United States Department of Agriculture

Forest Service

Southwestern Region

Wildlife Specialist Report –

Viability

Including Forest Planning Species, Management Indicator Species, Ecological Indicators, and Wildlife Quiet Areas

Forest Plan Revision FEIS

Apache-Sitgreaves National Forests (ASNFs)

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Table of Contents

Introduction

To comply with the National Forest Management Act, the Apache-Sitgreaves National Forests (hereafter, ASNFs) propose to revise the current land management plan (1987 forest plan). A final environmental impact statement (FEIS) has been prepared for four land management plan (LMP) alternatives developed for the programmatic management of the 2.1 million acres administered by the Apache-Sitgreaves NFs. The selected alternative would guide all natural resource management activities on the Apache-Sitgreaves NFs for the next 15 years. The four alternatives upon which the analysis in this report is based are described in Chapter 2 of the FEIS and compared in appendix A of this report.

This report evaluates and discloses the potential environmental consequences on wildlife and plants of implementing four plan alternatives, focusing on forest planning species and their habitat. As used in this report, "wildlife" is inclusive of all terrestrial and aquatic animal species (including invertebrates) and plants (including lichen, mosses, and fungi). For species of wildlife that are fish, see the Fisheries Specialist Report. For this wildlife analysis, habitat is characterized as potential natural vegetation types (PNVTs) and also as "habitat elements" that occur within or across PNVTs (e.g., snags). Other factors of concern for wildlife are also considered.

Habitat security and connectivity, the amount of wildlife quiet areas, and the needs of far ranging species and their influence across large landscapes (i.e., highly interactive species) were concerns raised by the public during scoping (see Alternative Development section in FEIS chapter 2). To address this issue, the LMP would include wildlife habitat areas (i.e., wildlife quiet areas). All wildlife quiet areas together would comprise a management area, also helping to contribute to species viability.

Relevant Laws, Regulations, and Policy

Wildlife species viability is addressed in fulfillment of the National Forest Management Act (NFMA) requirements (provisions of the 1982 planning rule). NFMA regulations require that habitat be managed to maintain viable populations of native and desirable non-native vertebrates within the planning area, i.e., the particular national forest. A species is considered viable if the following conditions are met: (1) habitat is well distributed relative to reference (or historic) conditions (see Terminology section at the beginning of FEIS chapter 3), (2) the species occupies a substantial portion of its habitat where that habitat occurs across the planning area, and (3) management will maintain or restore (move) the habitat toward reference conditions. This report also follows direction in the Southwestern Region Planning guidance (USFS, 2010) regarding viability procedures for use in forest plan revision.

Plan direction for the maintenance or movement toward desired ecological conditions (see Purpose and Need for Change section in FEIS chapter 1) is, for the most part, maintenance or movement toward reference conditions important for species viability (see the following wildlife analysis assumptions). These species-habitat relationships are evaluated in terms of viability effectiveness. The analyses in this report tally how well each alternative addresses viability effectiveness by PNVT and by categories of species (e.g., sensitive species).

NFMA regulations also require the identification of management indicator species (MIS) to assess how plan alternatives may affect wildlife populations (1982 planning rule section 219.19 (a)(1)) and which are monitored upon plan implementation (219.19(a)(6)). In addition, Forest Service Manual 2620.5-2 direction allows identification of ecological indicators (EIs) such as plant communities that contribute substantially to species viability. Both MIS and EIs are discussed in this report. Chapter 5 of the LMP includes monitoring for MIS and EIs.

In addition to the NFMA assessment of viability, other laws, regulations, and executive orders provide specific requirements and direction for the analysis of: (1) Endangered Species Act species (ESA), (2) Regional Forester-designated sensitive species (sensitive), (3) eagles (bald and golden), and (4) migratory birds. Most of these species are also discussed under the viability analysis. For ESA species, a Wildlife Specialist Report-Biological Assessment is prepared for consultation with the U.S. Fish and Wildlife Service (USFWS). Per Forest Service Manual direction, a Wildlife Specialist Report-Biological Evaluation is prepared for sensitive species. Executive Order 13186 requires the federal agencies to consider migratory birds in the planning process with an emphasis on species of concern and priority habitats, and the Bald and Golden Eagle Act (as amended) requires an assessment of take of eagles. One other Wildlife Specialist Report-Migratory Birds, Eagles, and Important Bird Areas is prepared for forest plan revision. All wildlife specialist reports are available in the Plan Set of Documents.

Diversity and Forest Planning Species

In anticipation of forest plan revision, a review of the diversity of wildlife on the ASNFs was conducted, beginning in 2007. The 2009 Ecosystem Sustainability Report (ESR) and other reports summarized diversity of ecosystems, including diversity of animals and plants, on the ASNFs. Initially, over 2,000 species of wildlife were screened using a collaborative approach to identify which ones may be present or have suitable habitat in the planning area. Biologists from the ASNFs and other Arizona national forests undergoing plan revision, Arizona Game and Fish Department (AZGFD), The Nature Conservancy, universities, species specialists, and individuals or groups with wildlife interests assisted in this effort.

Species found or potentially found on the ASNFs are those in the following categories:

- Species listed as proposed, threatened, or endangered under the federal Endangered Species Act.
- Species listed on the Region 3 Regional Forester's Sensitive Species list.
- Species identified as locally rare on the ASNFs.
- Birds of conservation concern as identified by (USFWS 2008) and Arizona Partners in Flight priority species (AZGFD 1999).
- Declining species or species of high public interest.

Based on a series of species status reviews,[1] an evaluation was made to determine whether there may be risks to each species' viability because habitat conditions are departed from reference conditions and/or because of species' vulnerability to impacts from LMP management and activities. Of the magnitude of species, most of the common or less common (but secure) species, including those unaffected by management, were found to have no risk to viability from management.[2] Hence, these species were not brought forward for further consideration. Those species with risk were identified as forest planning species (hereafter, FPS). Risks to viability were then considered in the development of LMP direction and/or components. A few common species with limited risk (highly interactive species) are also identified as FPS. In total, there are 109 FPS, consisting of 14 fish and 95 non-fish species. Documentation of the FPS process is found in the Iterative Update to Species Considered and Identification of Forest Planning Species Report found in the plan set of documents.

[1] The number of species identified over the course of the planning process changed as new information about known species, new species, or changes in species status became available; hence, this is an on-going and an iterative process. Although every effort was made to track exact number of species, there may be slight differences among report updates.

[2] This process followed the 2010 USFS Technical Guide for species and ecosystem diversity evaluation.

Provision for Species Viability

Historically species persisted (were viable) having adapted to the risks associated with normal ecosystem functions (e.g., fire, drought) and the habitat conditions that resulted. Risk to species viability is today also a result of human influences. Regardless of source, risks at some level can begin to threaten species viability; hence, in a general manner, risk and viability are inversely related.

To help ensure that the viability needs of species are addressed in the development of plan alternatives, possible risks from LMP management and activities are identified. Goals that support native plant and animal diversity and viability are also identified; these goals are known as desired conditions. Desired conditions are reflective of reference conditions which historically supported these species (see assumptions below). This step in planning for viability is the coarse filter which also takes into account desired conditions for vegetation, soils, watershed, water, and aquatic/riparian resources which contribute to habitat conditions that support species viability. Desired conditions descriptions along with other plan components are found in appendix B.

Another step in planning for viability is the fine filter which is added where desired conditions do not fully address the habitat needs of species. Here, other plan components (i.e., standards and guidelines), are identified to address the fine filter habitat element needs of species (e.g., wet or shaded habitat areas). Standards and guidelines are also identified, as needed, for situations where there are other factors of concern (risks) related to activities (e.g., collection) or indirectly related to habitat (e.g., predation). Standards and guidelines along with other plan components are found in appendix B.

Because of the programmatic nature of forest planning, site specific measures for projects and activities may still be needed to address short-term implementation impacts and provide for species needs. These impacts are often a result of treatment method (e.g., thinning, burning) or timing of management activities.

Analysis of Species Viability

The wildlife analysis characterizes risk from LMP management and activities, and the viability effectiveness of each of the alternatives. The determination of environmental consequences for 95 species, numerous habitat elements, and 4 plan alternatives is extremely complex. As such, the wildlife analysis relies heavily on an approach that categorizes or groups species and habitats. The general analysis process is described below.

F ranking variable. The existing condition of each FPS is expressed in terms of each species' abundance and distribution on the planning unit (ASNFs). This variable is called a forest or F ranking and it is described in table 1. Note that rare species are most often associated with rare habitats which would not become common with management.

Table 1. Forest F rankings for forest planning species (FPS)

F Ranking	Description of species abundance and distribution relative to reference or desired habitat conditions
F? [a/]	Unknown abundance and distribution
F1	Extremely rare
F2	Rare
F3	Uncommon (including locally common but in rare locations)
F4 [b/]	Widespread
F5	Secure

[a/] Because of insufficient information to determine abundance and distribution, F? species are analyzed as F1 species.

[b/] Populations of some F4 species could be affected by extensive landscape scale management and activities depending on timing, both spatial and temporal.

Abundance and distribution of habitat. Abundant and well distributed habitat provides for the continued persistence of a species. Habitat abundance, i.e., the quantity (acres) of habitat provided by a PNVT, generally changes little; however, in some cases the amount of suitable (i.e., quality) habitat acres can change such as when grassland becomes wooded or when a large fire completely removes the entire forest overstory. Habitat distribution, expressed in terms of the mix of vegetation states[3] within a PNVT, can change with management which is often the purpose of treatments.

Future habitat abundance and future habitat distribution based on LMP management and activities are qualitatively classified. Tables 2 and 3 provide descriptions of these classifications. Note that future distribution is classified in terms of desired conditions; hence, while a habitat element may be common across the planning unit in the future, if it is still mostly departed from these conditions it would be considered "poorly" distributed.

Table 2. Values used to classify future habitat abundance

Future habitat abundance value	Description
rare	The habitat (PNVT or habitat element) is rare, with limited occurrences, or habitat consists of patches generally occurring over a very minor portion of the planning area.
occasional	The habitat (PNVT or habitat element) is encountered occasionally, generally occurring over a small portion of the planning area.
common	The habitat (PNVT or habitat element) is abundant and frequently encountered, generally occurring over much of the planning area.

Table 3. Values used to classify future habitat distribution

Future habitat distribution value	Description
poor	The habitat (PNVT or habitat element) is poorly distributed within the planning area relative to historic or desired conditions. Number and size of habitat patches and/or their evenness in distribution over the landscape is greatly reduced.
fair	The habitat (PNVT or habitat element) is fairly well distributed within the planning area relative to historic or desired conditions. Number and size of habitat patches and/or their evenness in distribution over the landscape is somewhat reduced.
good	The habitat (PNVT or habitat element) is well distributed within the planning area relative to historic or desired conditions. Number and size of habitat patches and/or their evenness in distribution over the landscape is similar to those conditions.

Values for the future habitat abundance and distribution are estimated for the 15-year plan period with consideration of trend to 50 years. This is done for each PNVT and each habitat element by alternative. The values are based on different alternative treatment objectives along with treatment method (thin or burn) and specific prescriptions for each. For more information, see the Vegetation Specialist Report, Forest Products Specialist Report, and the Forest Health Specialist Report. All are found in the plan set of documents.

Likelihood of habitat limitation variable. Habitat abundance and distribution values are combined to indicate the likelihood that a PNVT or habitat element would limit future populations of associated species based on LMP management and activities, see table 4. In general, habitats that are poorly distributed, or rare, are most likely to have risk for associated species viability; while common, or well distributed habitats, are least likely to have risk for their species viability.

[3] Vegetation states are also known as seral stages.

