutthroat trout																	X
Rio Grande sucker																	X

Common Name	ALP	MSG	BP	SFF	MCW	MCD	PPF	PJO	PJS	SAGE	HERB	WTLA	UMCW	NSPR	NSHR	RGCS	Aquatics
Invertebrates																	
Nokomis fritillary butterfly											X				X	X	
Mammals																	
Black-footed ferret*		X								X							
Canada lynx*				X	X												
Gunnison's prairie dog		X								X							
Masked shrew		X	X	X	X						X	X	X	X			
New Mexico meadow jumping mouse*											X	X			X	X	
Pale Townsend's big-eared bat				X	X	X	X	X									
Spotted bat							X	X	X	X	X						
Water shrew											X	X	X	X			
Plants																	
Alpine larkspur	X	X															
Arizona willow		X										X	X				
Chaco milkvetch							X	X									
Chama blazing star								X	X								
Pagosa milkvetch							X	X									
Ripley's milkvetch							X	X	X	X							

Common Name	ALP	MSG	BP	SFF	MCW	MCD	PPF	PJO	PJS	SAGE	HERB	WTLA	UMCW	NSPR	NSHR	RGCS	Aquatics
Robust larkspur				X	X	X					X	X	X	X			
Small-headed goldenweed							X										
Tufted sand verbena								X	X	X							

Species can be grouped a number of different ways that are useful for identifying broad threats to their continued existence on the Carson NF. For efficiency during the risk assessment portion of this evaluation, species were grouped according to their associated ERUs, described above and presented in Table 5. This information is summarized by taxonomic group in Table 6. It is acknowledged that grouping species in this manner will not accurately capture all of their specific habitat needs, and so they have also been sorted by key ecosystem characteristics (Table 7).

Table 6. Federally listed species and potential species of conservation concern summarized by taxonomic group and their associated ERUs

ERU	Amphibs	Avians	Fish	Inverts	Mammals	Plants	Total
Alpine & Tundra (ALP)		2				1	3
Montane Subalpine Grassland (MSG)	1	2			3	2	8
Bristlecone Pine (BP)					1		1
Spruce-Fir Forest (SFF)		1			3	1	5
Mixed Conifer, with Aspen (MCW		3			3	1	7
Mixed Conifer, Frequent Fire (MCD)		3			1	1	5
Ponderosa Pine Forest (PPF)		3			2	3	8
Piñon-Juniper Woodland (PJO)		2			2	5	9
Piñon-Juniper Sagebrush (PJS)		2			1	4	7
Sagebrush (SAGE)		2			3	2	7
Herbaceous Riparian (HERB)	1	1		1	4	1	8
Willow-Thinleaf Alder (WTLA)		2			3	2	7
Upper Montane Conifer-Willow (UMCW)		1			2	2	5
Narrowleaf Cottonwood-Spruce (NSPR)		2			2	1	5
Narrowleaf Cottonwood Shrub (NSHR)		3		1	1		5
Rio Grande Cottonwood-Shrub (RGCS)		3		1	1		5
Aquatics	2		3				5

Table 7. Key ecosystem characteristics associated with federally listed species (*) and potential species of conservation concern known to currently occur in the Carson NF

Associated Key Ecosystem Characteristics	Associated Species
Tree features (cavities, snags, leaves, bark, downed logs, leaf or forest litter)	• Mexican spotted owl* • Northern goshawk • Pinyon jay • Canada lynx • Pale Townsend's big-eared bat • Spotted bat
Rock features (canyons, cliffs, crevices, outcrops, mine adits)	• American peregrine falcon • Mexican spotted owl* • Pale Townsend's big-eared bat • Spotted bat • Alpine larkspur • Chaco milkvetch • Small-headed goldenweed • Tufted sand verbena
Riparian and aquatic features (riparian areas, springs, permanent water)	• Northern leopard frog • Mexican spotted owl* • Southwestern willow flycatcher* • Western yellow-billed cuckoo* • Wilson's warbler • Rio Grande chub • Rio Grande cutthroat • Rio Grande sucker • Western boreal toad
Meadows and small openings	• Northern leopard frog • American peregrine falcon • Western burrowing owl • Black-footed ferret* • Gunnison's prairie dog • Masked shrew • Alpine larkspur • Arizona willow
Alpine and tundra	• American peregrine falcon • White-tailed ptarmigan • Alpine larkspur
Soil features (soil type, soil permeability, and soil condition)	• Western burrowing owl • Black-footed ferret • Gunnison's prairie dog • Masked shrew • Alpine larkspur • Arizona willow • Chaco milkvetch • Chama blazing star • Pagosa milkvetch • Ripley's milkvetch • Robust larkspur • Small-headed goldenweed • Tufted sand verbena

During the data-gathering and risk assessment portions of the assessment report, species were also grouped by individual zones within ranger districts (local scale, Figure 2). This grouping was appropriate for analysis of endemic or specialized species. It is expected that this may also benefit other planning purposes; however, caution should be exercised when making comparisons between local zones (Table 8).

Table 8. Federally listed, proposed, and potential species of conservation concern summarized by taxonomic group and associated local scale on the Carson National Forest[1]

Local Scale	Amphibs	Avians	Fish	Inverts	Mammals	Plants	Total
Jicarilla (Ji)	1	7	0	0	4	1	13
Cruces Basin (Cb)	2	6	3	1	8	3	23
Rio Chama (Rc)	2	7	2	1	8	4	24
Vallecitos (Vc)	1	7	3	1	7	6	25
Rio Grande (Rg)	1	6	2	1	4	1	15
Red River (Rr)	1	8	1	1	7	4	22
Valle Vidal (Vv)	1	6	1	1	8	3	20
Camino Real (Cr)	1	8	2	1	8	4	24

Step 4:

Perform a risk assessment analysis on federally listed and potential species of conservation concern, with their associated ERUs.

The final step of the process involved a risk assessment analysis on the remaining 32 species, both federally listed and potential SCC (Table 5). This was performed using the Risk Assessment Database (RAD), which is designed to assess habitat, population, and threat factors for each of the species in terms of historical, current, and future trends for each local zone. Numerical values (1 = high; 2 = moderate; or 3 = low) were assigned to habitat, population, and threat factors to analyze risk of persistence for each species. For example, a bird documented on all 8 local zones and known to use 3 different ERUs would undergo 24 separate risk assessments. Determining a numerical ranking of risk at the level of individual populations or habitat factors is not possible; however, the individual risk assessments provided in the RAD can contribute to our understanding of these factors.

The dual coarse-filter and fine-filter approach described earlier was used to assess risk to species on the Carson NF. The coarse-filter approach considered ERUs (habitat) associated with species and current condition and future trends of these ERUs were modeled using the Vegetation Dynamics Development Tool (VDDT) (ESSA 2006). This tool was used to simulate stand structure 15 years, 100 years, and 1,000 years into the future under current management. The data

[1] Some species are associated with more than one local zone.

presented in the Terrestrial Vegetation (p. 34) and Riparian Vegetation (p. 116) sections of the assessment report is modeled at the plan or forest-wide scale of analysis. Additional VDDT modeling for departure at current conditions was performed at the local scale for terrestrial ecosystems (p. 13 of assessment) and this finer scale of resolution was used for the species risk assessment. Some of the results of that modeling are presented in Table 9 and the rest is available in the forest plan revision project record (ESSA 2006).

Table 9. Risk to ERUs (habitat) in local zones using Vegetation Dynamics Development Tool modeling[1]

ERU	Jicarilla	Cruces Basin	Rio Chama	Valle-citos	Rio Grande	Valle Vidal	Red River	Camino Real	Modeled Departure in 100 Years Forest-wide
Alpine & Tundra (ALP)							Low	Low	Mod
Montane Subalpine Grassland (MSG)		Mod	Mod	High		Mod	High	Mod	High
Bristlecone Pine (BP)						Mod			Mod
Spruce-Fir Forest (SFF)		Low	Low	Low		Low	Low	Low	Low
Mixed Conifer, with Aspen (MCW)		Low	Low	Low		Low	Low	Low	Mod
Mixed Conifer, Frequent Fire (MCD)		High	High	High		High	Mod	High	Mod
Ponderosa Pine Forest (PFF)	High	High	High	High	High	High	High	High	High
Piñon-Juniper Woodland (PJO)	Low	Low	Mod	Low	Low		Low	Low	Low
Piñon-Juniper Sagebrush (PJS)	Mod		Mod	Mod	Mod		Mod	Mod	Mod
Sagebrush (SAGE)	High		High		Mod			High	High
Herbaceous Riparian (HERB)	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod	Mod
Willow-Thinleaf Alder (WTLA)	High	High		High		High	High	High	High
Upper Montane Conifer-Willow (UMCW)		Low	Low	Low				Low	Low

[1] ERUs are divided by local zone and the departure from a reference condition are presented. The current local departure and future forestwide departure are shown for each ERU. Gray indicates that ERU is not present on that local zone.

ERU	Jicarilla	Cruces Basin	Rio Chama	Valle-citos	Rio Grande	Valle Vidal	Red River	Camino Real	Modeled Departure in 100 Years Forest-wide
Narrowleaf Cottonwood-Spruce (NSPR)				Mod			Mod	Mod	Mod
Narrowleaf Cottonwood Shrub (NSHR)		Mod		Mod			Mod	Mod	Mod
Rio Grande Cottonwood-Shrub (RGCS)	High		High	High	High				High
Streams	High	High	High	High	High	High	High	High	High
Waterbodies	High	Low	Mod	Low	Low	High	Mod	Mod	High

Trend was not calculated for Alpine and Tundra (ALP, p. 34 of assessment), Bristlecone Pine (BP, p. 42 of assessment), and unspecified aquatic ERUs, where forest acreages were too small to adequately model in VDDT or where structure stand is not appropriate for VDDT modeling. Because these ecological conditions of these ERUs are important to species, they are rated qualitatively (low, medium, high) on professional judgment (Table 9).

Currently, most of the modeled ERUs are partially departed from reference and are predicted to be departed from reference 100 years from now. An extensive discussion of that analysis is presented in Terrestrial Vegetation (p. 34) and Riparian Vegetation (p. 116) sections of the assessment report, and is only briefly summarized here. Fire regimes are disrupted in all but the highest elevation ERUs on the forest, due to historic overgrazing and over a century of fire suppression. The lack of fire has led to a shift toward smaller diameter trees and denser stands in frequent fire systems (MCD, p. 56 and PPF, p. 60 of assessment) and expansion and infill by tree species in Montane Subalpine Grassland (MSG, p. 37 of assessment), Piñon-Juniper Woodland (PJO, p. 65 of assessment), Piñon-Juniper Sagebrush (PJS, p. 69 of assessment) and Sagebrush (SAGE, p. 73 of assessment). Many wildlife species are dependent on shrub and forb species that once grew in the understory of various ERUs, but are now crowded out by this overall shift in seral structure and density. Additionally, years of prolonged drought combined with overstocked stands increases the risk of higher-intensity, more severe fires that could further eliminate habitat in all ERUs.

Key ecosystem characteristics important to wildlife and plants, such as coarse woody debris, that provide shelter, food, and moisture retention and standing snags of sufficient size for roosting, nesting, or foraging, are also departed from reference conditions (see Summary of Ecosystem Characteristics for Terrestrial Vegetation, Coarse Woody Debris and Snag Density, p. 80 of assessment). These key ecosystem characteristics are somewhat more transient on the landscape. For example, as snags fall and eventually decay, standing live trees die and become new snags. In some ERUs, where smaller diameter trees are favored, the recruitment rate of large trees may be less than required to provide adequate habitat for species such as Mexican spotted owl or northern goshawk.

For all modeled ERU types, the current departure from reference condition and modeled departure for 100 years into the future were entered into the RAD. Qualitative determinations for those ERU types not modeled were made using knowledge of current condition and expert opinion. The RAD calculates an overall risk rating for each ERU-local zone combination entered based on the parameters described below. The **bold** words describe how each parameter is identified in the RAD. Each qualitative ranking selected is assigned a numerical value between 1 and 3 and then an overall habitat risk ranking value is calculated. All parameters below are evenly weighted in this calculation. They are summarized as follows:

1. The **extent of habitat available** to a species does not change from reference to future conditions. As stated above, ERU map units reflect the potential of a site and the historical disturbance regime. These are not expected to change at the time scales used; therefore, the amount of habitat available in historical/reference conditions does not change when moving to current or future conditions. ERUs that make up less than 5 percent of the plan area provide low amounts of habitat. Moderate amounts of habitat are ERUs that range from 6 to 50 percent, and high amounts of habitat make up 51 to 100 percent of the plan area.

2. **Quality of habitat** represents the current ecological condition of ERU departure from reference. It is assumed that all habitats were sufficient to maintain viability during reference conditions. For current conditions, ERUs in low departure are considered high quality, ERUs in moderate departure are moderate quality, and ERUs in high departure are low quality. ERUs modeled 100 years into the future represent the future trend in habitat quality. While it is acknowledged that highly departed ERUs that are not necessarily low quality habitat for wildlife, for the purpose of this risk assessment, that is the assumption. The VDDT modeling for ERUs on the Carson NF represents the most comprehensive habitat data available. More detailed habitat information for the SCC is indicated, where available.

3. **Distribution** is a qualitative measure that indicates the representativeness and redundancy (p. 139 of assessment) of ERU types across local zones. ERUs were determined to be even (habitat dispersed broadly), restricted (habitat restricted to certain areas), or highly fragmented (habitat isolated and separated by distance or barriers). The consistency of these ratings was also assessed across historical, current, and future trends.

4. **Processes** refer to ecological processes, such as herbivory, fire, and flooding, and were evaluated using ERU departure. Similar to quality of habitat, it is assumed these processes were functioning in historical conditions. ERUs that are 0 to 50 percent departed are classified as functioning in both current and future conditions. ERUs that are 51 to 100 percent departed are considered disrupted. The future trend in quality of habitat reflects ERUs modeled for 100 years from the present time.

After the risk to ERUs and key ecosystem characteristics (habitats) were analyzed and entered into the RAD, the historic, current, and future trend of potential SCC populations were evaluated. The RAD steps the user through a similar analysis of historical, current, and future population trends. Qualitative rankings are assigned a numerical value of 1 to 3. Overall risk to populations is then calculated where all parameters are weighted equally. As with the analysis of habitats, a number of assumptions were made regarding population trends. Data informing these trends were gathered from a variety of places including NatureServe (2015), BISON-M (2014), and North American Breeding Bird Survey Data (Sauer et al. 2014).

5. **Distribution** refers to the species occurrence on the Carson NF, with respect to the nation-wide range for that species. Detailed distribution maps for breeding birds were available from North American Breeding Bird Survey Data (Sauer et al. 2014) and NatureServe (2015), as well as distribution maps for many non-avian species. Distribution of the species on the Carson NF was determined by evaluating the availability and location of suitable habitat. Within a single species, populations across the forest were determined to be either in high isolation, moderate isolation, or high interaction with one another.

6. **Size** refers to the overall population size across the species' range. Detailed information about populations of each species on just the Carson NF was not available in most cases. Population sizes were categorized as small, moderate, or large.

7. **Stability** refers to a population's relative trend towards increasing, decreasing, or remaining the same. In nearly all cases, population trend information specific to the Carson NF was not available, which constitutes a data gap in the analysis. For these instances, trend was inferred from regional or state information where possible. Trends were assumed stable if it was unclear whether or not populations were increasing or decreasing, or if the trends were not significant. All species were ranked as either in decline, stable, or increasing.

8. **Diversity** refers to phenotypic, ecological, and genetic diversity. If there was no information available regarding diversity for a species then moderate diversity was selected for that species.

Once population factors have been evaluated, the RAD enables other threats to be analyzed, including human related harassment, invasive species, diseases, parasitism, obstructions (e.g., collisions with wind turbines, cars), or predation (Table 10). The severity of each threat is determined to be low, moderate, or high and the likelihood of that threat is also determined to be low, moderate, or high. Unlike the habitat or population factors which require assessment, these other threats do not require assessment if no data is available. Again, numerical values are assigned to both the severity and likelihood ratings. The RAD then calculates overall numerical risk (1to 3) to each species and assigns a qualitative rank (high, moderate, low).

Table 10. Additional threats to federally listed (*) and potential species of conservation concern on the Carson National Forest

Additional Threats	Affected Species
Harassment (e.g., human presence disrupting species during sensitive life stages, dogs, disturbance from mining, recreational, oil/gas development activities, target shooting)	• American peregrine falcon • Mexican spotted owl* • Northern goshawk • Pinyon jay • Southwestern willow flycatcher* • Western burrowing owl • Western yellow-billed cuckoo* • White-tailed ptarmigan • Wilson's warbler • Canada lynx* • Gunnison's prairie dog • Pale Townsend's big-eared bat • Spotted bat • Alpine larkspur • Arizona willow • Chaco milkvetch • Chama blazing star • Pagosa milkvetch • Small-headed goldenweed • Tufted sand verbena
Invasive Species	• Northern leopard frog • Western boreal toad • Rio Grande chub • Rio Grande cutthroat trout • Rio Grande sucker • New Mexico meadow jumping mouse • Arizona willow • Alpine larkspur • Chama blazing star • Chaco milkvetch • Pagosa milkvetch • Ripley's milkvetch • Robust larkspur • Small-headed goldenweed • Tufted sand verbena
Diseases (e.g., White-nose syndrome, chytrid fungus, sylvatic plague)	• Northern leopard frog • Western boreal toad • Western burrowing owl • Rio Grande cutthroat trout • Gunnison's prairie dog • Pale Townsend's big-eared bat • Spotted bat
Parasitism (including nest parasitism from brown-headed cowbirds, whirling disease)	• Southwest willow flycatcher* • Wilson's warbler • Rio Grande cutthroat trout

Additional Threats	Affected Species
Obstructions (e.g., dams, barriers, roads, collisions with wind turbines or vehicles)	• American peregrine falcon • Western burrowing owl • Western yellow-billed cuckoo* • White-tailed ptarmigan • Rio Grande chub • Rio Grande cutthroat trout • Rio Grande sucker • Canada lynx* • Pale Townsend's big-eared bat • Spotted bat
Predation	• Northern leopard frog • Mexican spotted owl* • Northern goshawk • Western burrowing owl • White-tailed ptarmigan • Rio Grande chub • Rio Grande cutthroat trout • Rio Grande sucker • Gunnison's prairie dog • Masked shrew • New Mexico meadow jumping mouse* • Water shrew • Ripley's milkvetch • Robust larkspur • Arizona willow • Chama blazing star

Federally Listed Species and Species of Conservation Concern and Current Carson Management

All of the federally listed species and potential SCC can be affected by the management activities authorized under the current Carson forest plan. Risk was not assessed for ERUs or other habitat factors on non-NFS lands. Therefore, it is not possible to state with certainty the overall risk to the species at the context scale. However, for many of these species, habitat provided on the forest represents the majority of habitat available. Changing land use patterns, habitat degradation and loss, or simply the lack of suitable habitat off of the forest, places a particular emphasis on the Carson NF to maintain these species.

Federally Listed Species

New Mexico Meadow Jumping Mouse

New Mexico meadow jumping mouse (*Zapus hudsonius luteus*) is federally listed as endangered. This species occurs in dense mid-elevation riparian areas (Herbaceous, Willow-Thinleaf Alder, Upper Montane Conifer-Willow, and Narrow Cottonwood-Shrub riparian ERUs) with dense and tall grass key ecosystem characteristics in the western U.S. It was historically documented on the Carson NF, but recent surveys on the forest were unable to detect this species. The number of historic locations of this species on public lands is far greater than on private land (Frey and Malaney 2009). The Carson NF currently has potential habitat for this species, but it is limited and highly fragmented. Major threats include the degradation of riparian habitat because of grazing, post-wildfire flooding events, and unmanaged recreation. Agricultural uses and development of land outside the forest boundary have permanently changed historic locations, which makes any potential habitat on the Carson NF vital.

Western Yellow-billed Cuckoo

Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is federally listed as threatened west of the Rio Grande (distinct population segment). The species occurs in dense cottonwood and willow riparian habitats (Narrow Cottonwood-Shrub, Rio Grande Cottonwood-Shrub riparian ERUs) in the western U.S. Although it has not been documented on the Carson NF, it is possible the species uses the Carson NF. The major threat to the species is the loss of riparian habitat, because of invasive species and changing water use and land use. Cuckoos are also susceptible to tower and turbine strikes. Current emphasis on prescribed burning in upland habitat has led to insufficient emphasis and funds for restoration in riparian areas with high potential for quality habitat. Protecting native saplings from grazing in restored areas is also a problem. The removal of non-native invasive woody species and the subsequent replanting of native cottonwood and willows require extensive multi-partner planning, involvement, and investment.

Southwestern Willow Flycatcher

Southwestern willow flycatcher (*Empidonax traillii extimus*) is federally listed as endangered and relies on dense riparian areas (Willow-Thinleaf Alder, Narrowleaf Cottonwood-Shrub, Rio Grande Cottonwood-Shrub riparian ERUs) typically dominated by the key ecosystem characteristic of dense willow species. There are 148 acres of designated critical habitat on the Camino Real RD of the Carson NF. This is described in more detail in Chapter III. Designated Areas (p. 442) of the assessment report. Threats include loss of riparian habitat from altered hydrology, clearing and controlling non-native, increased fire risk, due to the establishment of non-native plants, unmanaged grazing, and nest parasitism by the brown-headed cowbird. These threats have consequently reduced population levels range-wide for this species.

Mexican Spotted Owl

Mexican spotted owl (*Strix occidentalis lucida*) is federally threatened species on the Carson NF. There are 22,954 acres of designated critical habitat on the Jicarilla RD of the Carson NF. This is described in more detail in Chapter III. Designated Areas (p. 442 of assessment). Although numerous surveys have not documented this species on the Carson NF, a recent record described the movement of a Mexican spotted owl banded on the Gila NF and was found dead on private property adjacent to the Questa RD of Carson NF in 2012 (Ganey and Jenness 2013). The Mexican spotted owl requires a variety of mixed conifer habitats (Mixed Conifer, with Aspen, Mixed Conifer, Frequent Fire, and Ponderosa Pine Forest ERUs), with key ecosystem characteristics of proximity to riparian areas, standing large snags for roosting and nesting, or cavities in vertical canyon walls. Timber management activities negatively affected habitat before the Mexican spotted owl was listed as threatened in 1995. Timber harvest, prescribed burning, and other management activities are designed following the Mexican Spotted Owl Recovery Plan (2012b) along with consultation from FWS. These management activities can still have disturbance affects to the MSO, but they are minimalized.

Canada Lynx

Canada lynx (*Lynx canadensis*) is a federally threatened species and is not known to den or breed on the forest. Historically, the Carson NF did not support a naturally resident lynx population (USDI FWS 2014a), but occasionally an individual may roam out of Colorado onto the forest. In New Mexico, this species is a habitat specialist confined largely to mid- to high elevation boreal and subalpine spruce-fir forests at 9,800 to 12,000 feet in elevation (Spruce-Fir Forest ERU) (Koehler and Brittell 1990; Ruggiero et al. 1999). Snowshoe hare is the primary forage for this species. Lynx do not typically reside on the Carson NF because the forest lacks the aforementioned physical and biological features necessary to sustain a population (USDI FWS 2014a). Forest management activities are not expected to have any effect on this species as it only utilizes the forest occasionally.

Black-footed Ferret

Black-footed ferret (*Mustela nigripes*) is a federally endangered species that is not known to occur on the Carson NF. This species is closely tied to the presence of prairie dog colonies of at least 80 to 100 acres in size depending upon the prairie dog species (USDI FWS 2013). Currently, there are no prairie dog colonies of this magnitude on the Carson NF. Forest management activities are not expected to have any effect on this species as suitable habitat features do not currently exist on the Carson NF.

Potential Species of Conservation Concern

Information on the species below indicates substantial concern about the species' capability to persist over the long term in the plan area, as evidenced by one or more of the following criteria:

1. Habitat is limited, rare, or has a downward trend within the plan area.
2. Current management activities that are of sufficient duration, intensity, and magnitude to be a threat to the species or species habitat within the plan area.
3. Available monitoring indicates a decline in population, range, or both within the plan area.

All species listed met one or more of the initial requirements for SCC (Table 4) and a number of sources were consulted to determine whether the above criteria were met (see Evaluating Relevant Information for At-Risk Species, p. 6). Additional threats for special habitat features used by potential SCC and federally listed are presented in Table 11.