Table 4. Likelihood of habitat limitation to FPS viability based on future habitat abundance and future habitat distribution

Future habitat abundance	Future habitat distribution		
	poor	fair	good
rare	High limitation	High limitation	Moderate limitation
occasional	High limitation	Moderate limitation	Low limitation
common	Moderate limitation	Low limitation	Low limitation

Species viability risk rating variable. Species and habitats are linked by combining each species' F ranking variable and the likelihood of limitation for their associated PNVTs and habitat elements. Definitions for the likelihood of limitation categories are shown in Table 5.

Table 5. Definitions for likelihood of limitation to viability based on future habitat abundance and distribution

Likelihood of habitat limitation	Description
High limitation	High probability that the habitat (PNVT or habitat element) will be limiting for a species' viability
Moderate limitation	The habitat (PNVT or habitat element) has a likelihood of some limitation for a species' viability
Low limitation	The habitat (PNVT or habitat element) will likely not be limiting to a species' viability

The relationship between each species and its habitat is expressed as a viability risk rating by alternative. The viability risk rating is determined for the 15-year plan period with consideration of trend to 50 years. Within their given habitat, widespread and abundant species generally have less risk and are more likely to persist, as compared to rare species with small populations. Viability risk ratings are described in table 6.

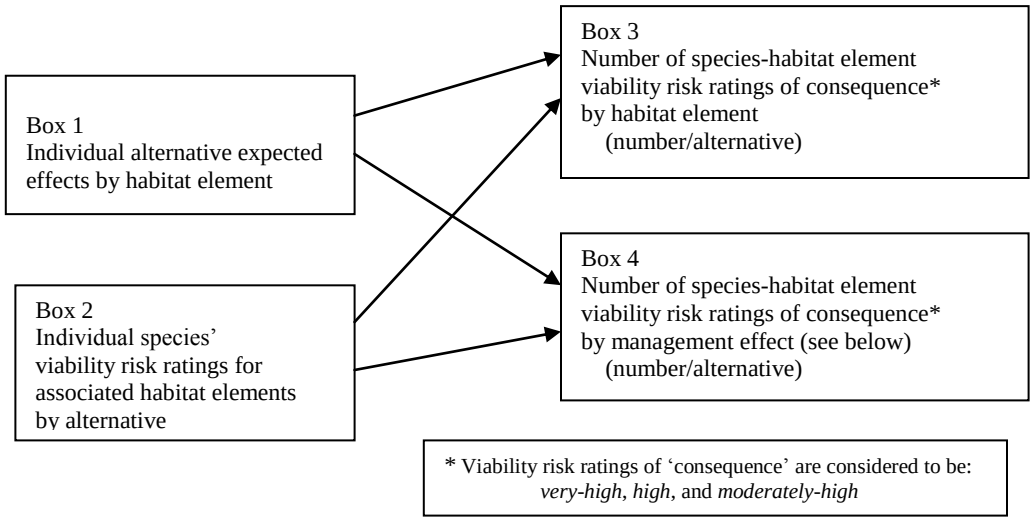
Table 6. Viability risk ratings reflecting species' F rank and likelihood of habitat limitation

Likelihood of habitat limitation	FPS F ranking			
	F? or F1	F2	F3	F4 / F5 [a/]
high	*very-high*	*high*	*moderately-high*	*moderate / low* [b/]
moderate	*high*	*moderately-high*	*moderate* [2/]	*low / low* [b/]
low	*moderately-high*	*moderate* [2/]	*low* [2/]	*low / low* [b/]

[a/] F4 and F5 species are not species of viability concern but a few are considered FPS as highly interactive species.
[b/] Moderate and low level risk ratings are considered no more substantial than normal ecosystem fluctuations.

The linkage of species ranking and habitat elements is referred to as the species-habitat relationship. Figure 1 demonstrates this relationship.

Figure 1. Number of consequential species-habitat viability risk ratings



Management effect variable. This variable categorizes the relative expected outcome of management and activities in terms of minimizing species viability risk. Management effect, by alternative, is determined for each PNVT and habitat element. It is based on how well plan objectives maintain or move habitat toward (i.e., reduce departure from) desired conditions as a result of alternative treatment objectives. Management effect is determined for the 15-year plan period. Movement toward desired conditions reflects desired changes in the mix of vegetation states to provide suitable habitat. Management effect ratings are described in table 7.

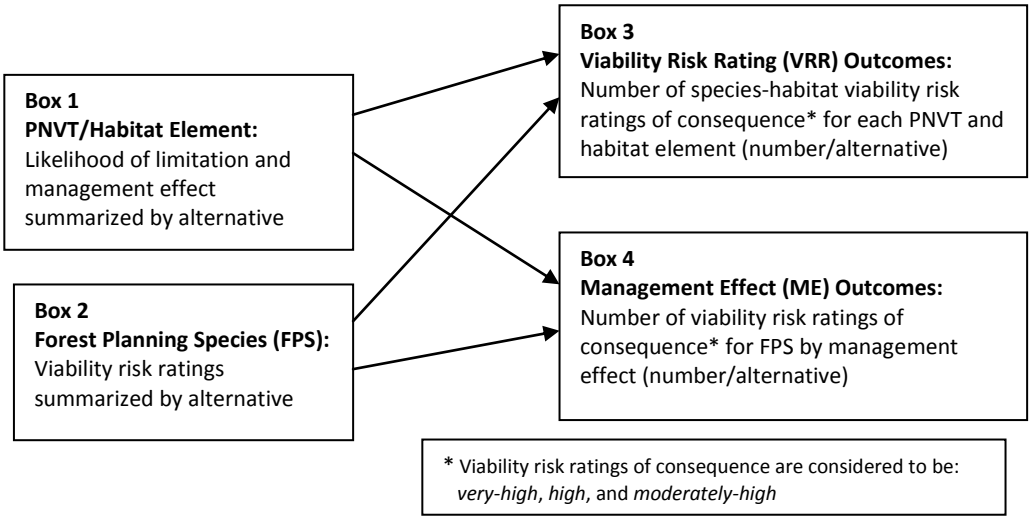
Table 7. Description of relative management effect rating for alternatives

Mgt. Effect Rating	Management effect outcomes based on alternative objectives
1	Greatest relative improvement or maintenance of habitat abundance and distribution through management and activities.
2	Intermediate relative improvement or maintenance of habitat abundance and distribution through management and activities.
3	Least to no relative improvement or maintenance of habitat abundance and distribution as a result of management/activities or lack of thereof (or by factors outside of Forest Service control).

Environmental consequences. The viability risk rating outcomes and the management effect rating outcomes form the basis for the determination of environmental consequences to FPS as a result of LMP management and activities. This is expressed as the relative "viability effectiveness" for each alternative for the 15-year plan period, with consideration of trend to 50 years.

The likelihood of limitation and management effect for each PNVT and habitat element by alternative are summarized (figure 2, box 1). The viability risk ratings for each species-habitat relationship by alternative is also summarized (figure 2, box 2). Next, the number of species-habitat risk ratings of consequence (moderately-high, high, very-high) is tallied for both PVNTs and habitat elements by alternative (figure 2, box 3). The number of viability risk ratings is summarized by alternative for each of the management effects (figure 2, box 4).

Figure 2. Viability Risk Rating outcomes and Management Effect outcomes that form the basis for environmental consequences



Information used in the species viability analysis as described above include forest plan decisions such as desired conditions, standards and guidelines, different alternative management area allocations, different alternative treatment objectives, and different alternative vegetation states. These were applied to the vegetation dynamics development user tool (VDDT) that modeled different LMP alternative outcomes. For more information see the FEIS Vegetation Specialist Report in the plan set of documents.

Analysis Indicators

The following analysis indicators[4] are presented in order to additionally compare alternatives in terms of how effectively each alternative addresses species viability.

- Management effect rating outcomes (the numbers of management effect categories across PNVTs and habitat elements) are tallied in order to compare alternatives. These numbers are also tallied across alternatives for three categories of species: ESA, sensitive, and the remaining FPS (except MIS).
- The number of viability risk ratings of consequence is tallied for each species-habitat relationship by alternative. These are also tallied by alternative for three categories of species: ESA, sensitive, and other FPS (except MIS).
- The number and acreage of management areas best providing for wildlife habitat security (e.g., wildlife quiet areas, wildernesses) and connectivity are tallied. The average distance between management areas that best provide for wildlife habitat security and connectivity is also determined.

Assumptions for Analysis

The following assumptions form the basis for the viability analysis of forest planning species (FPS).

[4] These analysis indicators are not to be confused with Ecological Indicators or Management Indicator Species which are discussed later.

- If a species is associated with a particular habitat, then the quality and quantity of habitat elements available to the species helps to predict its distribution and abundance within that habitat.
- Habitat abundance and distribution similar to that which supported associated species during conditions as a consequence of evolutionary time, will likely contribute to their maintenance in the future (Haufler, 1999). Therefore, habitat abundance and distribution similar to reference conditions will likely contribute to associated species maintenance in the future.
- Desired conditions are synonymous with reference conditions with the exception of three PNVTs where desired conditions were adjusted from reference conditions as follows: In the dry mixed conifer and Madrean pine-oak woodland PNVTs, vegetation states to reflect needed habitat conditions for the threatened Mexican spotted owl (e.g., closed canopies) are included in desired conditions. In ponderosa pine, vegetation states to reflect needed habitat conditions for the sensitive northern goshawk (e.g., large trees) are included in desired conditions.
- In general, the further a habitat is departed from desired conditions (i.e., from reference or reference adjusted conditions), the greater the risk to viability of associated species and the less the alternative's viability effectiveness. Conversely, the closer a habitat is to desired conditions, the lower the risk to viability of associated species and the greater the alternative's viability effectiveness.
- Low to moderate ratings of species viability risk are considered no more substantial than normal ecosystem fluctuations and within a species' ability to adjust, and therefore pose no risk to viability. Hence, only moderately high, high, and very high viability risk ratings are used to develop additional plan components to assure viability and used to compare alternatives.
- The evaluation of environmental consequences to species viability is framed as a risk assessment in terms of alternative viability effectiveness. However, there is a level of uncertainty about the projected effects of LMP management and activities on species viability because of gaps in knowledge about the complex interaction between species and their habitats (Holthausen, 2002). Because of this uncertainty and impacts outside of Forest Service control, monitoring as identified in chapter 5 of the LMP will take place, thereby facilitating adaptive management and changes, as needed, to support ongoing species viability.
- Acreage of each PNVT is static, because it is based on geology, soils, and climate. However, the acreage of states within a PNVT varies due to disturbance and management (see the Vegetation Specialist Report). As such, PNVT states (i.e., habitat conditions that are most suitable for a particular FPS) vary among alternatives.

Affected Environment

The ASNFs provide some of the most diverse habitats of national forests in the Southwestern Region of the Forest Service. These habitats span almost 8,000 feet in elevation, ranging from semi-desert grasslands at about 3,500 feet to spruce-fir forests at about 11,400 feet. A large portion of the forests is ponderosa pine (part of the largest, contiguous ponderosa pine forest in the world); yet, the ASNFs also contain much of the acreage in unique habitats of the Southwestern Region. These habitats include montane and subalpine grasslands, extensive wetlands (including bogs and fens), and the headwaters of major river systems in Arizona (Blue, Black, San Francisco, and Little Colorado). The ASNFs encompass over 2,000 miles of rivers and perennial streams and more than 30 lakes and reservoirs. Both extensive and unique habitats support species ranging from one of the largest elk herds in Arizona to rare species like the Three Forks springsnail which only occurs on the ASNFs. These diverse habitats and the wildlife they support help draw upwards of 2 million visitors to the ASNFs annually.

The following sections describe existing conditions for habitat and associated FPS. Existing conditions reflect changes brought about by the 2011 Wallow Fire where applicable. The 2009 Ecosystem Sustainability Report (ESR) and other reports in the plan set of documents summarized diversity of ecosystems, including diversity of animals and plants, on the ASNFs. General ecological condition information from that report is found in appendix C.