Table 11. Primary threats to key ecosystem characteristics and their associated species[8]

Key Ecosystem Characteristic	Primary Threats	Associated Species
Tree features, cavities, snags, leaves, bark, downed logs, leaf or forest litter	• Fire not only creates but can also consume tree features directly resulting in the loss of nesting, breeding, and roosting habitat. Smoke from fire can displace species and cause direct mortality. • Trampling can cause mortality to individuals occupying leaf litter. • Timber harvest activities may result in direct damage/loss of trees and snags. • Large-scale outbreaks of insects or disease could threaten large areas of habitat.	• Northern goshawk • Mexican spotted owl* • Pinyon jay • Wilson's warbler • Canada lynx* • Masked shrew
Rock features, canyons, cliffs, crevices, outcrops	• Activities including recreational rock climbing, caving, mining, mine reclamation, construction and vandalism, can disturb or damage habitat. • Removal of surface rock causes direct mortality and damages habitat. • Alterations of the rock surfaces such as removing rock through excavation or rock climbing, can alter the habitat enough to prevent plant establishment. • Trampling of plants in crevices causes direct mortality.	• American peregrine falcon • Mexican spotted owl* • Spotted bat • Pale Townsend's big-eared bat • Alpine larkspur •Chaco milkvetch • Chama blazing star • Pagosa milkvetch • Small-headed goldenweed • Tufted sand verbena

[8] An asterisk (*) denotes federally listed species. All others are potential species of concervation concern.

Key Ecosystem Characteristic	Primary Threats	Associated Species
Aquatic features, riparian areas, springs, permanent water	• Groundwater depletion and streamflow diversion, roads, trails, facilities, nonnative plant species and upland species encroachment, uncharacteristic fire in riparian and adjacent areas, mining, or unmanaged herbivory, leads to loss or damage of riparian characteristics. • Disturbance to soil in these areas due to unmanaged herbivory, dispersed camping, or construction activities can decrease plant numbers. • Spring development for livestock or wildlife use decreases water available for local ecosystems and trampling further degrades these areas. • In some places, invasive species can out-compete native species found only in aquatic features.	Northern leopard frog • Western boreal toad • Mexican spotted owl* • Southwestern willow flycatcher* • Western yellow-billed cuckoo* • Wilson's warbler • Rio Grande chub • Rio Grande cutthroat trout • Rio Grande sucker • Nokomis fritillary butterfly • Masked shrew • New Mexico meadow jumping mouse* • Water shrew • Arizona willow • Robust larkspur
Alpine, tundra, meadows, small openings, other grassland features	• Unmanaged herbivory can change local conditions and invertebrate communities. • Encroachment by woody vegetation eliminates grasses and forbs and decreases the size of these features.	• Northern leopard frog • Western boreal toad • Western burrowing owl • White-tailed ptarmigan • Gunnison's prairie dog • Masked shrew • Alpine larkspur • Arizona willow • Ripley's milkvetch • Robust larkspur
Soil features, soil type, soil permeability, soil condition	• In some places, invasive species can out-compete native species found only in special soil types. • Disturbance to soils from dispersed camping, off-highway vehicle use, unmanaged herbivory, or mining can negatively impact species.	• Western burrowing owl • Gunnison's prairie dog • Masked shrew • Alpine larkspur • Arizona willow • Chaco milkvetch • Chama blazing star • Pagosa milk-vetch • Ripley's milkvetch • Robust larkspur • Small-headed goldenweed • Tufted sand verbena

Northern Leopard Frog

Northern leopard frog (*Lithobates pipiens*) is currently found in all local zones. There are also historic records documenting this species on each local zone. This aquatic species requires springs, slow streams, or other perennial water for overwintering (all riparian ERUs and aquatic ecosystems), which currently is found within less than 5 percent of the forest (Step 2, filter D). These ERU habitats are currently highly departed and in a downward trend on the Carson NF (Step 2, filter D). Current threats to these species and its habitat include habitat degradation caused by grazing (91% potential habitat affected), chytrid fungus, lack of beaver ponds, depredation by bull frogs, or siltation from poor road management (69% potential habitat affected) (Step 2, filter E). These threats have contributed to the current ecological conditions of riparian areas on the Carson NF, which in turn has limited species distribution within these

ERUs (Step 2, filter D). This species has become extirpated from parts of its historic range on the Carson NF (Step 2, filter C).

Western Boreal Toad

Western boreal toad (*Anaxyrus boreas*) was confirmed at Lagunitas, Canjilon, and Trout Lakes on the Carson NF (Step 2, filter D). This aquatic species requires springs, slow streams, or other perennial water associated with spruce-fir forest (Spruce-Fir Forest ERU and aquatic ecosystems). During warmer months, it may be found in wet meadows or other habitats near standing water, which are limited on the Carson NF (Step 2, filter D). Presently, ecological conditions are highly departed and in a downward trend on the Carson NF (Step 2, filter D). Current threats include degradation of these habitats caused by grazing (67% occupied habitat affected), chytrid fungus, lack of beaver ponds, and depredation by bull frogs, or siltation from poor road management (67% occupied habitat affected) (Step 2, filter E). These threats have contributed to the current ecological condition for riparian areas on the Carson NF, which in turn has limited species distribution within these habitat types (Step 2, filter D). According to NMDGF (2006a), western boreal toads are currently only found in Canjilon and Trout lakes and in low numbers (Step 2, filter C).

American Peregrine Falcon

American peregrine falcon (*Falco peregrinus anatum*) is found on all local zones where it nests in cliffs and rock outcrops, a key ecosystem characteristic found within all terrestrial ERUs and stable (c Step 2, filter D). Threats include disturbance from recreational climbing (46% known sites affected) (Step 2, filter E). Of the known eyries on the Carson NF, about a quarter of them were monitored each year under independent contracts through the US Fish and Wildlife Service or NMDGF. Long-term monitoring efforts documented declining productivity of American peregrine falcon from 2001-2013 in New Mexico (Johnson and Williams III 2014) (Step 2, filter C).

Northern Goshawk

Northern goshawk (*Accipiter gentilis*) is a forest habitat generalist that uses a wide variety of forest ages, structural conditions and successional stages in Spruce-Fir Forest, Mixed Conifer, with Aspen, Mixed Conifer, with Frequent Fire, and Ponderosa Pine Forest ERUs. Ecological conditions of most of these ERUs are currently departed from reference on the Carson NF, because of historic fire suppression activities and wildfire (Step 2, filter D). These ERUs are also in a downward habitat trend (Step 2, filter D). This species can be found on all local zones. Threats to this species on the Carson NF include large-scale thinning (<5% of potential habitat impacted) and recreation (13% of potential habitat impacted, Step 2, filter E). Following the northern goshawk guidelines, continually monitoring known nest sites, and surveying for new nests is sufficient to eliminate substantial concern about the species' capability to persist over the long term on the Carson NF (Step 2, filter C), however habitat is departed (Step 2, filter D).

Pinyon Jay

Pinyon Jay (*Gymnorhinus cyanocephalus*) is a pñon-juniper woodlands obligate species (Piñon-Juniper Woodland and Piñon-Juniper Sagebrush ERUs), and is found throughout the Carson NF. Changes in fire regimes, drought, and recent outbreaks of piñon engraver beetles have resulted in the loss of piñon pines on the forest (Step 2, filter D) (Wiggins 2005). Threats to this species on the Carson NF include drought, widespread die-offs of piñon pines from beetles (approximately 50% of potential habitat impacted), large-scale thinning (<5% of potential habitat impacted), and fuelwood harvesting (14% of potential habitat impacted, Step 2, filter E). Trends observed in New Mexico Breeding Bird Surveys data

indicates declines of 4 percent per year, making it one of the fastest declining forest obligate bird species in the state (Sauer et al. 2014) (Step 2, filter C).

Western Burrowing Owl

Western burrowing owl (*Athene cunicularia hypugaea*) is found on the Carson NF in Montane Subalpine Grassland and Sagebrush ERUs. They nest and roost in recently abandoned burrows dug by mammals, including ground squirrels, prairie dogs, and badgers. These burrows may soon become unsuitable for nesting (Green and Anthony 1989) (Step 2, filter D). For this reason, viability of western burrowing owls is inextricably linked to that of burrowing mammals, including prairie dogs. Threats to this species on the Carson NF include burrowing mammals, such as Gunnison's prairie dogs, recreational shooting, and sylvatic plague (Antolin et al. 2002; Finch 1992; USDA FS 2013) (Step 2, filter E). These threats are outside of Forest Service control.

White-tailed Ptarmigan

White-tailed ptarmigan (*Lagopas leucura*) utilize the Alpine and Tundra ERU of the Carson NF (<1% of the forest). ALP on the Carson NF is very susceptible to climate change, and given its current limited extent and elevation constraints is likely to decline in western mountain systems generally (USDA FS 2010a). However, ALP is lowly departed from reference conditions on the Carson NF, and when intensified by climate change is still only moderately departed into the future. (p. 298 of assessment). Also, 86 percent of ALP on the Carson NF already receives the highest level of protection, having been designated as wilderness (Step 2, filter D). Threats include degradation of habitat by grazing (25% potential habitat affected), and recreation (15% potential habitat affected) (Step 2, filter E). Monitoring indicates that ptarmigan are found in the alpine and tundra habitat of the Carson NF, but in very small numbers (Wolfe et al. 2012) (Step 2, filter C).

Wilson's Warbler

Wilson's warbler (*Cardellina pusilla*) utilizes mesic shrub communities (all riparian ERUs). The optimal habitat for this species consists of key ecosystem characteristics found along the edges of beaver ponds, lakes, dense riparian zones, fens, bogs, and overgrown clear-cuts (Step 2, filter D). Most of the riparian ERUs on the forest are departed from reference, because of changes in vegetative composition and hydrology (Step 2, filter D). Wilson's warblers are only found on the Camino Real, Red River, and Jicarilla local zones (Step 2, filter D). Habitat degradation and sedimentation from wildfire, grazing (64% potential habitat affect), recreation (28% potential habitat affected), motorized travel (11% potential habitat affected), and changes in hydrology can negatively impact this species (Step 2, filter E). According to Breeding Bird Surveys (2014), this species showed a declining trend of 7 percent from 2003 to 2013 in New Mexico (Step 2, filter C).

Rio Grande Cutthroat Trout, Rio Grande Chub, and Rio Grande Sucker

Rio Grande cutthroat trout (*Onchorychus clarkia virginalis*) (RGCT), Rio Grande chub (*Gila Pandora*) (RGC) and Rio Grande sucker (*Catostomus plebius*) (RGS) all need clear, cold water streams with gravel and cobble substrates to survive (aquatic ecosystems). These species are found in various streams throughout the Carson NF, but habitat is limited. This is because the ecological conditions of most streams are departed, due to grazing, wildfire, recreation activities, motorized travel, road management, or from negative interactions with non-native species (e.g., brown trout or rainbow trout) (Step 2, filter d and E). Negative interactions with non-native fishes include competition for space and food and predation by non-natives. Furthermore, the hybridization that occurs between native RGCT and rainbow trout is of great concern for the continued persistence of RGCT (Step 2, filter C). Hybridization and competition with non-native trout affects 61 percent of occupied RGCT, RGC, and RGS stream habitat.

Sedimentation from various road sources (45% occupied habitat affected), recreational activities (40% occupied habitat affected), and grazing (71% occupied habitat affected) degrades water habitat quality and negatively impacts eggs and fry (Step 2, filter E). Clamusso and Rinne (2009) discovered RGC and RGS were found in less streams on the forest in 2009, compared to 1990; whereas, RGCT were found in more streams, because of reintroduction efforts (Step 2, filter C and D).

Nokomis Fritillary Butterfly

Nokomis fritillary butterfly (*Speyeria nokomis nokomis*) is found in arid landscapes (Ponderosa Pine Forest, Piñon-Juniper Woodland, Piñon-Juniper Sagebrush, and Sagebrush ERUs), with the key ecosystem characteristics of streamside meadows and open seepage areas (Selby 2007). Low elevation arid landscapes with riparian habitat is limited (<1% of the entire forest), and the currently ecological condition of these ERUs are departed from reference, because of change in vegetative composition and hydrology (Step 2, filter D). Presence of bog violet (*Viola nephrophylla*), the only confirmed larval food source, is an essential habitat component. During floral surveys in 2006 and 2007, only three species of bog violets were found on the Carson NF. The bog violets were documented in very limited numbers and in isolated occurrences (Step 2, filter C and E). The main threat to Nokomis fritillary is loss of habitat from grazing (44% potential habitat affected), change in hydrological conditions, and recreation (5% potential habitat affected) (Step 2, filter E).

Gunnison's Prairie Dog

Gunnison's prairie dog (*Cynomys gunnisoni*) is known to occur within the Montane Subalpine Grassland ERU of the Carson NF which is moderately departed. Threats include recreational shooting (Finch 1992; USDA FS 2013a) (Step 2, filter E) and sylvatic plague (Antolin et al. 2002). Most of these threats are outside of agency control, but sylvatic plague could be affected by management because the Carson NF could elect to "dust" prairie dog burrows with the insecticide Deltamethrin, which controls fleas infected with the plague bacterium (Antolin et al. 2002; Seery et al. 2003) (Step 2, filter E) Exact population estimate are unknow on the Carson NF for this species.

Masked Shrew

Masked shrew (*Sorex cinereus*) hunts insects and small mammals along banks of cold streams, in springy meadows, or under logs in cold spruce forest (Spruce-Fir Forest ERU and Herbaceous, Willow-Thinleaf Alder, Upper Montane Conifer-Willow, and Narrowleaf Cottonwood-Spruce riparian ERUs). Riparian ERUs' current ecological conditions on the Carson NF are departed from reference, because of changes in vegetative composition and hydrology (Step 2, filter D). The masked shrew is found on every local zone, except Jicarilla (Frey 2003). Negative impacts to the masked shrew include habitat degradation and sedimentation caused by grazing (79% potential habitat affected), fuelwood gathering (8% potential habitat affected), wildfire, recreation (2% potential habitat affected), motorized travel (8% potential habitat affected), and changes in hydrology (Step 2, filter E).

Pale Townsend's Big-Eared Bat

Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*) has been recorded on Rio Chama, Jicarilla, and Red River local zones. This species has not been documented on the Carson NF since 1998 (Step 2, filter C). They require key ecosystem characteristics, such as caves (there are no caves on the Carson NF) and abandoned mine features (within all terrestrial ERUs), to hibernate and roost in, which are rare on the forest (Step 2, filter D). Ongoing activities known to impact habitats used by the bats, include recreational mine exploring (25% potential habitat affected), vandalism (25% potential habitat affected), renewed mining (0.1 potential habitat affected), mine reclamation (50% potential habitat affected) (Step 2, filter E), and potentially white nose syndrome, a lethal fungal infection found in some

species of hibernating bats in the eastern- and midwestern United States. Past activities, such as improper mine closures, have led to a reduction in the number of available hibernacula for this species (Step 2, filter D).

Spotted Bat

Spotted bat (*Euderma maculata*) individuals have been recorded on the Rio Chama local zone of the Carson NF (Geluso 2006). They are believed to require key ecosystem characteristics of accessible rock crevices (within all terrestrial ERUs) to roost in. Recreational climbing (26% potential habitat affected) is known to impact this species (Step 2, filter E). The potential seems low for white-nose syndrome, a lethal fungal infection found in some species of hibernating bats in the eastern and midwestern United States, as this bat is not known to hibernate in groups. This bat feeds on noctuid moths in and over the forest canopy. Large wildland fires can threaten this species and timely restoration of the Carson NF is needed to avoid impacts to the population, which is low to rare wherever it is found (Step 2, filter C).

Water Shrew

Water shrew (*Sorex palustris*) hunts insects and small mammals exclusively near clear, cold high elevation streams (Herbaceous, Willow-Thinleaf Alder, Upper Montane Conifer-Willow, and Narrowleaf Cottonwood-Spruce riparian ERUs and aquatic ecosystems) throughout the Carson NF. High elevation riparian habitat is limited (3% of the entire forest) and is departed from reference, because of changes in vegetative composition and hydrology (Step 2, filter D). Habitat degradation and sedimentation from grazing (70% potential habitat affected) recreation (11% potential habitat affected), motorized travel (29% potential habitat affected), and changes in hydrology can negatively impact this species (Step 2, filter E).

Alpine Larkspur

Alpine larkspur (*Delphinium alpestre*) occurs in alpine/tundra and open meadows in subalpine coniferous forest (Alpine/Tundra and Montane Subalpine Grassland ERUs) from 11,500-13,000 feet (3,505-3,962 m) elevation. ALP on the Carson NF is very susceptible to climate change, and given its current limited extent and elevation constraints is likely to decline in western mountain systems generally (USDA FS 2010a). However, ALP is lowly departed from reference conditions on the Carson NF, and when intensified by climate change is still only moderately departed into the future. (p. 298 of assessment). Also, 86 percent of ALP on the Carson NF already receives the highest level of protection, having been designated as wilderness (Step 2, filter D). In New Mexico it has only been found within Taos County (Step 2, filter D). This species is occasionally targeted for weed control (0.1% of potential habitat affected), as some species of larkspur are poisonous to livestock and seed collection (Step 2, filter E). Population numbers are low where found (Step 2, filter C).

Arizona Willow

Arizona willow (*Salix arizonica*) is only found in high elevation areas within open meadows and along streams (Montane Subalpine Grassland ERU and Willow-Thinleaf Alder, Upper Montane Conifer-Willow, and Narrowleaf Cottonwood-Spruce riparian ERUs) (Step 2, filter D). It is a favored plant by grazers. The growth and vigor of this willow is impacted by livestock grazing (96% potential habitat affected) and recreational snowmobiling (71% potential habitat affected) (Step 2, filter E). Protection by small enclosures on the Carson NF has resulted in expansion of this species in the past decade, but these enclosures have not been maintained. Measuring consumption by a percentage of use of available forage does not protect this species from preferred selection by livestock (Step 2, filter E).

Chaco Milkvetch

Chaco milkvetch (*Astragalus micromerius*) is restricted to soils with the key ecosystem characteristic of gypsum soils and outcrops on the Rio Chama local zone (NMRPTC 1999) (Step 2, filter D). Threats include habitat disturbance from recreation (0.1% potential habitat affected), motorized travel (5% potential habitat affected), and gypsum mining (not occurring at this time) (Step 2, filter E). Populations of this plant are small and isolated on the Carson NF (Step 2, filter C).

Chama Blazing Star

Chama blazing star (*Mentzelia conspicua*) is only found in small and isolated populations on the Rio Chama local zone (Step 2, filter D). It is usually found on the key ecosystem characteristic of gray to red shales of Mancos and Chinle soil formations in the Piñon-Juniper Woodland ERU (NMRPTC 1999) (Step 2, filter D). Threats include habitat disturbance from recreation (0.1% potential habitat affected) and road construction and maintenance (14% potential habitat affected) (Step 2, filter E).

Pagosa Milkvetch

Pagosa milkvetch (*Astragalus missouriensis* var. *humistratus*) is only found in one small and isolated population on the Jicarilla local zone (Step 2, filter D). This species is usually found in Ponderosa Pine Forest and Piñon-Juniper Woodland ERUs, within the key ecosystem characteristics of Mancos and Lewis soil formations (Decker 2006) (Step 2, filter D) . Threats include habitat disturbance from recreation (0.1% potential habitat affected), oil and gas development (0.3% potential habitat affected), and road construction and maintenance (7% potential habitat affected) (Step 2, filter E).

Ripley's Milkvetch

Ripley's milkvetch (*Astragalus ripleyii*) is exclusively associated with key ecosystem characteristic of the volcanic substrates within the San Juan volcanic field and is only found on the Cruces Basin (Cr), Vallecitos (Vc), Rio Grande (Rg), and Red River (Rr), local zones (Ladyman 2003) (Step 2, filter D). Currently, it has been identified at 44 locations in New Mexico, of which 10 are on the Carson NF (NHNM 2014). Determining occurrence size is difficult as the number of individuals appears to be correlated with the amount of moisture received in April and May. This species is vulnerable to herbivores, particularly sheep grazing, and invasion of non-native plants (Step 2, filter E).

Robust Larkspur

Robust larkspur (*Delphinium robustum*) is a regional endemic species of south-central Colorado and north-central New Mexico (Beatty et al. 2004) (Step 2, filter D). It occurs in valley bottoms, riparian woodlands, subalpine meadows, and aspen groves in lower and upper montane coniferous forests (Spruce-Fir Forest, Mixed Conifer, with Aspen, Mixed Conifer, with Frequent Fire, Ponderosa Pine Forest ERUs) from 7,000 to 11,200 feet. Six occurrences have been reported in New Mexico, three of which were found on the Carson NF (Seinet 2014) (Step 2, filter D). This species is occasionally targeted for weed control (0.1% of potential habitat affected), as some species of larkspur are poisonous to livestock (Step 2, filter E). This species is highly palatable to herbivores (88% potential habitat affected). Additional threats to this species include habitat disturbance from recreation (2% potential habitat affected) and road construction (13% potential habitat affected) (Step 2, filter E).

Small-headed Goldenweed

Small-headed goldenweed (*Ericameria microcephala*) is restricted to the Cruces Basin local zone within ponderosa pine forest with the key ecosystem characteristic of granite rock crevices and outcrops (NMRPTC 1999) (Step 2, filter D). Threats include habitat disturbance from recreation (0.1% potential

habitat affected) and forest fires (Step 2, filter E). Populations of this plant are small and isolated on the Carson NF (Step 2, filter C).

Tufted Sand Verbena

Tufted sand verbena (*Abronia bigelovii*) is restricted to soils with the key ecosystem characteristic of gypsum soils and outcrops on the Rio Chama and Vallecitos local zones (NMRPTC 1999) (Step 2, filter D). Threats include habitat disturbance from recreation (0.1% potential habitat affected), motorized travel (5% potential habitat affected), and gypsum mining (not occurring at this time) (Step 2, filter E). Populations of this plant are small and isolated on the Carson NF (Step 2, filter C).

Species Risk Analysis

The final products of the RAD are species ratings tables that give a numerical overall risk value to each species, for each ERU, in each local zone (1 to 1.66 = High Risk; 1.67 to 2.33 = Moderate Risk; 2.34 to 3.0 = Low Risk). These have been averaged to provide a single overall risk value and qualitative ranking for each species. Federally recognized species are presented in Table 12, while potential SCC are presented in Table 13. These potential SCC have been found to be declining in abundance and distribution by external entities, including the U.S. Fish and Wildlife Service, Southwestern Region of the U.S. Forest Service, the New Mexico Department of Game and Fish, the New Mexico Department of Forestry, the Navajo Nation, and Natural Heritage New Mexico, among others. It was determined that management actions implemented by the Carson NF further threatened these species' persistence on the forest. These species, in addition to federally listed species relevant to the Carson NF (Table 1), will be considered as the Carson NF evaluates needs for change to its current land and resource management plan.

Table 12. Risk to federally recognized species relevant to the Carson National Forest[9]

Common Name	Scientific Name	Risk Assessment Value	Overall Risk
Birds			
Mexican spotted owl	*Strix occidentalis lucida*	2.03	Moderate
Southwestern willow flycatcher	*Empidonax traillii extimus*	1.91	Moderate
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*	1.97	Moderate
Mammals			
Black-footed ferret	*Mustela nigripes*	1.93	Moderate
Canada lynx	*Lynx canadensis*	2.22	Moderate
New Mexico meadow jumping mouse	*Zapus hudsonius luteus*	1.74	Moderate

[9] The Risk Assessment Database calculates a risk value between 1 and 3. Risk value determinations are: High = 1 to 1.66; Moderate = 1.67 to 2.33; and Low = 2.33 to 3.0.