Wildlife Habitat

The following sections describe habitat at two levels which include (1) the PNVT(s), i.e., the coarse filter for meeting species needs and viability and (2) the habitat element(s) (e.g., wet meadows or large snags), i.e., the fine filter for further assuring species viability. Viability needs of species associated with the coarse filter PNVT are generally met by providing PNVT desired conditions or movement toward them, while standards and guidelines help meet the viability needs of species associated with fine filter habitat elements. However, the coarse-fine filter approach is not entirely discrete in that standards and guidelines can contribute to viability for some coarse filter species, while the needs of fine filter species can also be provided for, in part, by the coarse filter desired conditions of PNVTs.

Table 8 lists wildlife habitat provided by PNVTs and habitat elements, along with associated FPS. Note that not all of the PNVTs are listed: two PNVTs are not departed from their reference conditions (interior chaparral and piñon-juniper woodland) and they have no associated species with viability concerns. Because of the diversity of riparian habitats and species, riparian habitat needs are primarily addressed at the fine filter level. These riparian habitat elements are also shown in the table with associated FPS.

Table 8. PNVTs (coarse filter) and habitat elements (fine filter) of importance to species viability, showing associated forest planning species

PNVTs (coarse filter) Habitat elements (fine filter)	Associated forest planning species (FPS)
Four Forested PNVTs	
PONDEROSA PINE FOREST (PPF)	Arizona myotis bat, Abert's squirrel, northern goshawk, zone-tailed hawk, Grace's warbler, flammulated owl, Mexican spotted owl (where Gambel oak occurs)
Sometimes shaded or often wet meadow or forest opening	Mogollon vole, Merriam's shrew, four-spotted skipperling butterfly, Arizona sneezeweed, Mogollon clover, Oak Creek triteleia
DRY MIXED CONIFER FOREST (DMCF)	Arizona myotis bat, red squirrel, northern goshawk, flammulated owl, Mexican spotted owl
Cool understory micro-climate	Goodding's onion
Dense, low-mid canopy with ample ground vegetation/litter and/or woody debris	black bear, red-faced warbler
Sometimes shaded or often wet meadow or forest opening	Merriam's shrew
WET MIXED CONIFER FOREST (WMCF)	red squirrel, black bear, northern goshawk, red-faced warbler, Mexican spotted owl, White Mountains paintbrush [a/], yellow lady's slipper, wood nymph, heartleaf ragwort, yellow Jacob's ladder, hooded lady's tress
Dense, low-mid canopy with ample ground vegetation/litter and/or woody debris	White Mountains chipmunk, Swainson's thrush, southern red-backed vole, dusky blue grouse
SPRUCE-FIR FOREST (SFF)	red squirrel, black bear, Mexican spotted owl, crenulate moonwort, White Mountains paintbrush [a/], yellow lady's slipper, wood nymph, heartleaf ragwort, yellow Jacob's ladder, hooded lady's tress
Dense, low-mid canopy with ample ground vegetation/litter and/or woody debris	White Mountains chipmunk, Swainson's thrush, southern red-backed vole , dusky blue grouse
One Woodland PNVT	
MADREAN PINE-OAK WOODLAND (MPOW)	mule deer (winter), juniper titmouse, Mexican spotted owl (often in association with canyons), gray vireo, Bigelow's onion
Cool understory micro-climate	Mexican hemlock parsley
Mosaic of conditions [c/]	Greene milkweed

PNVTs (coarse filter) Habitat elements (fine filter)	Associated forest planning species (FPS)
Three Grassland PNVTs	
MONTANE/SUBALPINE GRASSLANDS (MSG)	pronghorn antelope, Gunnison's prairie dog, dwarf shrew, savannah sparrow, splachnoid dung moss
Seasonally wetted swales	Ferris' copper butterfly, Alberta arctic butterfly, nitocris fritillary butterfly, nanomis fritillary butterfly
Mosaic of conditions [c/]	long-tailed vole, dwarf shrew, White Mountains ground squirrel
GREAT BASIN GRASSLAND (GBG)	pronghorn antelope, Gunnison's prairie dog, Arizona sunflower
Seasonally wetted swales	Parish alkali grass (alkali soils only)
Mosaic of conditions [c/]	Springerville pocket mouse, White Mountains ground squirrel, western burrowing owl, Montezuma's quail, Greene milkweed
SEMI-DESERT GRASSLAND	Bigelow's onion, Arizona sunflower, superb penstemon,
Mosaic of conditions [c/]	lesser long-nosed bat, Montezuma's quail, plateau giant tiger beetle
ACROSS ALL PNVTs	
Canyon slopes/cliffs, caves, rocky slopes (often in vicinity of riparian areas, often cool micro-climate)	Townsend's big-eared bat, spotted bat, greater western mastiff bat, Allen's big-eared bat, peregrine falcon, Eastwood alumroot[2/], Arizona alumroot [2/], Davidson's cliff carrot (primarily within PPF, MPOW)
Habitat connectivity	Mexican wolf, jaguar, mountain lion, bear
WITHIN RIPARIAN PNVTs (4) [d/] **Mixed Broadleaf Deciduous Riparian Forest (MBDRF), Cottonwood-Willow Riparian Forest (CWRF), Montane Willow Riparian Forest (MWRF), Wetland-Cienega Riparian Area (WCRA)**	
High water quality--all riparian PNVTs	water shrew, bald eagle, Arizona toad, Chiricahua leopard frog, northern leopard frog, lowland leopard frog, northern Mexican gartersnake, narrow-headed gartersnake, false ameletus mayfly, California floater, Mosely caddisfly, Arizona snaketail dragonfly, White Mountains water penny beetle, Three Forks springsnail, Blumer's dock, carnivorous bladderwort
Healthy riparian conditions (i.e., well vegetated and untrampled streambanks and floodplains)--all riparian PNVTs (unless otherwise specified)	Arizona montane vole, water shrew, NM meadow jumping mouse, Southwestern willow flycatcher, peregrine falcon, Lincoln's sparrow (MWRF), northern Mexican gartersnake (below Mogollon Rim), narrow-headed gartersnake (above Mogollon Rim), Blumer's dock, Arizona willow (MWRF only), Bebbs willow
Large trees, snags and/or dense canopies—MBDRF (unless otherwise specfied)	beaver (all riparian forests), greater western mastiff bat, Allen's big-eared bat, Arizona gray squirrel, common black-hawk, yellow-billed cuckoo, bald eagle (all riparian forests) , evening grosbeak (all riparian forests)
Dense low-mid canopy with ample ground litter--MBDRF	western red bat, ocelot, Southwestern willow flycatcher (MWRF), MacGillvray's warbler (all forested riparians), gray catbird (all riparian forests), bear
Permanent wet meadow-like areas—WCRA	Ferris' copper butterfly, nitocris fritillary butterfly, nokomis fritillary butterfly

[a/] White Mountains paintbrush classified as either *Castilleja mogollonica* or *C. sulpurea*.
[b/] Eastwood alumroot also known as Senator mine alum root; Arizona alumroot also known as Chiricahua Mountain alumroot.
[c/] Mosaic of conditions indicates these species need adjacent untreated areas for persistence within the PNVT.
[d/] Because of the great diversity of conditions in the riparian PNVTs, some important fine filter habitat elements are identified beyond desired conditions.

Coarse Filter PNVT Habitat

Table 9 provides the acreage of each coarse filter PNVT. It also shows the existing condition for each PNVT and how it compares to desired conditions and, for context, historic conditions or HRV. The FEIS Vegetation Specialist Report contains more details about PNVTs including discussion about historic and desired conditions. Although FPS associated with a particular PNVT do not typically use every acre of

the PNVT, the total PNVT acreage is considered suitable habitat and potentially occupied for this analysis, unless otherwise noted.

Table 9. PNVTs influencing FPS on the ASNFs--their existing condition (EC), acreage, and comparison to historic (HRV) and desired condition (DC)

PNVT abbreviation	Habitat element: PNVT (vegetation type) -acreage and approx. % of ASNFs -name and abbreviation	Existing Condition (EC) with Comparisons		Comments ASNFs lands total 2,015,352 acres exclusive of private or state in-holdings
		EC % departure from HRV & class	EC % departure from DC & class	
	Departure ratings classes: 0-20%= no or little departed; 21-40%= low departure; 41-60%= moderate; 61-80%= high; 81-100=severe			
Forest types - 945,753 acres & 47% of ASNFs				
PPF	Ponderosa Pine Forest -- about ⅓ has Gambel oak component 602,206 ac, 30%	94%, severe	77%, high	DC includes some current vegetation states now utilized by northern goshawk, i.e., large-very large trees with closed canopies that were not common historically
DMCF	Dry Mixed Conifer Forest (frequent fire mixed conifer)-- can include an aspen component 147,885 ac, 7%	77%, high	67%, high	DC includes some current vegetation states now utilized by Mexican spotted owl, i.e., large-very large trees with closed canopies and multi-storied that were not common historically
WMCF	Wet Mixed Conifer Forest (infrequent fire mixed conifer)-- often includes an aspen component 177,996 ac, 9%	61%, high	54%, mod	Increased canopy and representation of shade intolerant connivers, especially in the low to mid layers.
SFF	Spruce-Fir Forest--includes a mix of other conifers & often includes an aspen component 17,667 ac, 1%	62%, high	59%, mod	Lower elevation than pure spruce- fir types; still typically a stand replacement fire type--partially incorporated into DC
Woodland types – 617,093 acres & 31% of ASNFs				
MPOW	Madrean Pine-oak Woodland 394,927 ac, 20%	72%, high	61%, high	Higher density (trees/acre) than historically or desired
PJW [a/]	Piñon-Juniper woodland 222,166 ac, 11%	26%, low	26%, low	Much higher density (trees/acre) than historically or desired
Grassland types – 344,034 acres & 17% of ASNFs				
MSG	Montane/Subalpine Grassland 51,559 ac, 3%	54%, mod	54%, mod	Compositional shift in grasses and forbs has occurred, some conifer encroachment
GBG	Great Basin Grassland 185,523 ac, 9%	67%, high	67%, high	Extensive encroachment by conifers
SDG	Semi-Desert Grassland 106,952 ac, 5%	79%, high	79%, high	Widespread encroachment by conifers
Riparian types – 48,241 acres & ~2% of NFS Land				
WCR	Wetland-Cienega Riparian Area 17,900 ac, 1%	36%, low	36%, low	Compositional shift from dominance by sedges and other native grasses to non-native bluegrasses and some encroachment by conifers; more bare ground than historically
MWR	Montane-Willow Riparian Forest 4,808 ac, <1%	21%, low	21%, low	Compositional shift from dominance by sedges and other native grasses to non-native bluegrasses and some encroachment by conifers
CWR	Cottonwood-Willow Riparian Forest 15,876 ac, 1% (approx.. 800 miles drainages)	20%, not departed	20%, not departed	Limited trees in young age classes due to ungulate grazing and reduced bank stability in some areas
MBDR	Mixed Broad-leaf Deciduous Riparian Forest 9,657 ac, <1% (approx.. 860 miles drainages)	33%, low	33%, low	Under representation of large trees, increased density in lower canopies; less streambank stability
Shrubland – 55,981 acres & 3% of ASNFs				

IC [a/]	Interior Chaparral 55,981 ac, 3%	8%, no departure	8%, no departure	Converts to grassland with fire, rapidly returning to chaparral within 3-4 years
[a/] Indicates that no associated species have viability risk of concern in these PNVTs.				

Fine Filter Habitat Elements

The amount and current condition of fine filter habitat elements is not available on a forestwide basis (it is normally determined on a project-level basis). However, table 10 provides a general description of existing condition for each habitat element and its associated risks to viability. This is based, in part, on information in the Riparian and Vegetation Specialist Reports found in the plan set of documents. Even where some habitat element locations are not currently used by FPS, all are considered suitable habitat that is potentially occupied, unless otherwise noted. Besides existing condition and risks, appendix D provides more detail about the fine filter habitat elements themselves.