Table 13. Risk to potential list of species of conservation concern for the Carson National Forest[10]

Common Name	Scientific Name	Risk Assessment Value	Overall Risk
Amphibians and Reptiles			
Northern leopard frog	*Lithobates pipiens*	1.91	Moderate
Western boreal toad	*Bufo boreas*	1.45	High
Avians			
American peregrine falcon	*Falco peregrinus anatum*	2.31	Moderate
Northern goshawk	*Accipiter gentilis*	2.24	Moderate
Pinyon jay	*Gymnorhinus cyanocephalus*	2.26	Moderate
Western burrowing owl	*Athene cunicularia*	1.86	Moderate
White-tailed ptarmigan	*Lagopus leucura*	2.27	Moderate
Wilson's warbler	*Cardellina pusilla*	2.22	Moderate
Fish			
Rio Grande chub	*Gila pandora*	1.78	Moderate
Rio Grande cutthroat trout	*Onchorhynchus clarkii virginalis*	1.94	Moderate
Rio Grande sucker	*Catostomus plebeius*	1.81	Moderate
Invertebrates			
Nokomis fritillary butterfly	*Speyeria nokomis nokomis*	2.30	Moderate
Mammals			
Gunnison's prairie dog	*Cynomys gunnisoni*	1.91	Moderate
Masked shrew	*Sorex cinereus*	2.31	Moderate
Pale Townsend's big-eared bat	*Corynorhinus townsendii pallescens*	2.21	Moderate
Spotted bat	*Euderma maculatum*	2.32	Moderate
Water shrew	*Sorex palustris*	2.13	Moderate

[10] Same risk values as previous footnote.

Common Name	Scientific Name	Risk Assessment Value	Overall Risk
Plants			
Alpine Larkspur	Delphinium alpestre	2.02	Moderate
Arizona willow	*Salix arizonica*	2.04	Moderate
Chaco milkvetch	Astragalus micromerius	2.14	Moderate
Chama blazing star	*Mentzelia conspicua*	2.10	Moderate
Pagosa milk-vetch	*Astragalus missourensis var. humistratus*	2.11	Moderate
Ripley's milkvetch	*Astragalus ripleyi*	2.15	Moderate
Robust larkspur	*Delphinium robustum*	1.98	Moderate
Small-headed goldenweed	Ericameria microcephala	1.94	Moderate
Tufted sand verbena	*Abronia bigelovii*	2.12	Moderate

These 26 potential SCC meet the requirements set forth in the proposed directives at FSH 1909.12.5 and have been linked to current Carson forest plan management direction that may be negatively affecting either habitat or populations on the Carson NF. Many of these species are also affected by activities outside of the Carson NF or beyond Forest Service control. It is important to recognize the limits of agency authority and the inherent capability of the Carson NF.

These potential SCC, along with the six federally recognized species, will be considered as the plan revision process moves forward and determines needs for change to the existing forest plan. The coarse-filter/fine-filter approach used to assess species will also be carried forward through the next steps. Plan components will be developed to maintain or restore ecological conditions for ecosystem integrity and ecosystem diversity in the Carson NF. By working toward the goals of ecosystem integrity and ecosystem diversity with connected habitats that can absorb disturbance, it is expected that over time, management would maintain and restore ecological conditions that provide for diversity of plant and animal communities and support the abundance, distribution, and long-term persistence of native species, both those considered common and secure, as well as those considered imperiled or vulnerable. In addition, species-specific plan components and the fine-filter approach will provide for additional specific habitat needs or other ecological conditions for those species that are not met through the coarse-filter approach. Species, for which the 2012 planning rule requires fine-filter plan components, when necessary, are federally listed threatened and endangered species, proposed, and candidate species, as well as SCC.

Summary of Conditions, Trends, and Risks

The Carson NF is home to hundreds of animal and plant species, some of which are found only on the Carson NF, and others for which changing land-use patterns have increased their reliance on Carson NF managed lands. These species provide many ecosystem services, including: (1) supporting services, such as nutrient cycling, soil formation and manipulation, primary production, and seed dispersal;

(2) regulating services, including carbon sequestration, pollination, and erosion control; (3) provisioning services, such as food, fiber, medicine, and forest products; and (4) cultural services, including recreation, opportunities for scientific discovery and education, and cultural, intellectual, or spiritual inspiration. The most important drivers of change in ecosystem services are habitat change, climate change, invasive species, overexploitation, and pollution. This section focuses on at-risk species that occur on the Carson NF, which indicate the ecosystem services provided by these species are decreasing and at risk.

Federally recognized and potential SCC were identified and evaluated for the Carson NF. A total of six federally recognized species (three endangered) were determined to be relevant to the Carson NF. Of the six, three are mammals and three are birds. Potential SCC were determined following guidance in the proposed directives issued for the 2012 Planning Rule.

Wildlife and plant species identified as at-risk by a number of different entities were considered. The species that were ultimately considered to be at-risk met the following criteria: (1) met the initial requirements; (2) had been documented on the Carson NF; and (3) had the potential to be both positively and negatively affected by Forest Service management activities. An overall risk assessment for each species was calculated from data identifying the status of historic, current, and future population trends and associated ERUs and data identifying direct threats to the species or to key ecosystem characteristics. A total of 26 potential SCC were determined to be at risk by current Forest Service management activities, including: 2 amphibians; 6 birds; 3 fish; 1 invertebrate; 5 mammals; and 9 plants.

If management activities focus on ecosystem integrity and diversity goals by including disturbance-absorbing connected habitats, then ecological conditions would be effectively restored and maintained. These improved ecological conditions would increase the diversity of plant and animal communities and support the abundance, distribution, and long-term persistence of common and secure, imperiled, or vulnerable native species. Species-specific plan components within each ERU will be developed for those species with additional or key ecosystem characteristics or where ecological conditions are not otherwise met.

Appendix 1

Introduction

The Carson National Forest began its Forest Revision Process, which included the evaluation of Species of Conservation Concern on May 2014. Rocky Mountain bighorn sheep was considered during the SCC evaluation.

A species of conservation concern (SCC) is defined in the 2012 Planning Rule as “a species, other than federally recognized threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species’ capability to persist over the long-term in the plan area.” The guidance provided in the final directives for the 2012 planning regulations (Forest Service Handbook [FSH] 1909.12 – Land Management Planning, Chapter 10) is used to develop the SCC list for the Carson NF. The criteria for identifying species of conservation concern are also the criteria for identifying potential species of conservation concern, which are (FSH 1909.12, 12.52c):

1. The species is native to, and known to occur in, the plan area.

   A species is known to occur in a plan area if, at the time of plan development, the best available scientific information indicates that a species is established or is becoming established in the plan area. A species with an individual occurrences in a plan area that are merely “accidental” or “transient,” or are well outside the species’ existing range at the time of plan development, is not established or becoming established in the plan area. If the range of a species is changing so that what is becoming its "normal" range includes the plan area, an individual occurrence should not be considered transient or accidental.

2. The best available scientific information about the species indicates substantial concern about the species’ capability to persist over the long term in the plan area. See FSH 1909.12, zero code, section 07, for guidance on best available scientific information.

   If there is insufficient scientific information available to conclude there is a substantial concern about a species’ capability to persist in the plan area over the long-term that species cannot be identified as a species of conservation concern.

   If the species is secure and its continued long-term persistence in the plan area is not at risk based on knowledge of its abundance, distribution, lack of threats to persistence, trends in habitat, or responses to management that species cannot be identified as a species of conservation concern.

Initial potential list of SCC for the Carson NF consisted of 1,384 species which included Rocky Mountain bighorn sheep. Carson then identified which of these 1,384 species actually occurred on the forest. From the initial 1,384 potential SCC identified for the State of New Mexico, 202 potential SCC were identified for the counties of the Carson NF. Of these 202 potential SCC, 66 species met criteria 1 (described above), including Rocky Mountain bighorn sheep. In order for species to be determined to be secure and it continued long-term persistence is not at risk on the Carson NF, species are evaluated through the following filters (FSH 1909.12, 12.52d (3f)) for criteria 2 (described above):

A. Species is “transient” species that is documented to use the Carson NF occasionally?

   i. if answer is yes then species cannot be identified as a species of conservation concern

B. There is insufficient population or abundance information to evaluate whether or not a species is at risk for persistence within the Carson NF?

    i. If answer is yes then species cannot be identified as a species of conservation concern

C. Species' has stable to upward population trend?

D. Species' habitat trend is stable to upward and abundant?

E. Species inhabiting plan area are not known to be affected by significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions (habitat) they depend upon?

Carson Bighorn Sheep Species of Conservation Concern Criteria 2 Evaluation

The following is the SCC Criteria 2 evaluation for Rocky Mountain bighorn sheep to determine if this species is secure and its continued long-term persistence is not at risk on the Carson NF. There are four known bighorn sheep herds (Latir, Wheeler Peak, Rio Grande Gorge, and Pecos) occurring on the Carson NF. The Wheeler Peak Herd consist of three subpopulations (Red River, Gold Hill, and Wheeler Peak). This evaluation is for the entire population of Rocky Mountain sheep found on the Carson and not individual herds.

Filter A

Species is "transient" species that is documented to use the Carson NF occasionally?

No, there are four known bighorn sheep herds (Latir, Wheeler Peak, Rio Grande Gorge, and Pecos) occurring on the Carson NF.

Filter B

There is insufficient population or abundance information to evaluate whether or not a species is at risk for persistence within the Carson NF?

No

Filter C

Species has stable to upward population trend?

Yes, the population trend for all Carson NF Rocky Mountain bighorn sheep herds combined is increasing since 2004 (NMDGF 2022 and Figure 1).

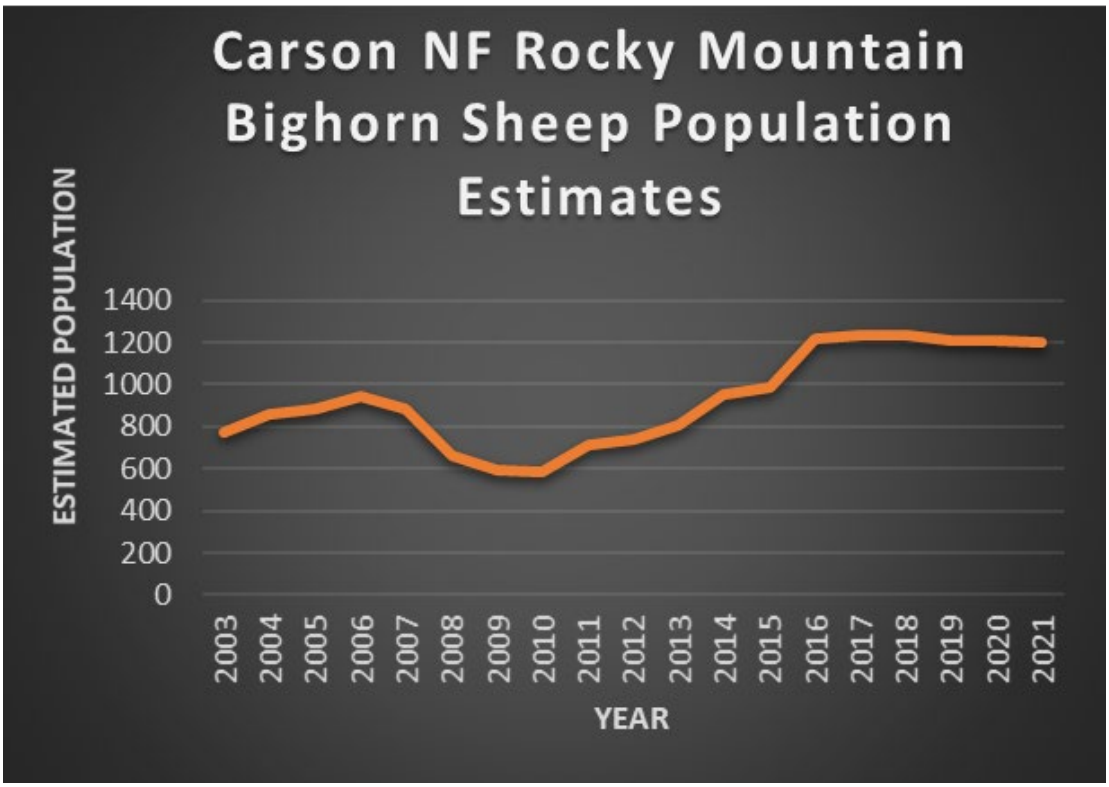

Figure 3. Carson NF Rocky Mountain bighorn sheep population estimates 2003-2021

Filter D

Species' habitat trend is stable to upward and abundant?

Yes, habitat is abundant and habitat trend for bighorn sheep is stable. According to the Carson NF 2014 Assessment (USDA FS Carson NF 2015), screes, cliffs, and rock features are widespread microsites within all vegetation communities. These ecological characteristics are inherently stable for long periods of time because they are changed primarily by geologic forces. The majority of the Rocky Mountain bighorn sheep on the Carson NF are found in the Alpine and Tundra (ALP) ERU (Assessment p. 34) and wilderness. ALP's departure from reference condition is low on the Carson NF, and when intensified by climate change departure is still predicted to be moderate into the future (Assessment p. 298). Also, 86% of ALP on the Carson NF already receives the highest level of protection, having been designated as wilderness. Designated wilderness areas provide high quality and contiguous alpine tundra habitat and are less influenced by human and management activities. One herd on the forest occupies the Rio Grande Gorge, between Pilar and the Red River confluence. This land is mostly managed by the Bureau of Land Management (BLM) and Taos Pueblo, while 977 acres are on the Questa (Cebolla Mesa area) and Tres Piedras Ranger Districts (Tres Orejas area) of the Carson NF (Figure 6). According to the Carson NF 2014 Assessment (USDA FS Carson NF 2015), this area is low elevation, low relief, and dry, with a very deep-water table at the level of the Rio Grande (the river), hundreds of feet below. The area along the Rio Grande Gorge Rim includes Sage ERU, cliffs, and inaccessible canyons. According to the 2014 Assessment, rocky outcrops and cliff ecological characteristics on the Carson NF are inherently stable for long periods of time because they are changed primarily by geologic forces, and the Sage ERU within this area is lowly departed from reference condition. The habitat surrounding the alpine and gorge occupied habitats is not quality habitat and would not encourage movement outside of the occupied habitat.

Filter E

Species inhabiting areas not known to be affected by significant threats, caused by stressors on and off the plan area, to populations or the ecological conditions they depend upon (habitat)?

Yes, threats to Rocky Mountain bighorn sheep include competition for forage and space with livestock and other ungulate species, human disturbance, and high susceptibility to epizootic pneumonia when in contact with domestic goats and sheep, which are frequent carriers of disease (Besser et al. 2012; Besser et al. 2017). On the Carson NF, competition for forage and space with livestock and other ungulate species and human disturbance are not considered primary limiting factors for bighorn sheep. From a forage perspective, bighorn sheep have the most dietary overlap with domestic sheep, cattle, and elk. There are no domestic sheep allotments that directly overlap bighorn sheep occupied habitat, therefore there is no direct competition between these species. Cattle allotments do overlap with bighorn sheep occupied habitat. Cattle impacts on bighorn sheep is evaluated on site-specific allotment project NEPA and the impact of cattle has been found to be limited as cattle primarily remain close to water and use areas with less slope. Human disturbance does warrant further site-specific evaluation of influences on local bighorn herds (particularly the Red River subpopulation); however, the majority of the herds on the Carson NF are found within designated wilderness. Designated wilderness areas provide high quality and contiguous alpine tundra habitat and are less influenced by human and management activities. This high-quality habitat is surrounded by non-habitat and therefore would less likely facilitate movement to permitted domestic herds outside of occupied habitat.

Respiratory illness due to comingling with permitted domestic sheep is considered the primary limiting factor for bighorn sheep on the Carson NF. While large die offs have occurred in the western US, including on the Rio Grande NF to the north, the Carson NF has not experienced outbreaks that spread throughout a herd or have caused multiple casualties. There have been recent cases of disease transmission between goats and bighorn sheep in the Rio Grande Gorge herd and the Red River subpopulation of the Wheeler Peak herd. The extent of the infection in the Red River subpopulation is not known but is currently being evaluated by the New Mexico Department of Game and Fish and other landowners. The relationship between bighorn sheep population viability and domestic sheep grazing on National Forest System lands continues to be an important wildlife and range management issue facing the Forest Service on western rangelands. Where management objectives include maintenance or enhancement of bighorn sheep populations, the potential for disease transmission from domestic sheep/goats to bighorn sheep must be addressed. To meet these objectives, forests must conduct a bighorn sheep viability analysis using the enclosed viability analysis outline (Weldon 2011, 2012, 2014). This assessment is not a risk of contact model similar to the "Payette Model (O'Brien et al. 2014)," but a qualitative risk assessment of all bighorn sheep herds and permitted grazing allotments on the Carson NF. At the time of this 2014 assessment, New Mexico Department of Game and Fish has not established core herd home ranges and has limited radio collar data for all the bighorn sheep herds on the Carson NF (NMDGF 2014) which is a requirement of the risk of contact model. The risk of contact model also does not calculate potential risks from small private flocks/hobby farms/4-H sheep or goats (USDA FS 2015). Due to these deficiencies, the Carson is choosing to conduct a qualitative risk assessment at the Forest level (the risk to all bighorn sheep herds is being evaluated together, not as risk to individual herds) consistent with the 2011 Forest Service policy letter (Weldon 2014).[11]

The following 4-step outline for conducting an assessment for bighorn sheep viability will be used as a qualitative risk assessment as related to bighorn sheep and permitted grazing allotments on the Carson

[11] As of 2022, the New Mexico Department of Game and Fish still does not have established core herd home ranges for all the bighorn sheep herds on the Carson NF (NMDGF 2022), and the risk of contact model still does not calculate potential risks from small private flocks/hobby farms/4-H sheep or goats.

NF (Weldon 2011, 2012, 2014). The assessment that follows was used to help determine if bighorn sheep are secure and whether their continued long-term persistence is at risk on the Carson NF as a part of the SCC evaluation process (Criteria 2, Filter E).

1. Gather applicable data and information from appropriate sources.

    a. In all NEPA analysis regarding bighorn sheep viability, coordinate with state fish and game agencies and consider state wildlife management plans for bighorn sheep.

        i. Identify seasonal bighorn sheep occupied habitats (to infer bighorn sheep core herd home range areas).

        ii. Consider objectives for critical/core and non-critical/core herds.

2. Assess spatial and temporal overlap of bighorn sheep core herd home ranges with domestic sheep allotments, use areas, and driveways using, but not limited to:

    a. Maps showing suitable (occupied and unoccupied) bighorn sheep habitat (including suitable source bighorn sheep summer habitat).

    b. Maps showing habitat connectivity between bighorn sheep core herd home ranges and domestic sheep allotments, use areas, and driveways (if information is available).

    c. Distances between bighorn sheep core herd home ranges and domestic sheep allotments on the Forest, use areas, driveways (if information is available).

    d. The proportion of rams/ewes within the bighorn sheep population that foray outside of the core herd home range and the distances they foray (if information is available).

3. Assess likelihood of contact (low, moderate, high) based on spatial and temporal overlap between allotments and bighorn sheep herds.

4. Identify management practices with the goal of separation between domestic and bighorn sheep where necessary to provide for forest-wide bighorn sheep viability (this step will not have any bearing on determination as bighorn sheep as an SCC for the Carson NF) .

Carson Bighorn Sheep Assessment (Filter E)

This assessment is not a risk of contact model similar to the Payette Model, but a qualitative risk assessment of all bighorn sheep herds in relation to permitted grazing allotments on the Carson NF. Risk of contact analysis using the models similar to the Payette Model or other best available science may be conducted at the project (allotment) analysis level if appropriate data is available. At the time of this 2014 assessment, New Mexico Department of Game and Fish does not have established core herd home ranges and has very limited radio collar data for all the bighorn sheep herds on the Carson NF (NMDGF 2014). This data is a requirement of the risk of contact model. The risk of contact model also does not calculate potential risks from small private flocks/hobby farms/4-H sheep or goats (USDA FS 2015).[12] Due to these limitations the Carson is choosing to conduct a qualitative risk assessment at the Forest level (entire forest all bighorn sheep herds together not individually) as suggested in the 2011 Forest Service policy letter (Weldon 2014). **This qualitative risk assessment is a species-wide assessment for all**

[12] As of 2022, the New Mexico Department of Game and Fish still does not have established core herd home ranges for all the bighorn sheep herds on the Carson NF (NMDGF 2022), and the Risk of Contact Model still does not calculate potential risks from small private flocks/hobby farms/4-H sheep or goats.

bighorn sheep on the Carson NF and not individual herds. The Long-Range Plan for the Management of Rocky Mountain Bighorn Sheep in New Mexico (NMDGF 2005), guides the New Mexico Department of Game and Fish in effectively managing Rocky Mountain bighorn sheep. New Mexico Department of Game and Fish has not updated the 2005 Long Range Plan for the Management of Rocky Mountain Bighorn Sheep since its initial release. New Mexico bighorn sheep herds have not been classified by core vs. non-core categories (NMDGF 2005). In 2014, Western Association of Fish and Wildlife Agencies (WAFWA) Bighorn Sheep Working Group and USDA Forest Service mapped suitable occupied bighorn sheep habitat nationally, including for herds on the Carson NF (USDA FS 2012). This product was used for this assessment.

Step 1: Gather applicable data and information

Bighorn Sheep Occupied Habitats

Typically, bighorn sheep prefer open terrain with adjacent steep rocky areas for escape and safety (Brewer, C. E., et al. 2014). The Latir and Pecos herds occupy the Alpine Tundra of the Latir, and Pecos Wildernesses (Figure 4 and Figure 5) on the Camino Real and Questa Ranger Districts. The Wheeler Peak herd occupies the Alpine Tundra of the Wheeler Peak and Columbine-Hondo Wildernesses as well as cliff habitat along Highway 38 between Red River and Questa (Figure 4 and Figure 5) on the Questa Ranger District. According to the Carson NF 2014 Assessment (USDA FS Carson NF 2015), Alpine and Tundra ERU (ALP) departure from reference condition is low on the Carson NF, and when intensified by climate change it is still only moderately departed into the future. Also, all of the ALP habitat these herds use already receives the highest level of protection, having been designated as wilderness. Designated wilderness areas provide high quality and contiguous alpine tundra habitat and are less influenced by human and management activities. Designated wilderness is required to be managed according to the Wilderness Act. Rocky outcrops and cliff ecological characteristics found along Highway 38 on the Carson NF are inherently stable for long periods of time because they are changed primarily by geologic forces.

The Rio Grande Gorge herd occupies the Rio Grande Gorge, between Pilar and the Red River confluence. This land is mostly managed by the Bureau of Land Management (BLM) and Taos Pueblo, while 977 acres are on the Questa (Cebolla Mesa area) and Tres Piedras Ranger Districts (Tres Orejas area) of the Carson NF (Figure 6). According to the Carson NF 2014 Assessment (USDA FS Carson NF 2015), this area is low elevation, low relief, and dry, with a very deep-water table at the level of the Rio Grande (the river), hundreds of feet below. The area along the Rio Grande Gorge Rim includes Sage ERU, cliffs, and inaccessible canyons. Rocky outcrops and cliff ecological characteristics on the Carson NF are inherently stable for long periods of time because they are changed primarily by geologic forces.

The habitat surrounding the alpine and gorge occupied habitats is not quality habitat and would not encourage movement outside of the occupied habitat.

Herd Population Objectives

The bighorn sheep herds on the Carson NF are currently managed according to a bighorn sheep management framework (NMDGF 2019). There is a 2005 Long Range Plan for the Management of Rocky Mountain Bighorn Sheep in New Mexico (NMDGF 2005) for the Wheeler Peak, Pecos, and Latir herds. However, this plan is outdated and does not include the Rio Grande or Red River herds. New Mexico bighorn sheep herds have not been classified by core vs. non-core categories (NMDGF 2005).

According to the 2005 plan, the Latir herd carrying capacity for bighorn sheep is 76, and as of 2021, the estimated population for this herd was 80 (NMDGF 2022).

The Wheeler Peak herd is divided into 3 subpopulations using habitat within the Wheeler Peak Wilderness, Columbine/Hondo Wilderness, and the cliffs along Highway 38. According to the Long Range

Plan (2005), the Wheeler Peak herd carrying capacity is 243, and as of 2021 the estimated population for this herd was 380 (NMDGF 2022).

According to the Long-Range Plan (2005), the Pecos Wilderness herd carrying capacity for bighorn sheep is 330. As of 2021 the estimated population for this herd was 400 (NMDGF 2022).

Population goals or estimates of the projected carrying capacity for the Rio Grande Gorge herd have not been established (NMDGF 2005). The current estimated population of this herd is 420 (NMDGF 2022).