Table 10. Description of fine filter habitat elements and risks

Fine filter habitat elements [a/]	Description of general existing condition and risks
Sometimes shaded or often wet meadow or forest opening (PPF, DMCF, and WMCF)	Mostly small areas (quarter acre, sometimes more or less) within forest and woodland PNVTs with no trees that are dominated by herbaceous vegetation, often with cool season [b/] herbaceous plant (forage) growth due to moister soil conditions or shading from adjacent trees. High to moderate intensity fire and extensive thinning can dry and warm these areas. Livestock use can change herbaceous vegetation structure and composition (shifts to warm season and lower seral state vegetation and introduce non-native invasive plants), decrease ground cover, cause soil compaction, and increase erosion. These risks are most likely on lower elevation, yearlong allotments which comprise about 797,000 acres of the ASNFs.
Cool understory micro-climate (DMCF, MPOW)	Not openings among trees but rather cool, moist areas under dense trees with high canopy closure, where summer temperatures and high winds are mitigated. High to moderate intensity fire and extensive thinning can dry and warm these areas, changing herbaceous vegetation structure and composition. The Wallow Fire resulted in the complete loss of forest canopy on over 50,000 acres within these two PNVTs [c/] with the associated loss of this habitat element.
Dense, low-mid canopy with ample ground litter or woody debris (DMCF, WMCF, SFF, and MBDRF)	Dense low and/or mid canopies provide foraging and nesting habitat, necessary hiding and travel cover, and help limit detection by predators. Ample ground cover and woody debris provide habitat structure (e.g., cover) and associated forage plants. These areas increase habitat effectiveness (carrying capacity) because more individuals of certain FPS can persist in locations where cover is denser. High to moderate intensity fire and extensive thinning can degrade hiding and travel cover. The Wallow Fire resulted in the complete loss of forest canopy on almost 106,000 acres [c/] within these four PNVTs with the associated loss of this habitat element.
Seasonally wetted swales (MSG and GBG)	Low areas with greater seasonal moisture inflow or wetted from below; these can be small or, in the MSG, extensive in size (40 acres or more). They provide denser, often more diverse, and often cool season [b/] herbaceous plant (forage) growth. High to moderate intensity fire and extensive thinning can dry and warm these areas. Livestock use can change herbaceous vegetation structure and composition (shifts to warm season and lower seral state vegetation and introduce non-native invasive plants), decrease ground cover, cause soil compaction, and increase erosion. These risks are most likely on lower elevation, yearlong allotments which comprise about 797,000 acres of the ASNFs and on seasonal allotments with May and June livestock use every year which comprise about 514,000 acres of the ASNFs.

Canyon slopes, cliffs/caves, rocky slopes--often in vicinity of riparian areas or often providing cool micro-climate conditions due to aspect (across all PNVTs)	All are found across the forests (roughly 18% of the acreage on the forests is over 40% slope with most of that on the Apache side of the ASNFs). Although typically limited in such areas, fire which burns hotter on steep slopes can impact plants, while human activity can disturb foraging or roosting bats and nesting birds.
High water quality (all riparian PNVTs)	All associated aquatic and semi-aquatic species. All are susceptible to degradation of water quality and sedimentation from LMP management and activities. Sediment can smother invertebrates, smother prey eggs and larvae, clog invertebrate prey habitat, and reduce oxygen needed by fish prey species. There are over 2,000 miles of riparian corridors (both perennial and intermittent) including many of the State's headwater streams, all of which have experienced channel changes and sedimentation impacts over time. However, management and activity impacts have been reduced or, in some areas removed, which has likely resulted in improved water quality in these locations over the last decade.
Healthy riparian conditions, e.g., well vegetated and untrampled streambanks and floodplains) (all riparian PNVTs, unless otherwise specified)	These conditions allow for vigorous, successfully reproducing plants that protect banks and floodplains. Dense, untrampled herbaceous vegetation and uncompacted stream or drainage banks and floodplains provide habitat structure and forage, as well as hunting or hiding cover and nesting sites. Wildfire and all but low intensity prescribed fire can reduce plant and woody debris cover and lead to excess sedimentation and potentially debris flows. Thinning and all ungulate use can trample or remove vegetation and lead to soil compaction and erosion. Many riparian locations have reduced ground cover, damaged banks, and compositional shift to lower seral state vegetation (see the following Riparian Ecological Indicator section for more information).
Large trees and/or dense canopies (MBDRF, CWRF, and MWRF)	Provides roosting, nesting, hiding, and foraging habitat for FPS or their prey. Although fire is generally limited in riparian areas, all but low intensity fire can easily weaken or kill woody riparian vegetation (flooding is the primary riparian ecological disturbance). Livestock and wild ungulate use, especially during spring and early summer, have impacted the successful regenerataion of woody species in numerous locations. In total, there are over 48,000 acres of riparian habitat on the ASNFs.
Large snags [d/] (MBDRF and CWRF)	Provides nesting, roosting, and foraging habitat. Although generally limited in riparian areas, all but low intensity fire can weaken or topple large snags. The 2002 Rodeo-Chediski Fire burned many snags in CWRF. Overall, burn out operations along the Blue River for the 2011 Wallow Fire had limited impact on large snags in MBDRF. Number of large snags is not available for these PNVTs.
Permanent wet meadow-like areas (WCRA)	Moist ground surface and vegetation, along with flowering plants, provide egg laying and foraging habitat for FPS invertebrates and foraging and hiding cover for small FPS mammals. High to moderate intensity fire and livestock use can dry these areas out, changing herbaceous vegetation structure and composition (shifts to warm season [b/] and lower seral state vegetation), decrease ground cover, cause soil compaction, and lower the water table. The majority of these areas occur at higher elevations (>7,500 ft.) and there are over 20,000 acres in this PNVT. These risks are most likely in locations where livestock grazing use occurs every year during May and June (about 564,000 acres on the ASNFs).

[a/] ( ) indicates the PNVT where a habitat element most commonly falls within.

[b/] Because a greater percentage of moisture falls during the summer period in the Southwest, most herbaceous plant species do the majority of their growth during the warm summer months (warm season growing plants) and forage is typically abundant during this period unless droughty; however, fewer plants do the majority of their growth during spring to early summer (May and June) period (cool season growing plants) based on winter moisture so there is limited herbaceous forage during the period before summer rains and, additionally, most cool season plants are found in riparian areas where foraging is often concentrated during spring and early summer.[c/] Acreage with tree basal area (BA) loss of 75 to 100 percent which reflects complete (100 percent) loss

of all trees based on the 7/18/11RVAG mapping provided by USFS Remote Sensing Applications Center.

[d/] While desired conditions for forest and woodland PNVTs address needed snags at the coarse filter, the riparian forest PNVTs desired conditions do not.

Habitat Ecological Indicators (EIs)

Two vegetation communities important to viability of many species (aspen and riparian) are selected as ecological indicators per Forest Service manual direction. The Report on the Selection of Management Indicator Species and Ecological Indicators describes the indicator selection process. Existing conditions for these two EIs follow.

Aspen EI

Aspen occurs primarily within the forested PNVTs. Aspen stands provide a wide range of habitat for wildlife, including migratory birds. Aspen leaves provide forage in summer and the bark provides winter forage. Aspen stands can have twice the density and diversity of insects as compared to pure conifer stands, supporting many species of wildlife (Simard et al., 2001). Aspen stands also provide preferred cavity nesting sites for a large number of birds (Martin et al., 2004). Given the regeneration of existing aspen and anticipated new appearances of aspen (via seeding) after the Wallow Fire, this EI is expected to play a major role in the viability of many species during the 15-year LMP. See the Vegetation and Forest Health Specialist Reports for more information about aspen.

Prior to the 2011 Wallow Fire, trend for this habitat community was static to down due to conifer encroachment and browsing. Aspen have been observed to be root-sprouting prolifically and sprouting from seed after the fire; therefore, it could be inferred that the trend is now up. Table 11 depicts the amount of aspen habitat as of 2012 after the Wallow Fire. However, while aspen acreage across forested PNVTs is expected to increase, the extent of that is unknown, as is the ability of aspen to persist over time given domestic and wild herbivory, and impacts from removal of hazard and salvaged trees post fire.

Table 11. Aspen within forested PNVTs, existing condition in 2012 (post-Wallow Fire)

Amount (acres) of forested PNVTs containing aspen									
ponderosa pine 602,206		wet mixed conifer 177,995		dry mixed conifer 147,885		spruce-fir 17,667		TOTAL 945,753	
Amount (acres) of aspen within each forested PNVT									
acres - percent		acres - percent		acres - percent		acres - percent		acres - percent	
5,988	1.0%	50,355	28.3%	14,232	9.7%	5,875	33.3%	76,506	8.1%

Desired conditions for forest types containing aspen are the coarse filter for assessing associated FPS' viability. In addition, aspen EI monitoring, upon LMP implementation, would determine the response to and persistence of aspen over time to LMP management and activities, recent large fires, subsequent ungulate use, and climate change. Monitoring (LMP chapter 5) would inform adaptive management and any need for change.

Riparian EI

The cottonwood-willow riparian forest, and the montane willow riparian forests PNVTs on the ASNFs represent a substantial portion of these riparian forests types across the USFS Southwestern Region. These two riparian forested PNVTs are together considered the riparian ecological indicator for the ASNFs. The 2005 and 2006 midscale vegetation inventory determined the existing condition of riparian overstory relative to reference condition.

Overall, existing conditions reflect low departure from reference or desired condition in terms of riparian overstory composition and structure. However, from some historic photographs circa 1960s and 1970s (USFS, 2011), it appears that the current extent of woody riparian vegetation has been substantially reduced in some areas.

The 2011 Wallow Fire impacted riparian forest PNVTs but, overall, not substantially. Of the 15,876 acres in cottonwood-willow riparian forest PNVT, only 1.5 percent burned at these levels. In the montane willow riparian forest PNVT there are 4,808 of which just less than 14 percent burned at these levels. However, the long term indirect impact from heavy post-fire flooding has not been assessed. Because most woody vegetation in these PNVTs typically resprouts, PNVT acreage is not considered reduced by the Wallow Fire. However, succession is set back to earlier seral states in burn areas and where heavy post fire flooding down-cut drainages, recovery time is much greater.

Reference conditions in riparian understories (the herbaceous vegetation layer) are not as well understood. However, monitoring across the ASNFs over the last decade has found that riparian area soils and herbaceous vegetation (e.g., sedges, grasses, forbs are assessed) and deciduous trees and shrubs (e.g., cottonwoods, willows) receive far greater impacts from grazing and browsing ungulates (domestic and wild) than the uplands. This is especially true where ungulates are present during the winter and spring periods when little other forage provides adequate nutrition. Road and recreation activities also contribute to existing conditions (e.g., trampling or loss of understory riparian vegetation).

Proper functioning condition (PFC) riparian surveys (a Bureau of Land Management methodology adapted by the USFS) are a measure of how well riparian processes are functioning (e.g., vegetation bank cover and stability, woody debris). Based on forestwide PFC riparian surveys conducted in the 15 years prior to the Wallow Fire (irrespective of particular riparian PNVT), many riparian areas are not at proper functioning condition. The majority of stream segments on 9 of 12 streams in the Little Colorado River watersheds are not in proper functioning condition; the majority of stream segments on all streams in the San Francisco, Black River, and Eagle Creek watersheds are not in proper functioning condition; and the majority of stream segments on 6 of 7 streams in other watersheds are also not in proper functioning condition. In the last 15 years, some riparian areas have been excluded from primarily livestock impacts and are in the process of recovering.