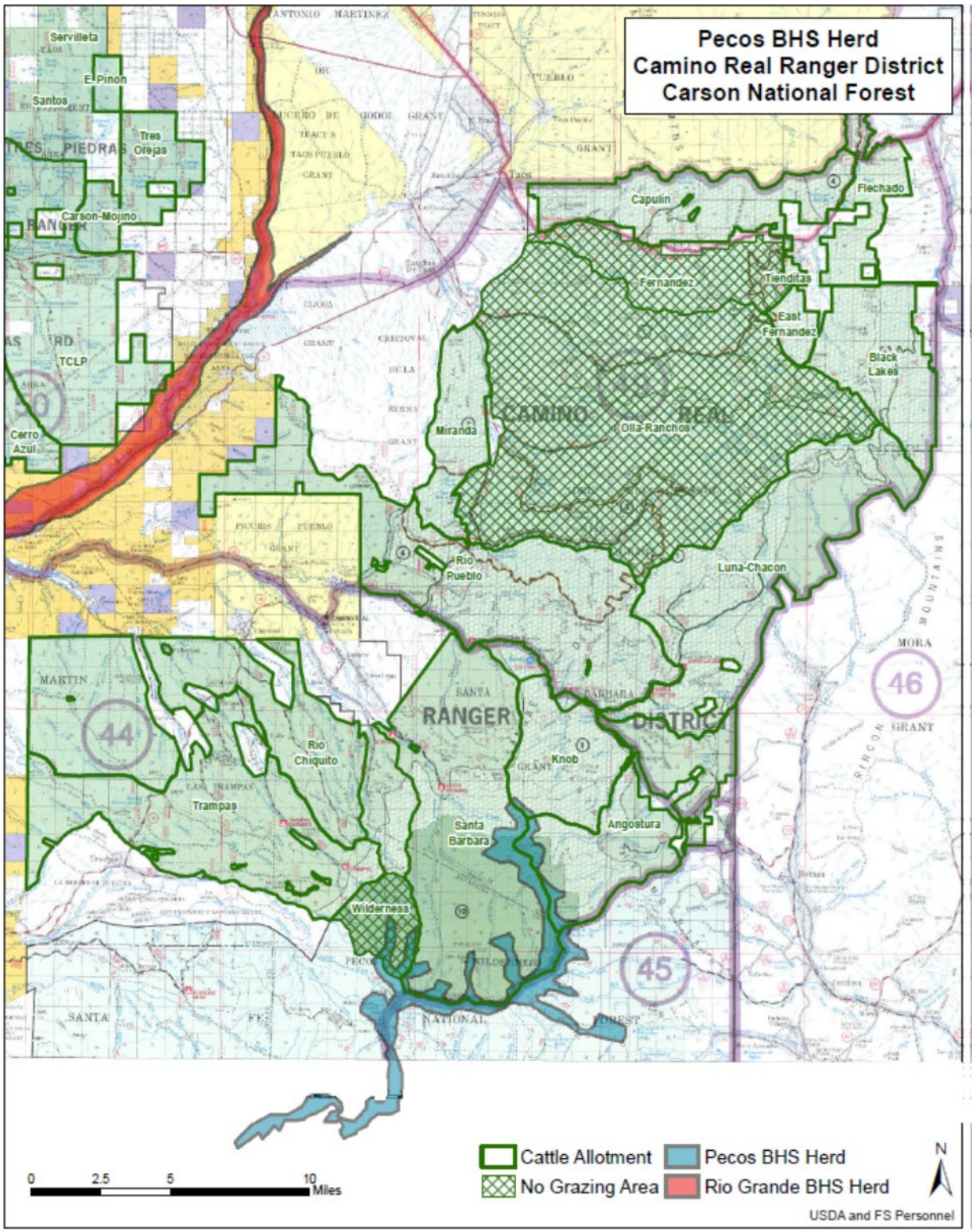

Figure 4. Pecos Bighorn Herd, Camino Real Ranger District

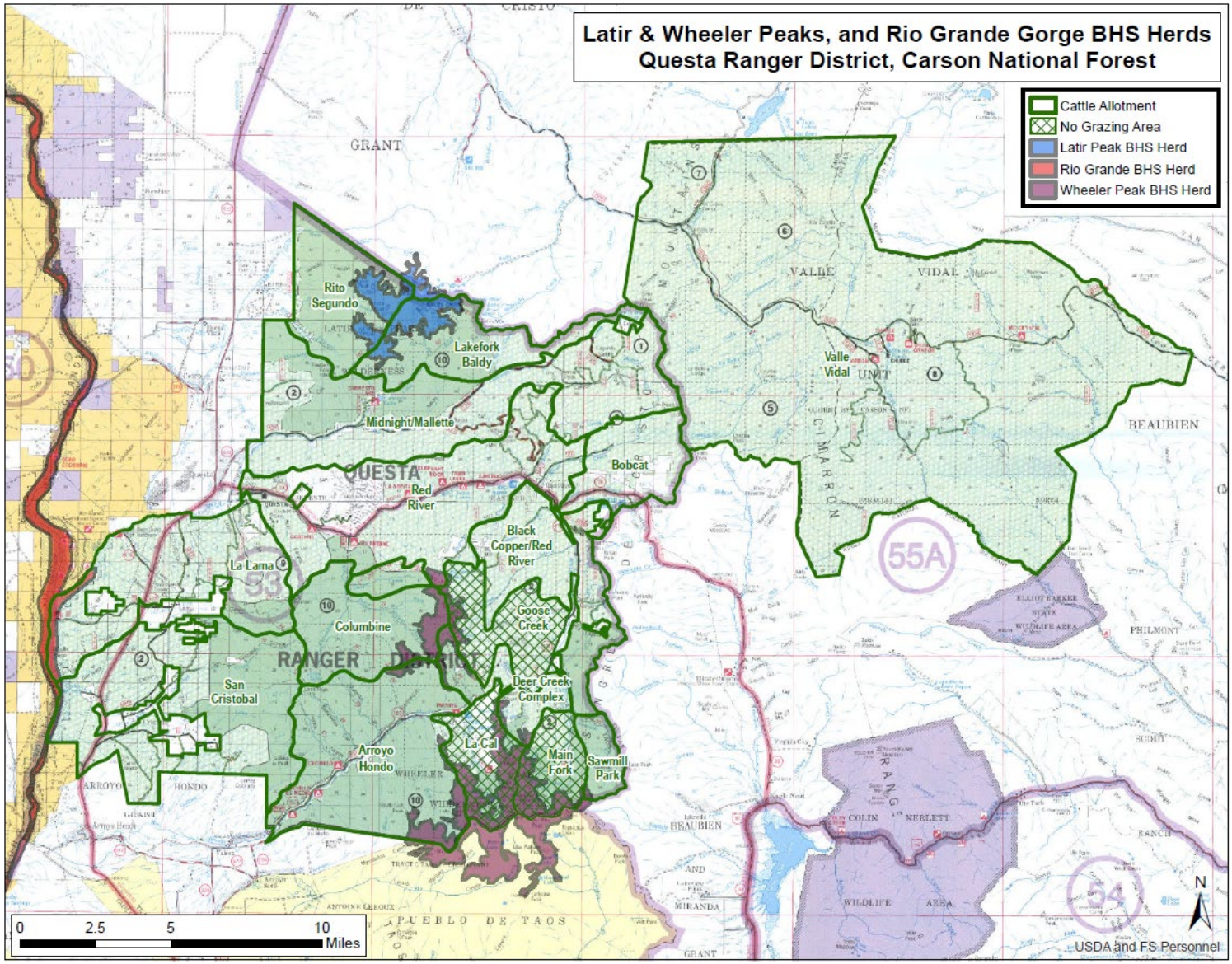

Figure 5. Latir, Wheeler Peak, and Rio Grande Gorge Bighorn Sheep Herds, Questa Ranger District

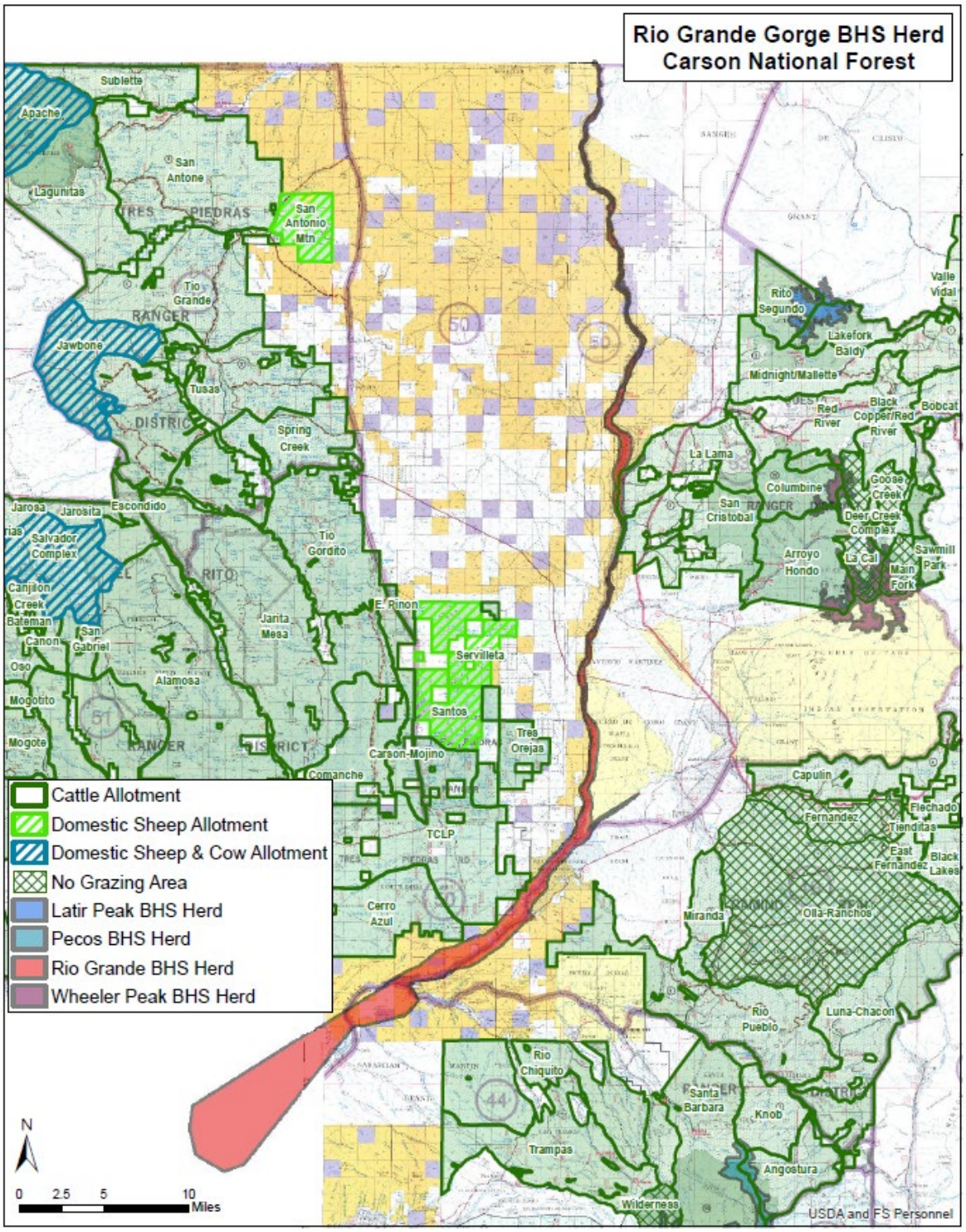

Figure 6. Rio Grande Gorge Bighorn Sheep Herd

Step 2: Assess spatial and temporal overlap of bighorn sheep with domestic sheep allotments.

Currently, there are **no** Carson NF permitted domestic sheep allotments that directly overlap occupied habitat of any of the bighorn sheep herds on the Carson NF (Figure 5 and Figure 6).

There are no permitted domestic sheep grazing allotments on the Questa Ranger District or Camino Real Ranger District (Wheeler Peak, Latir, and Pecos Herds). There are no private land or federally permitted domestic sheep flocks that overlap, or are adjacent to the Wheeler Peak, Latir, or Pecos Herds. There are privately owned domestic flocks close to, but not overlapping the Red River subpopulation of the Wheeler Peak herd.