Table 12 describes current understory (herbaceous and soil) conditions taken from the Riparian Specialist Report and the Vegetation Specialist Report and which reflects post-Wallow Fire conditions.

Table 12. Existing understory/herbaceous condition of the riparian ecological indicator

Riparian ecological indicator by riparian forest PNVT	Decline in ground cover from potential	Decline in herbaceous production from potential	Ecological condition	Current trend relative to desired conditions for understory vegetation/soils
Cottonwood-willow riparian forest	11 – 46%	56%	low - moderate	away/away
Montane willow riparian forest	up to 20%	91%	low - moderate	away/away

Because of the normal sensitivity of riparian habitat and major watershed adjustments (e.g., movement of soil, reestablishment of vegetation) after the Wallow Fire, ongoing species viability is an important consideration in riparian areas. Riparian EI monitoring, upon plan implementation, would determine the response of especially understory components (e.g., sedges, young trees, stream banks) to large fires and to LMP management and activities. Monitoring (LMP chapter 5) would inform adaptive management and any need for change.

Wildlife Species

Forest Planning Species

The 95 non-fish forest planning species (FPS) are comprised of 8 ESA species, 53 Regional Forester sensitive species, and 34 other species. The latter 34 species hold no special regulatory status except as

addressed for viability under NFMA. Public scoping identified six FPS (mammals) as highly interactive (HI) species for which there are landscape level concerns relative to habitat security and connectivity (one highly interactive species is an ESA and another is a sensitive species, while four are other species). More background is provided in the Iterative Update to Species Considered and Identification of Forest Planning Species and their Existing Condition found in the plan set of documents.

Table 13 characterizes the existing condition of all FPS in terms of their abundance and distribution (F ranking), along with associated PNVTs and habitat elements. It also lists their status as of 2012[5]. Note that a species can have more than one status and status can change over time. FPS are grouped as follows: 30 mammals, 22 birds, 6 reptiles/amphibians, 12 invertebrates, and 25 plants. FPS that are also ESA, sensitive, and highly interactive (HI) are further discussed.

Table 13. FPS, their status, F ranking, associated PNVTs and habitat elements

FPS by species group		Status [a/]	F ranking [b/]	PNVT Habitat element [c/]
[a/] **Status**: T = ESA threatened; E = ESA endangered; ENE = ESA experimental, non-essential; CH = ESA critical habitat; p = ESA proposed; C = ESA candidate for listing under ESA; S = Southwestern Region sensitive species; HI = highly interactive species (see following section). [b/] **F ranking** (existing condition relative to reference or desired conditions): F? = unknown abundance/distribution; F1 = extremely rare; F2 = rare; F3 = uncommon (including locally common but in rare locations); F4 = widespread; F5 = secure [c/] **( )** denotes which PNVT a particular habitat element is tied, otherwise the habitat element generally occurs irrespective of PNVT(s) [d/] Initially, the Mexican spotted owl was widespread in suitable habitat across the ASNFs; however, the Wallow Fire affected habitat suitability substantially and there is uncertainty about their persistence so that their F ranking is adjusted to F3 until post-fire MSO surveys are completed over the next few years.				
Mammals (30)				
pronghorn antelope	*Antilocapra america*	HI	F4	GBG MSG substantial predation
Mexican wolf	*Canus lupus baileyi*	ENE, HI	F1	habitat connectivity (all PNVTs) intentional harassment
beaver	*Castor canadensis*	HI	F4	large trees (forested riparian PNVTs)
southern red-backed vole	*Clethrionomys (Myodes) gapperi*	S	F?	ample litter and woody debris (WMCF, SFF)
Townsend's big-eared bat	*Corynorhinus townsendii pallenscens*	S	F?	caves disease
Gunnison's prairie dog	*Cynomys gunnisoni*	S, HI	F?	GBG MSG intentional harassment
spotted bat	*Euderma maculatum*	S	F1	wet meadow (PPF, DMCF) wet swales (MSG, GBG) cliffs
greater western mastiff bat	*Eumops perotis californicus*	S	F?	large trees (MBDRF) cliffs
Allen's big-eared bat	*Idionycteris phyllotis*	S	F3	large trees and snags (MBDRF) cliffs
western red bat	*Lasiurus blossevillii*	S	F2	ample debris & litter (MBDRF) caves disease
ocelot	*Leopardus pardalis*	E	F?	dense, low vegetation & cover (MBDRF)
lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*	E	F?	mosaic of conditions (SDG)
long-tailed vole	*Microtus longicaudus*	S	F3	wet swales (MSG)
Arizona montane vole	*Microtus montanus arizonensis*	S	F3	healthy riparian conditions (CWRF, MWRF)
Mogollon vole	*Microtus mogollonensis mogollonensis*	S	F3	wet meadow (PPF)
Arizona myotis bat	*Myotis occultus*		F3	PPF DMCF

[5] By 2014, a small number of Regional Forester sensitive species were no longer listed as sensitive; however, they are retained in this report and evaluated as FPS.

FPS by species group		Status [a/]	F ranking [b/]	PNVT Habitat element [c/]
mule deer	*Odocoileus hemionus*		F4	MPOW, winter
jaguar	*Panther onca*	E	F?	habitat connectivity (MBDRF)
Springerville pocket mouse	*Perognathus flavus goodpasteri*	S	F3	mosaic of conditions (GBG)
mountain lion	*Puma concolor*	HI	F5	habitat connectivity (all PNVTs)
Abert's squirrel	*Sciurus aberti*		F4	PPF
Arizona gray squirrel	*Sciurus arizonensis arizonensis*	S	F?	large trees (MBDRF)
Merriam's shrew	*Sorex merriami*	S	F3	wet meadow (PPF, DMCF)
dwarf shrew	*Sorex nanus*	S	F3	MSG
water shrew	*Sorex palustris navigator*	S	F?	water quality (CWRF, MWRF) healthy riparian conditions (CWRF,MWRF)
White Mountains ground squirrel	*Spermophilus tridecemlineatus monticola*	S	F3	mosaic of conditions (MSG, GBG)
White Mountains chipmunk	*(Neo)Tamias minimus arizonensis*	S	F3	ample veg, woody debris (WMCF, SFF)
red squirrel	*Tamiasciurus hudsonicus*		F4	DMCF WMCF SFF
black bear	*Ursus americanus*	HI	F4	dense low-mid canopy, woody debris (DMCF) WMCF SFF habitat connectivity
New Mexico meadow jumping mouse	*Zapus hudsonius luteus*	S, C	F1	healthy riparian conditions (all riparian PNVTs)
Birds (22)				
Northern goshawk	*Accipiter gentilis*	S	F4	PPF DMCF WMCF
western burrowing owl	*Athene cunicularia hypugaea*	S	F?	GBG
juniper titmouse	*Baeolophus ridgwayi*		F4	MPOW
zone-tailed hawk	*Buteo albonotatus*	S	F3	PPF
common black-hawk	*Buteogallus anthracinus*	S	F3	large trees (MBDRF)
red-faced warbler	*Cardellina rubrifrons*		F3	dense, low vegetation & litter (DMCF) WMCF
Swainson's thrush	*Catharus ustulatus*		F2	ample litter and woody debris (WMCF, SFF)
evening grosbeak	*Coccothraustes vespertinus*		F3	dense canopies (forested riparian PNVTs)
yellow-billed cuckoo	*Coccyzus americanus occidentalis*	S, C	F1	large trees, dense canopies (forested riparian PNVTs)
Montezuma quail	*Cyrtonyx montezumae mearnsi*		F3	mosaic of conditions (GBG, SDG)
dusky blue grouse	*Dendragapus obscurus*		F2	ample woody debris (WMCF, SFF)
Grace's warbler	*Dendroica graciae*		F4	PPF nest parasitism
gray catbird	*Dumetella carolinensi*	S	F3	dense low-mid canopy (forested riparian PNVTs)
Southwestern willow flycatcher	*Empidonax traillii extimus*	E CH	F1	dense low-mid canopy (MWRF) healthy riparian conditions (MWRF) nest parasitism
peregrine falcon	*Falco peregrinus anatum*	S	F3	cliffs healthy riparian conditions
bald eagle	*Haliaeetus leucocephalus*	S	F2	water quality (CWRF, MBDRF) large trees (CWRF, MBDRF)
Lincoln's sparrow	*Melospiza lincolnii*		F1	healthy riparian conditions (MWRF)
MacGillivray's warbler	*Oporornis tolmiei*		F2	dense low-mid canopy (forested riparian PNVTs)
flammulated owl	*Otus flammeolus*		F3	PPF

FPS by species group		Status [a/]	F ranking [b/]	PNVT Habitat element [c/]
				DMCF
savannah sparrow	*Passerculus sandwichensis*		F3	MSG
Mexican spotted owl [d/]	*Strix occidentalis lucida*	T, CH	F3	DMCF WMCF MPOW PPF where Gambel oak
gray vireo	*Vireo vicinior*	S	F2	MPOW
Amphibians/Reptiles (6)				
Arizona toad	*Bufo microscaphus*	S	F3	water quality (MBDRF) disease
Chiricahua leopard frog	*Lithobates chiricahuensis*	T pCH	F1	water quality disease
northern leopard frog	*Lithobates pipiens*	S, C	F1	water quality disease
lowland leopard frog	*Lithobates yavapaiensis*	S	F3	water quality disease
northern Mexican gartersnake (below Rim)	*Thamnophis eques megalops*	S, C	F?	water quality healthy riparian conditions
narrow-headed gartersnake (above Rim)	*Thamnophis rufipunctatus*	S	F1	water quality healthy riparian conditions
Invertebrates (12)				
plateau giant tiger beetle	*Amblycheila picolominii*		F?	mosaic of conditions (SDG)
false ameletus mayfly	*Ameletus falsus*		F?	water quality
California floater	*Anodonta californiensis*	S	F1	water quality
Mosely caddisfly	*Culoptila moselyi*		F?	water quality
Ferris' copper butterfly	*Lycaena ferrisi*	S	F2	wet swale (MSG) WCRA
Alberta arctic butterfly	*Oeneis alberta daura*		F3	mosaic of conditions (MSG)
Arizona snaketail dragonfly	*Ophiogomphus arizonicus*	S	F?	water quality
four-spotted skipperling butterfly	*Piruna polingii*	S	F3	wet meadow or shaded opening (PPF)
White Mountains water penny beetle	*Psephenus montanus*		F1	water quality
Three Forks springsnail	*Pyrgulopsis trivialis*	E CH	F1	water quality predation by invasives
nitocris fritillary butterfly	*Speyeria nokomis nitocris*	S	F3	wet swales (MSG) WCRA collection
nokomis fritillary butterfly	*Speyeria nokomis nokomis*	S	F3	wet swales (MSG) WCRA collection
Plants (25)				
Bigelow's onion	*Allium bigelovii*		F3	MPOW SDG
Goodding's onion	*Allium gooddingii*	S	F3	cool micro-climate (DMCF)
Greene milkweed	*Asclepias uncialis spp. uncialis*	S	F?	MPOW GBG
crenulate moonwort	*Botrychium crenulatum*		F?	SFF
White Mountains paintbrush	*Castilleja mogollonica*	S	F2	WMCF (meadows) SFF (meadows)
Mexican hemlock parsley	*Conioselinum mexicanum*		F2	cool micro-climate (MPOW)
yellow lady's slipper	*Cypripedium parviflorum var. pubescens*	S	F1	Collection (WMCF, SFF)
Arizona sneezeweed	*Helenium arizonicum*	S	F2	wet meadow (PPF)
Arizona sunflower	*Helianthus arizonensis*	S	F1	mosaic of conditions (GBG, SDG)
Eastwood alumroot	*Heuchera eastwoodiae*	S	F1	canyon slopes
Arizona alumroot	*Heuchera glomerulata*	S	F3	canyon slopes
wood nymph	*Moneses uniflora*		F3	WMCF SFF
heartleaf (bittercress) ragwort	*Packera cardamine*	S	F3	wet meadow, shaded forest opening (WMCF, SFF)
superb penstemon	*Penstemon superbus*		F2	MPOW

FPS by species group		Status [a/]	F ranking [b/]	PNVT Habitat element [c/]
				SDG
yellow Jacob's-ladder	*Polemonium foliosissimum var. flavum*		F2	Collection (WMCF, SFF)
Davidson's cliff carrot	*Pteryxia davidsonii*	S	F1	cliffs, canyon slopes
Parish alkali grass	*Puccinellia parishii*	S	F1	wet alkali swales (GBG)
Blumer's dock	*Rumex orthoneurus*	S	F3	water quality healthy riparian conditions
Arizona willow	*Salix arizonica*	S	F1	healthy riparian conditions
Bebbs willow	*Salix bebbiana*	S	F3	healthy riparian conditions
hooded lady's tresses	*Spiranthes romanzoffiana*		F2	Collection (WMCF, SFF)
splachnoid dung moss	*Tayloria splachnoides*		F2	MSG
Mogollon clover	*Trifolium neurophyllum*	S	F3	wet meadow, shaded forest opening (PPF)
Oak Creek triteleia	*Triteleia lemmoniae*		F3	shaded forest opening (PPF)
carnivorous bladderwort	*Utricularia macrorhiza*		F1	water quality

Endangered Species Act (ESA) Species

Due to their status as endangered with extinction or threatened with endangerment (ESA section 3 (6) and (20)), viability is a concern and all ESA species are ranked F1. Existing abundance and distribution (F ranking) of each of the eight ESA species included as FPS is shown in the table above. Tables 9 and 10 provide information on associated PNVTs and habitat elements for these species. For more information, see the Wildlife Specialist Report – Biological Assessment in the plan set of documents. One threatened species, Mexican spotted owl, is additionally discussed below under management indicator species.

Sensitive Species

Existing abundance and distribution (F ranking) of each of the 53 sensitive species is shown in the table above; most are F1, F2 or F3. This is because sensitive species, by definition (Forest Service Manual 2670.32), are those for which there may be a viability concern. Tables 9 and 10 provide information on associated PNVTs and habitat elements for these species. For more information, see the Wildlife Specialist Report – Biological Evaluation. One sensitive species, northern goshawk, is additionally discussed below under management indicator species.

Highly interactive species

Existing abundance and distribution (F ranking) of each of the highly interactive (HI) species is shown in the table above. Tables 9 and 10 provide information on associated PNVTs and habitat elements for these species.

Highly interactive species are also referred to as keystone or foundation species or even as maintenance engineers. Their absence or substantial reduction across the landscape leaves a functional void that, over time, can create changes leading to degraded or simplified ecosystems (Soulé et al., 2003). All terms refer to the fact that certain species have a disproportionate effect on their environment relative to biomass (Paine, 1995); examples include beavers and prairie dogs (beaver ponds provide fish habitat through drought periods and sustain riparian vegetation, and prairie dogs enrich grassland soils increasing diversity of plants as forage and cover for other species). This influence may also take the form of altering habitat in a way important to other species or in the form of affecting prey species, who may in turn affect habitat (Beschta and Ripple, 2010). In addition, species for which landscape level habitat connectivity is important are also considered highly interactive species in this report, e.g., pronghorn antelope.

Management indicator species (MIS)

In compliance with NFMA, species are selected as management indicator species because they have habitats influenced by forest management and activities. The ponderosa pine and dry mixed conifer are PNVTs where substantial restoration efforts would take place to move habitat toward desired conditions (up to 55,000 acres per year). In addition, the Great Basin grassland is another PNVT where substantial restoration would take place (up to 25,000 acres per year). Associated MIS are selected so that the effects of each alternative on these wildlife populations can be estimated.

Under Alternative A, the current 1987 Forest plan, there are a total of seventeen management indicator species (MIS) for 5 management areas.[6] For this analysis, a list of MIS common to all alternatives is evaluated to facilitate equivalent comparisons between alternatives. As required under NFMA once the plan revision decision is made, MIS monitoring will take place. Chapter 5 of the LMP includes specific monitoring direction for MIS.

The following three MIS are used to compare and evaluate alternatives: Mexican spotted owl, northern goshawk, and pronghorn antelope. Refer to Table 13 for F rankings reflecting their current condition relative to abundance and distribution. Tables 9 and 10 provide information on associated PNVTs and habitat elements for these species. The Report on the Selection of Management Indicator Species and Ecological Indicators contains more information about the consideration of potential species, rationale, and the final selection of MIS.

Additional existing species and habitat condition information for these three indicators is described below. Much of the information is based on the Apache-Sitgreaves NFs' 2005-2011 MIS assessment report (AZGFD, 2012) and the 2011 biological assessment for the Wallow Fire emergency response, both found in the plan set of documents. Suitable habitat noted below is considered quality habitat in that it contains the components necessary to support successful reproduction and young rearing.

Mexican Spotted Owl (MSO)

Actual population numbers for MSO on the ASNFs are not available. Because MSO protected activity centers (PACs) represent breeding or potentially breeding pairs, the number of PACs is used as a measure of the population of this MIS. There are currently 150 MSO PACs, encompassing 96,957 acres. The 2011 Wallow Fire affected almost half of the PACs (74) on the forests to varying degrees so that population trend is considered downward. Monitoring of PACs took place during the 2012 field season and continues to assess the fire's impact to Mexican spotted owls over time. In addition, the Rocky Mountain Forest and Range Experiment Station will begin studying MSO habitat selection within the 2002 Rodeo-Chediski Fire boundary.

Of the various PNVTs or portions thereof that provide MSO habitat, it is the dry and wet mixed conifer PNVTs together that provide the most important MSO habitat relative to reproduction and viability. Therefore, both PNVTs are considered the "indicator habitat" for this management indicator species. Table 14 shows the acreage of indicator habitat and the amount of acreage affected by the 2011 Wallow Fire.

Table 14. Indicator habitat (PNVTs) for MSO showing existing condition and noting estimated change in suitable habitat acres from the 2011 Wallow Fire

MIS habitat indicator PNVTs for MSO	PNVT acreage	Proportion of habitat acres with 100% basal area (canopy cover) loss from the 2011 Wallow Fire [a/]	Acreage adjusted by the loss of total basal area (100% of canopy cover loss) [b/]

[6] Note that the current plan MAs are different than those for the other three LMP alternatives; hence, these same three MIS are considered for all alternatives for equivalent comparisons. Existing condition information for the current 17 MIS is found in appendix F.

		(% loss of PNVT acres)	(indicates currently suitable habitat)
Dry Mixed Conifer	147,885	34,959 (24%)	112,926
Wet Mixed Conifer	177,995	64,794 (36%)	113,201
Total	325,021	99,753 (31% overall)	226,127

[a/] Figures are from the 75-100% basal area loss category which reflects complete (100%) loss of all trees and canopy based on the 7/18/11 RVAG mapping provided by USFS Remote Sensing Applications Center.

[b/] Recovery to the forest structure and age needed by MSO for breeding and nesting in such burn areas will extend beyond the plan period and a century or more, the adjusted acreage is considered suitable MSO habitat acreage across the ASNFs for the 15-year period of the LMP.

Overall, 31 percent of the indicator habitat sustained total canopy loss (i.e., 75 to 100 percent basal area loss) from the Wallow Fire. This has substantially reduced suitable habitat for breeding, nesting, and young rearing. Hence, MSO habitat trend on the ASNFs is now considered downward.

Northern Goshawk (NOGO)

Actual population Numbers for NOGO on the ASNFs are not available. Because NOGO post-fledgling areas (PFAs) represent breeding or potentially breeding pairs, nest area habitat within PFAs is used as a measure of the population of this MIS. There are 103 NOGO post-fledgling areas (PFAs) encompassing 67,466 acres of which approximately 18,540 acres is considered suitable nesting habitat based on nest stands. The 2011 Wallow Fire affected 30 of these PFAs. Approximately half of the acreage in these 30 PFAs had 100 percent canopy loss so that population trend on the ASNFs is now considered downward. Monitoring of PFAs took place during the 2012 field season and continues to assess the fire's impact to northern goshawks over time.

The ponderosa pine PNVT is the most important NOGO habitat relative to reproduction and viability so it is considered the "indicator habitat" for this management indicator species. Table 15 depicts the acreage of indicator habitat both and the amount of acreage affected by the 2011 Wallow Fire.

Table 15. Indicator habitat for Northern goshawk showing existing condition and noting estimated change in habitat acres from the 2011 Wallow Fire

MIS habitat indicator PNVTs for NOGO	PNVT acres on ASNFs	Proportion of NOGO habitat acres with 100% basal area (canopy cover) loss from the 2011 Wallow Fire [a/] (% loss of PNVT acres)	Acreage adjusted by the loss of total basal area (100% of canopy cover loss) [b/] (indicates currently suitable habitat)
Ponderosa Pine	602,206	32,722 (5%)	569,484

[a/] Figures are from the 75-100% basal area loss category which reflects complete (100%) loss of all trees and canopy based on the 7/18/11 RVAG mapping provided by USFS Remote Sensing Applications Center.

[b/] Recovery to the forest structure and age needed by NOGO for breeding and nesting in such burn areas will extend beyond the plan period and a century or more, the adjusted acreage is considered suitable NOGO habitat acreage across the ASNFs for the 15-year period of the LMP.

Although only 5 percent of the indicator ponderosa pine habitat sustained total canopy loss from the Wallow Fire, trend was considered downward pre-fire based on monitoring of PFAs from 2006 through 2011 across the ASNFs. This is believed to be, in part, due to drought over the last decade that has led to the loss of habitat conditions necessary for many NOGO prey species (AZGFD, 2012). After the Wallow Fire, the trend is still considered downward based on PFA acreage with 100 percent canopy loss.

Pronghorn Antelope (Pronghorn)

Pronghorn are a common and persistent species on the ASNFs, although limited in number. While they occur at densities less than habitat capacity, they are well distributed in areas across suitable habitat. Overall, population trend is considered static with approximately 600-700 pronghorn on the ASNFs portion of game management units 1, 3A, and 3B in the last two years (AZGFD, 2012a). Impacts to

pronghorn from the Wallow Fire would be determined by AZGFD surveys but are expected to be minimal.

The Great Basin grassland PNVT (185,523 acres) is considered "indicator habitat" for the pronghorn because this is where they spend the greatest majority of their time. They also use the montane-subalpine grassland PNVT (51,559 acres) but because they use it only in the summer (due to high elevations and winter snow depth), it is not considered indicator habitat. The semi-desert grassland PNVT, below the Mogollon Rim, currently supports limited numbers of pronghorn. Because it is isolated from other ASNFs grasslands by topography and dense woodlands, this PNVT is not considered indicator habitat for this MIS species.

Under existing conditions, pronghorn habitat in the Great Basin grassland PNVT is highly departed from desired conditions. Quality of habitat has been reduced by loss of extensive acreage in desirable perennial grasses, forbs, and shrubs, and by encroachment by trees (primarily piñon and juniper). In addition, well over two-thirds of this grassland has been converted to a woodland type (see the Vegetation Specialist Report). Given that pronghorn will use some open wooded areas, it is estimated that, overall, at least half of the Great Basin grassland acreage is today unsuitable pronghorn habitat.

Fire can also benefit grasslands by removing encroaching trees and improving herbaceous production in healthy grasslands. The 2002 Rodeo-Chediski Fire and the 2011 Wallow Fire burned portions of the Great Basin grassland PNVT. However, limited acreage in both fires burned at an intensity to kill trees and restore habitat. The long-term trend in condition of grasslands in meeting the herbaceous needs of this species is dependent in part on the amount and timing of restocking burned areas with livestock after wildfires and the subsequent herbaceous plant response and woody species regeneration (Belsky and Blumenthal, 1997 and Forest Service, 2008).