There are two permitted domestic sheep allotments (Santos and Servilleta) on the Tres Piedras Ranger District within 5-6 aerial miles of the Rio Grande herd (Figure 7). There are also four additional permitted domestic sheep allotments (San Antonio Mountain, Jawbone, Apache, and Salvador Complex) within 15-20 aerial miles of the Rio Grande Gorge Herd (Figure 7). There are also privately owned and other BLM federally permitted domestic sheep flocks adjacent to (less than 5 miles) the Rio Grande Gorge Herd.

Bighorn sheep from the Rio Grande Gorge herd have travelled north to the Colorado border on several occasions. Within the Carson NF, three bighorn sheep were reported near Canjilon, NM, 35 miles directly west of the Rio Grande Gorge bridge, two bighorn sheep on Black Mesa along US Highway 285 south of Ojo Caliente, and one bighorn sheep sighted at Echo Amphitheater near the Ghost Ranch on the west side of US Highway 84. It is not known at this time which herd (Jemez, Colorado, or Rio Grande Gorge) these bighorn sheep came from.

Evaluating probability of disease transmission involves examining both the potential for interaction with domestic sheep, but also the potential for interaction among bighorn sheep herds (intermingling). As illustrated in Figure 7, the Rio Grande Herd is less than 10 miles from the Red River subpopulation of the Wheeler Peak Herd, but more than 10 miles from Latir and Pecos herds. The Red River subpopulation of the Wheeler Peak Herd is less than 10 miles from the Rio Grande and Latir Herds. The Pecos Herd is significantly more isolated as it occupies land more than 15 miles from all the other herds on the Carson NF. According to limited radio collaring data, the bighorn sheep herds on the Carson NF at this time do not appear to intermingle with each other, even those than are less than 10 miles apart (NMDGF 2022). Isolation of these herds is also reenforced by non-habitat landscapes separating the occupied habitats of these herds.

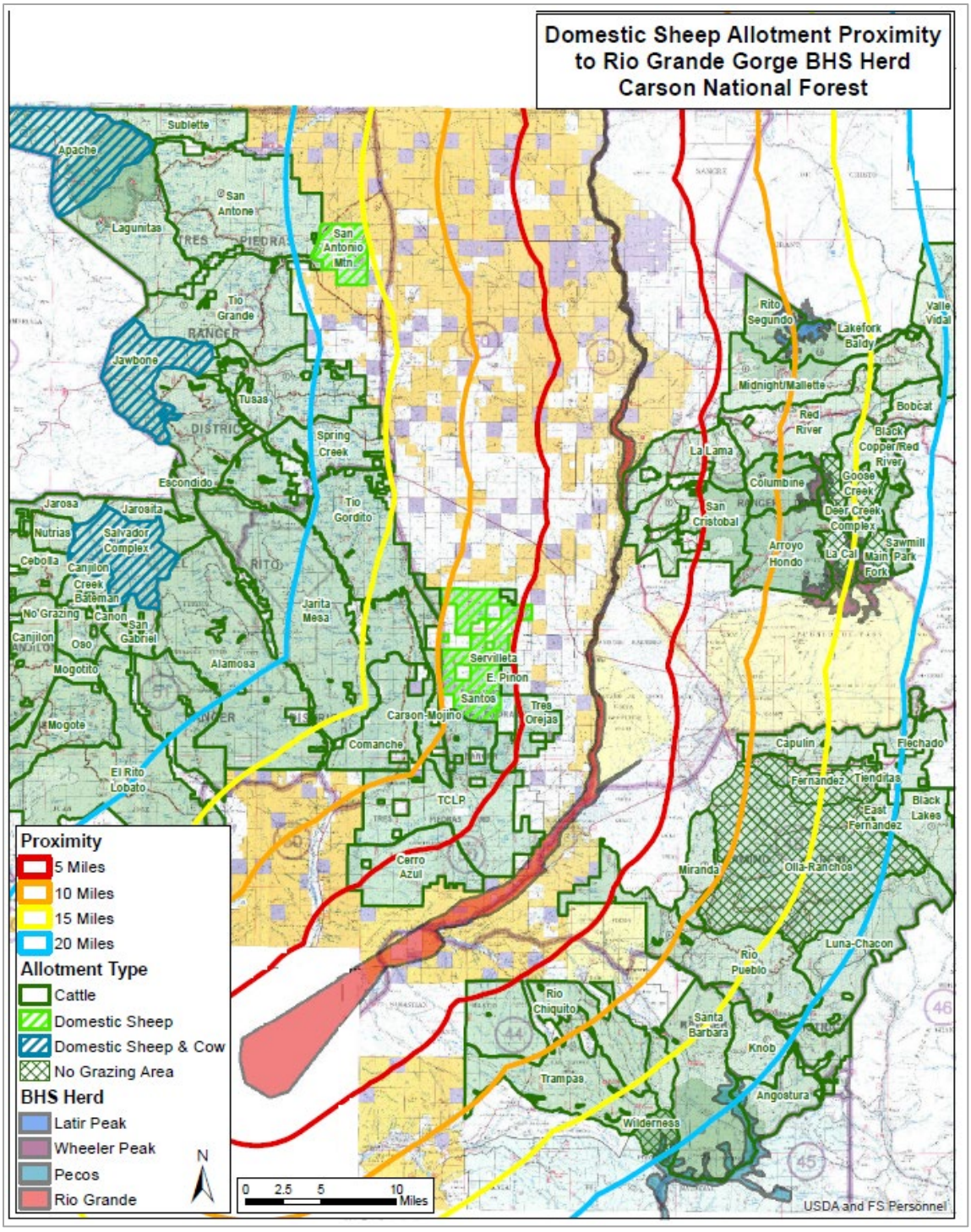

Figure 7. Carson National Forest permitted domestic sheep allotments proximity to Rio Grande Gorge Bighorn Sheep Herd

Step 3: Likelihood of contact

The likelihood of contact between bighorn sheep and domestic sheep or goats or other bighorn sheep herds is based on four factors averaged across herds to calculate an overall likelihood of contact on the Carson NF. Each factor was rated as low, moderate, or high for each herd and summarized using the median rating across herd or factor. The summary ratings by herd and factor were then summarized using the median to determine the forest-wide likelihood of contact for all herds. The four factors include:

- direct overlap between occupied bighorn sheep habitat and Carson NF permitted domestic sheep grazing allotments (direct overlap is high rating and no direct overlap is low rating,
- risk of foraying onto Carson NF permitted domestic sheep grazing allotments based strictly on distance (Carson NF permitted domestic sheep grazing allotment within 10 miles is a high rating and more than 10 miles is low rating),
- risk of foraying to private and other federally permitted domestic sheep flocks based strictly on distance (domestic sheep flocks within 10 miles is a high rating and more than 10 miles is low rating),
- and risk of intermingling between herds; low rating for all herds based on limited radio collar data (NMDGF 2022).

Table 14. Likelihood of Contact Ratings for Bighorn Sheep Herds on the Carson NF

Bighorn Sheep Herd	Direct overlap between occupied bighorn sheep habitat and Carson NF permitted domestic sheep grazing allotments	Risk of foraying onto Carson NF permitted domestic sheep grazing allotments	Risk of foraying to private and other federally permitted domestic sheep flocks	Risk of Intermingling between Carson NF bighorn sheep herds	Overall Likelihood of contact by herd
Latir	low	low	low	low	**low**
Pecos	low	low	low	low	**low**
Rio Grande Gorge	low	high	high	low	**moderate**
Wheeler Peak	low	low	high (due to the Red River subpopulation)	low	**low**
Overall Species-wide likelihood of contact for all Carson NF bighorn sheep	**low**	**low**	**moderate**	**low**	**Species-wide (Forest) likelihood of contact for all herds: low**

For the Latir and Pecos bighorn sheep herds, there is no direct overlap between Carson NF permitted domestic sheep allotments and occupied bighorn sheep habitat (low ratings; Figure 4 and Figure 5). There are no Carson NF permitted domestic sheep herds, private domestic sheep flocks, or other federally permitted domestic sheep within ten miles of these two bighorn sheep herds (low rating; Figure 7). The summary risk rating for these individual herds is low.

For the Wheeler Peak herd there is no direct overlap between Carson NF permitted domestic sheep allotments and occupied bighorn sheep habitat (low rating), or any Carson NF permitted domestic sheep allotments within 10 miles of this herd (low rating). There are, however, private domestic sheep flocks within 10 miles of the Red River subpopulation of this herd (high rating). The summary risk rating for this individual herd is low.

For the Rio Grande Gorge herd there is no direct overlap between Carson NF permitted domestic sheep allotments and occupied bighorn sheep habitat (low rating; Figure 6). There are Carson NF permitted domestic sheep allotments within 10 miles of this herd (high rating), and private and other federally permitted domestic sheep flocks within 10 miles of this herd (high rating; Figure 7). The summary risk rating for this individual herd is moderate.

The assessment of species-wide likelihood of contact integrates all bighorn sheep herds in the plan area because the evaluation of potential SCC is based on the entire population of bighorn sheep within the Carson NF and not individual herds. Currently, the overall likelihood of contact for all bighorn sheep on the Carson NF is low (Table 14) based on all risk factors across all herds combined.

Step 4:

Identify management practices with the goal of separation between domestic and bighorn sheep where necessary to provide for Forest-wide bighorn sheep viability.

Spatial/temporal separation is accomplished through the permitting process and balancing multiple-use demands. The Western Association of Fish and Wildlife Agencies Wild Sheep Working (Wild Sheep Working Group 2012) cautions “that BMPs (Best Management Practices) that work in one situation may or may not work in other situations (Schommer 2009); BMPs need to be developed for site-specific situations, and evaluated for effectiveness.” Likewise, a Technical Conservation Assessment for the USDA Forest Service (Beecham et al. 2007) indicates that, “it is unlikely that setting hard and arbitrary guidelines for buffer zones will work effectively in all situations. In many cases, topographic features of the landscape, herd dynamics, and other variables may reduce the effectiveness of buffer zones. Buffer distances need to be flexible to reflect local conditions.”

Although the Carson NF did not list bighorn sheep as an SCC, the Plan includes a number of species-specific plan components for bighorn sheep. This is in alignment with Section 219.10 of the Planning Rule; however, the inclusion of these plan components had no bearing on bighorn sheep determination as a SCC on the Carson NF. The Carson NF through the project level permitting process will include management strategies that best mitigate any potential risk of disease transfer from Carson NF permitted domestic sheep to all Carson NF bighorn sheep herds including the Rio Grande Gorge and Wheeler Peak herds.

Rocky Mountain bighorn sheep Species of Conservation Concern Evaluation Determination

Based on the above evaluation, Rocky Mountain bighorn sheep on the Carson NF have been determined to be secure and their continued long-term persistence within the Carson NF is not at risk. Therefore, Rocky Mountain bighorn sheep will not be included as a Potential Species of Conservation Concern on the Carson NF.

Rationale

Rocky Mountain bighorn sheep are secure within the Carson NF and their continued long-term persistence is not at risk, since their population trend is increasing, their habitat is stable and abundant, and the overall likelihood of contact across the entire bighorn sheep population on the Carson NF is low.

Population trends for Rocky Mountain bighorn sheep within the Carson NF have been increasing since 2004 (NMDGF 2022; Rominger 2015, Figure 3, Step 2, Filter C), and bighorn sheep transplant trapping and hunting have occurred on the Carson bighorn sheep herds for several years in order to maintain desired carrying capacity (NMDGF 2014). Also, the habitat trend for bighorn sheep is stable and abundant (Step 2, Filter D). Scree slopes, cliffs, and rock features are widespread microsites within all vegetation communities. These ecological characteristics are inherently stable for long periods of time because they are changed primarily by geologic forces. The majority of the Rocky Mountain bighorn sheep on the Carson NF are found in the Alpine and Tundra (ALP) ERU (Assessment p. 34) and wilderness. ALP's departure from reference condition is low on the Carson NF, and when intensified by climate change it is still only moderately departed into the future (Assessment p. 298). Also, 86% of ALP on the Carson NF already receives the highest level of protection, having been designated as wilderness. Designated wilderness areas provide high quality and contiguous alpine tundra habitat and are less influenced by human and management activities. Lastly, according to a 4-step qualitative bighorn sheep assessment, the overall species-wide likelihood of contact for all bighorn sheep on the Carson NF is low (Step 2, Filter E, steps 1-3).

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