Over the last 10 years, tree removal projects have begun to initiate restoration in this grassland to a limited extent across the north side of the ASNFs (approximately 5,000 acres total to date). Although only affecting a small portion of this large PNVT, tree removal by project and wildfire, along with rest from livestock use post Rodeo-Chediski Fire to help allow understory vegetation to regain dominance, have taken place. In general, fire within all three grassland types should be beneficial for this species, by removing encroaching trees and stimulating herbaceous plant regrowth. Hence, the trend for this pronghorn habitat indicator is currently considered on a low trajectory upward.

Other Factors of Viability Concern

Other factors of viability concerns raised by biologists and others, some related indirectly to habitat, include disease, harassment, and entrapment. These are generally addressed by fine filter guidelines. Table 16 lists these factors and affected FPS.

Table 16. Other factors of viability concern and affected forest planning species (FPS)

Other factors of concern (fine filter)	Forest planning species (FPS)
Collection or loss from management	nitocris fritillary butterfly, nokomis fritillary butterfly, yellow lady's slipper, hooded lady's tress
Nest parasitism	Southwestern willow flycatcher, Grace's warbler
Disease	Townsend's big-eared bat, spotted bat, western red bat, Arizona toad, Chiricahua leopard frog, northern leopard frog, lowland leopard frog
Entrapment	FPS that are small mammals, bats, and young of other species
Substantial predation or	pronghorn antelope, Three Forks springsnail

competition from invasive species	
Intentional harassment, forced removal, or avoidable disturbance	Mexican wolf, Gunnison's prairie dog, black bear, many FPS (at least during important life cycle periods)

Some species collection activities are under special use permit on the ASNFs; however, collection is likely much greater than known. The density of forest roads currently impacts habitat connectivity and can contribute to harassment or disturbance of FPS. The level of nest parasitism and extent of disease is unknown. However, inventory and non-mechanized work in riparian areas generally incorporates USFWS aquatic disease decontamination protocol. A deadly fungus (white nose syndrome) in bats can be spread by human presence in caves; the disease is not yet known in Arizona. Wildlife entrapment is not uncommon in water troughs and occasionally on fences. Currently some troughs have escape ramps but most do not and some fences meet wildlife needs for passage while others do not. The springsnail has been greatly impacted by the proliferation of crayfish over the last decade. Efforts to remove crayfish have had mixed results because, while numbers of adults are reduced, numbers of young are not.

Habitat Security, Connectivity, and Wildlife Quiet Areas

Habitat security and connectivity along with the amount of wildlife quiet areas was an issue raised by the public during scoping for plan revision. Currently, the ASNFs manage special wildlife habitat areas called wildlife quiet areas (WQAs) for no motorized vehicle use; these areas are currently implemented via forest special order. Appendix E contains information about the background and the benefits of WQAs. These were considered in response to public scoping for habitat security and connectivity.

There are currently eight WQAs on the ASNFs totaling 45,506 acres. There are three other areas, also in place by special order, that provide many of the benefits of WQAs, so these are additionally considered. Together these total less than 3 percent of the ASNFs. Table 17 lists these along with the primary species associated with each.

Table 17. Existing WQAs and other areas functioning similar to WQAs

Name	Ranger District	Acres	Note	Species
WQAs currently under Special Order				
Beaver Turkey Ridge	Black Mesa	3,295	Long-term WQA	big game
Hulsey Bench	Alpine	3,469	Long-term WQA	deer, elk, turkey, bear, MSO, NOGO
Middle Mountain	Alpine	3,629	Long-term WQA	deer, elk, turkey, pronghorn, NOGO
Open Draw	Alpine	2,499	Long-term WQA	elk, deer, turkey
St. Peters Dome	Springerville	5,850	Long-term WQA	bear, dusky grouse, wolves, other high elevation species
Upper Coyote	Alpine	829	Long-term WQA	elk, turkey, deer, bear (especially young rearing)
Willow Springs-Horse Trap	Black Mesa	8,690	Long-term WQA	big game
Woolhouse	Lakeside	17,245	Long-term WQA	pronghorn, elk (winter range)
	SubTotal	45,506		
Other areas currently functioning similar to WQAs				
Carr Lake	Black Mesa	2,196	Currently within the larger Rim Lakes Recreation Area	big game, MSO
Palomino	Black Mesa	8,407	Currently within the larger Rim Lakes Recreation Area	big game, MSO
Hidden Lake	Springerville	3,227	In response to the South Fork and Hay timber sales	deer, elk, bear, NOGO
Other areas:	SubTotal	13,830	**Total acres Functioning as WQA = 59,336**	

The PNVTs found within each WQA for each of the alternatives is displayed in table 18. Four PNVTs do not occur within any WQA. These are Madrean pine-oak woodland, semi-desert grassland, mixed broadleaf deciduous riparian forest, and interior chaparral. The piñon-juniper woodland PNVT is found

in all WQAs; although is it not a habitat element of importance to viability itself, habitat elements within it can be (e.g., dense low or mid canopy).

Table 18. Existing condition of WQAs (PNVT habitat elements) by alternative

PNVT	Acreage			
	Alt. A	Alt. B	Alt. C	Alt. D
PP	16,320	21,763	15,963	30,332
DMC	4,231	3,582	3,582	4,086
WMC	8,527	8,477	8,477	8,020
SF	93	93	93	0
PJ	6,305	6,305	6,305	6,593
MSG	764	764	764	1,077
GBG	8,766	8,766	8,766	8,766
WCR	244	244	244	253
MWR	106	101	101	185
CWR	0	29	29	4
Other (water)	56	47	47	64
TOTAL	45,506	50,173	44,373	59,379

Although these areas do not allow the use of motorized vehicles, they do *not* preclude hunting, other recreation activities, or periodic mechanized forest management activities (e.g., thinning and burning). WQAs do *not* exclude motorized vehicles for emergencies or activities authorized by permit such as public utilities, private water transmission lines, maintenance of developments, and livestock grazing management.

While existing WQAs have successfully provided secure habitat refugia and species site fidelity to date, there are large expanses without WQAs (up to 50 miles between them) on the Sitgreaves side of the ASNFs. This is addressed in alternatives B and D which include additional WQAs on the Sitgreaves side. In addition, WQAs would constitute a forest management area under alternatives B, C, and D. Appendix E shows the difference in WQAs by alternative.

Safe passage among habitat areas is also important for species viability. WQAs function as part of the larger wildlife need for habitat linkages and interconnected, safe habitat to support wildlife viability. Its corollary, habitat fragmentation, is becoming a greater concern every day with the level of human development that is occurring within Southwestern wildlife habitat. There are two components to this:

- Physical obstacles preventing or limiting wildlife movement or making travel unsafe resulting in mortality of moving animals (e.g., roads, fences).
- Lack of suitable and safe movement linkages or corridors[7] between habitats or between habitat components resulting in isolation (social, genetic, ability to reach food and water sources, and escape predation and severe weather, etc.).

In 2004, AZGFD initiated a collaborative effort to proactively address wildlife connectivity with the participation of Arizona forests, including the ASNFs. Several Wildlife Linkages workshops were held around the State. The objective of this effort is to facilitate wildlife movement, mitigate or remove barriers, and provide for or preserve known wildlife travel corridors. This is in response to increasing development of private lands, new and upgraded roadways, and increased fencing for livestock across the State. This effort can also help contribute to species viability across the ASNFs.

[7] Wildlife linkages or corridors are terms often used interchangeably.

An AZGFD report will be published that identifies linkages and barriers across Apache and Navajo Counties so that land managers can incorporate wildlife connectivity needs into project-level activities, as well as provide for both public and animal safety. Along with WQAs, the linkage report will inform large scale land treatments (thinning, burning) and smaller scale projects to provide for greater habitat security and habitat connectivity across the landscape.

Environmental Consequences

Alternative Differences, Similarities, and Outcomes

Differences among alternatives are the result of differences in plan components, especially among management areas and their acreage and among treatment objectives. Differences in the mix of treatment methods (thinning or burning) can also result in differences in environmental consequences and short-term impacts. For example, movement toward desired conditions with burning can be somewhat slower than with thinning but burning generally has less short-term implementation impacts. The four alternatives upon which the following environmental consequence determinations are made are described (including treatment methods) and compared in appendix A of this report.

On the other hand, all alternatives have the same desired conditions for PNVTs (coarse filter) and the same standards and guidelines (fine filter) as noted in appendix B. There are two exceptions among alternatives related to old growth:

- Alternative C does not include the following guideline regarding old growth characteristics important to some species: "Where current forests are lacking proportional representation of late seral states and species composition on the landscape scale, old growth characteristics should be retained or encouraged to the greatest extent possible within the scope of meeting other desired conditions (e.g., reduce impacts from insects and disease, reduce the threat of uncharacteristic wildfire)." While alternative C has no direction for old growth; it and the other alternatives have a desired condition for a mosaic of structural states ranging from young to old trees in the forested PNVTs. For more detail, see the Glossary section of the LMP.
- Alternative D has an additional standard for maintaining old growth characteristics: "Retain all large and old trees regardless of size or condition." **All alternatives** provide for species viability through LMP management and activities that help restore or maintain habitat across the ASNFs; however, the effectiveness of this varies by alternative. "Viability effectiveness" is thus an expression of alternative consequence to habitat abundance (quantity) and habitat distribution (quality).

Alternative outcomes consist of viability risk ratings (based, in part, on the likelihood of a habitat limitation/s) and management effect ratings. The number of viability risk ratings and the number of management effect ratings, by habitat element, are used to compare relative "viability effectiveness" among alternatives (i.e., the lower the alternative's number of viability risk and management effect ratings for a species' associated habitat element(s), the more effective the alternative is for that species' viability).

Therefore, environmental consequences for FPS, by alternative, are primarily expressed as having more or less "viability effectiveness" even though all alternatives provide species viability in compliance with NFMA. Viability risk and management effect ratings are also used to compare viability effectiveness consequences by alternative for ESA, sensitive, and other FPS.

Plan revision viability and management analysis findings (outcomes) and resulting environmental consequences for wildlife follow. The analysis is based on the high acre treatment objectives (rather than

the low acreage treatment objectives) in order to capture all possible consequences. Also included are the environmental consequences related to habitat security and connectivity.

Habitat and Management Effect Findings

The likelihood of habitat limitation, based on the estimate of future habitat abundance and distribution for each alternative, which is later coupled with species F ranking, is shown in table 19. In order to prove an overall comparison of alternative, this table shows the number of ratings for each of the three likelihood of limitation categories summarized by PNVTs. Definitions for the likelihood of limitation are described in table 5. Likelihood of limitation category values are *low*, *moderate*, and *high* (not to be confused with later viability risk rating categories). The lower the tally (number) of likelihood of limitation of low (L) ratings, the more effective the alternative is for that species' viability.

The management effect is also shown in Table 19 based, as noted, on high-acre treatment objectives. Management effect is the overall expected outcome of alternative implementation in terms of species viability. The expected management effect outcomes for each alternative are the result of alternative objectives and maintenance of or movement toward desired conditions (suitable habitat). The number of ratings for each of the three management effect categories is summarized by PNVT in order to provide an overall comparison of alternatives. Management effect category values are *1*, *2*, and *3*. The lower the tally (number) of likelihood of management effect ratings for a species' associated habitat, the more effective the alternative is for that species' viability.

The management effect and the likelihood of limitation values displayed in this table each cover the 15-year planning period.

Table 19. Expected habitat limitations and management effect outcomes by alternative at 15 years

Table rating descriptions or other information:

[a/] Likelihood of limitation: H = high probability that habitat will be limiting; M = moderate or habitat has a likelihood of some limitation; L = low or habitat will not likely be limiting.

[b/] Management effect: 1 = greatest relative improvement in suitable habitat through LMP management and activities; 2 = intermediate relative improvement; 3 = least to no relative improvement.

[c/] While dry mixed conifer, wet mixed conifer and spruce-fir are still common across the ASNFs, the 2011 Wallow Fire reduced suitable habitat by 24, 36 and 35% respectively in these PNVTs; hence likelihood of limitation is increased one class.

PNVT	Alternative			
	A	B	C	D
Ponderosa pine forest				
Likelihood of limitation [a/]	L	L	L	L
Management effects [b/]	2	1	1	1
Dry mixed conifer forest				
Likelihood of limitation [c/]	M	L	L	L
Management effects	2	1	1	1
Wet mixed conifer forest				
Likelihood of limitation [c/]	M	L	L	L
Management effects	2	1	1	1
Spruce-fir forest				
Likelihood of limitation [c/]	M	M	M	M
Management effects	2	2	2	1
Madrean pine-oak woodland				
Likelihood of limitation	M	L	L	L
Management effects	2	1	2	1
Montane/subalpine grassland				
Likelihood of limitation	M	L	M	L
Management effects	3	1	3	1
Great Basin grassland				
Likelihood of limitation	H	L	H	L

Table rating descriptions or other information:

[a/] Likelihood of limitation: H = high probability that habitat will be limiting; M = moderate or habitat has a likelihood of some limitation; L = low or habitat will not likely be limiting.

[b/] Management effect: 1 = greatest relative improvement in suitable habitat through LMP management and activities; 2 = intermediate relative improvement; 3 = least to no relative improvement.

[c/] While dry mixed conifer, wet mixed conifer and spruce-fir are still common across the ASNFs, the 2011 Wallow Fire reduced suitable habitat by 24, 36 and 35% respectively in these PNVTs; hence likelihood of limitation is increased one class.

PNVT	Alternative			
	A	B	C	D
Management effects	3	1	3	1
Semi-desert grassland				
Likelihood of limitation	H	L	H	L
Management effects	3	1	3	1
Tally of likelihood of habitat limitation for PNVTs by alternative				
L – low or no likelihood of habitat limitation:	0	7	4	7
M – moderate or some likelihood of habitat limitation:	5	1	2	1
H – high probability of habitat limitation:	3	0	2	0
Tally of management effects for PNVTs by alternative				
1 – greatest relative improvement:	0	7	3	8
2 – intermediate relative improvement:	5	1	2	0
3 – least to no improvement:	3	0	3	0

Table 20 shows movement toward desired conditions for modeled PNVTs upon which the overall alternative management effect was based in the table above. This is shown for all the alternatives at the 15-year period and movement toward desired conditions at 50 years. Change in departure can be seen by comparing existing departure from desired conditions to departure at 15 and 50 years. The latter is a projection of trend in desired conditions should the alternatives continue to be implemented that long. However, actual conditions will change over time so NFMA requires LMPs to be revised every 10-15 years.

Table 20. Movement toward desired conditions at 15 and 50 years by alternative

PNVT	PPF % departure		DMCF & departure		WMCF % departure		SFF % departure		All forested PNVTs together – % departure	
Alt.	15 yr.	50 yr.	15 yr.	50 yr.	15 yr.	50 yr.	15 yr.	50 yr.	15 yr.	50 yr.
Current departure:	**77**		**67**		**54**		**59**		**71**	
A	65	65	57	57	49	49	68†	68††	61	61
B	58	46	53	43	52	41	64†	61††	56	49
C	52	48	49	44	56†	59†	63†	60††	52	50
D	61	54	56	45	50	49	64†	60††	58	52
PNVT	**MPOW % departure**		**Woodland [a/] together- % departure**		**GBG % departure**		**SDG % departure**		**GBG & SDG [b/] together – % departure**	
Alt.	15 yr.	50 yr.	15 yr.	50 yr.	15 yr.	50 yr.	15 yr.	50 yr.	15 yr.	50 yr.
Current departure:	**61**		**49**		**67**		**79**		**71**	
A	59	59	45	45	63	63	89†	89††	71†	71††
B	41	30	33	25	9	22	66	52	30	33
C	50	40	38	35	63	68†	84†	94††	71†	78††
D	28	19	25	16	8	16	66	52	29	29

[a/] Includes the piñon-juniper woodland (no species with viability concerns were identified for this PNVT)

[b/] MSG PNVT was not modeled nor any of the riparian PNVTs although three habitat elements came out of the model: snags, coarse woody debris, and large/old trees.

† Indicates where improvement toward desired conditions does not occur from current departure to year 15

†† Indicates where improvement toward desired conditions does not occur from current to year 50.

All alternatives show an improvement in (reduced departure from) desired conditions at 15 years except

in the spruce-fir forested PNVT. At 50 years, trend is static under **alternative A** for all PNVTs, while it improves or continues to move toward desired conditions for **all alternatives** in all PNVTs with the exception of those noted by †† above. One reason for this is that **alternatives A and C** treat very limited acreage within Great Basin and semi-desert grasslands to restore it to grassland conditions. For more explanation, see the Vegetation and Forest Health Specialist Reports.

Habitat Ecological Indicators (EIs)

The habitat provided by aspen and riparian EIs are considered in the viability risk ratings for associated species based on treatment objectives and methods in the forested PNVTs. As such, they contribute to viability and the relative effectiveness of viability among alternatives for associated species.

Aspen EI

Alternatives compared: Actions under the 1987 plan (alternative A), includes clearcutting to convert aspen from a mixture of aspen with ponderosa pine or mixed conifer, providing big game, non-game, and upland game habitat in aspen, managing livestock to protect aspen regeneration, and retaining an area's visual classification where aspen contribute substantially to visual quality.

All alternatives have the desired condition to retain aspen on the landscape at the desired (minimum) level of 50,000 acres during the planning period. Aspen would be maintained above that level under all alternatives during the 15-year planning period. See appendix B for standards and guidelines related to aspen within the four forested PNVTs.

The amount and condition of aspen would also be affected by actions outside of Forest Service control, representing additional risk to aspen and associated species. Two primary examples of aspen loss not related to forest management and activities include wild ungulate browsing of aspen seedlings and saplings and disease (sudden aspen decline or SAD). As an identified LMP EI, aspen would be monitored across the ASNFs during the plan period to determine movement toward desired conditions and whether adaptive management is needed to better maintain or achieve desired conditions. During monitoring, browsing and disease would be recorded as well as impacts from management and activities (see LMP chapter 5 for monitoring direction).

Regarding actions outside of the ASNFs' control, **alternative A** would provide the greatest buffer against browsing and disease risks, retaining 71,076 acres of aspen across the ASNFs; while **alternatives B, C, and D** would have similar buffer levels (68,204 acres, 65,796 acres, 65,517 acres, respectively). Hence, it is expected that this ecological indicator would be maintained on the landscape for all alternatives, providing habitat and viability effectiveness for species such as those needing dense canopies or down woody debris (e.g., red-faced warbler, MacGillivray's warbler). See appendix B for standards and guidelines related to PNVTs with aspen and associated species.

Riparian EI

Alternatives compared: Riparian areas constitute management area 3 under the current 1987 forest plan. Direction includes consideration of grazing utilization standard levels to achieve "fisheries and T&E objectives" and to recover both physical and biological systems, identification of recreation carrying capacity, control of wildlife use where affecting riparian condition, and certain levels of [minimums of 60 to 80 percent] natural shade over water, streambank stability, and woody riparian age class distribution. Because there are limited objectives for riparian treatments, all riparian PNVTs are estimated to move away from desired conditions under **alternative A** (see the Riparian Specialist Report). In addition, **alternative A** would not result in substantial improvement in watersheds that are at risk or impaired (see the Watershed Specialist Report). **Alternatives B, C, and D** would move toward desired conditions based on riparian and road treatment objectives, although less so for **alternative C** where there are only road treatments (no riparian restoration treatments).

Alternatives B, C, and D would be expected to maintain or restore all four riparian PNVTs, including the cottonwood-willow and montane willow riparian forest PNVTs that comprise the riparian ecological indicator, toward desired riparian conditions consisting of: (1) natural ecological processes (e.g., flooding, scouring) that promote a diverse plant structure consisting of herbaceous, shrub, and tree species of all ages and size classes necessary for the recruitment of riparian-dependent species and (2) riparian-wetland conditions that maintain water-related processes (e.g., hydrologic, hydraulic, geomorphic) and that also maintain the physical and biological community characteristics, functions, and processes. See appendix B for standards and guidelines related to riparian PNVTs and associated species.

The amount and condition of riparian forests would also be affected by actions outside of Forest Service control, specifically wild ungulate use (primarily elk and, in places, unauthorized horse use). As an identified LMP EI, the cottonwood-willow and montane willow riparian forest PNVTs would be monitored during the plan period to determine if the plant community is moving toward desired conditions and whether adaptive management is needed to better do so. During monitoring, use by other species would be recorded as well as impacts from management and activities (see LMP chapter 5 for monitoring direction).

Species Viability Consequences

Species-Habitat Viability Findings (All FPS)

The viability risk rating (VRR) outcomes for each species based on combining the species F ranking and their associated habitat(s)' likelihood of limitation are shown in table 21. In a few instances, the viability risk rating is adjusted as noted in the table. Risk ratings of low and moderate are assumed to pose little risk to viability so are not considered (see assumptions). Hence, only moderately high, high, and very high viability risk ratings are those given additional consideration.

Table 21. Expected viability risk rating outcomes for each species-habitat relationship by alternative at 15 years

Table rating descriptions or other information:
[a/] Viability risk ratings are: VH = very high; H = high; and MH = moderately high. Ratings of moderate (M) to low (L) are not considered to be of consequence for species viability (see assumptions).
[b/] Although not known on the ASNFs, the viability risk rating is determined as if present to avoid over-estimating their ranking of F?.
[c/] Collection, along with other viability factors of concern such as disease, are addressed later.

FPS	PNVT and/or Habitat element	Viability risk rating (VRR) [a/]			
		Alt. A	Alt. B	Alt. C	Alt. D
Mammals					
pronghorn antelope	GBG MSG	M M	L L	M L	L L
Mexican wolf	habitat connectivity (all PNVTs)	MH	M	MH	L
beaver	large trees (forested riparian PNVTs)	L	L	L	L
southern red-backed vole	ample litter and woody debris (WMCF, SFF)	M	MH	MH	M
Townsend's big-eared bat	caves	L	L	L	M
Gunnison's prairie dog [b/]	GBG MSG	H H	M M	H MH	M M
spotted bat	cliffs	L	L	L	M
greater western mastiff bat	large trees (MBDRF) cliffs	M L	M L	M L	M M
Allen's big-eared bat	large snags (MBDRF) cliffs	M L	MH L	MH L	M M
western red bat	ample debris & litter (MBDRF)	MH	MH	H	MH
ocelot [b/]	dense, low vegetation & cover (MBDRF)	MH	M	M	L
lesser long-nosed bat [b/]	SDG	L	L	M	MH
long-tailed vole	mosaic of conditions (MSG)	MH	M	M	M

Table rating descriptions or other information:

[a/] Viability risk ratings are: VH = very high; H = high; and MH = moderately high. Ratings of moderate (M) to low (L) are not considered to be of consequence for species viability (see assumptions).

[b/] Although not known on the ASNFs, the viability risk rating is determined as if present to avoid over-estimating their ranking of F?.

[c/] Collection, along with other viability factors of concern such as disease, are addressed later.

FPS	PNVT and/or Habitat element	Viability risk rating (VRR) [a/]			
		Alt. A	Alt. B	Alt. C	Alt. D
Arizona montane vole	healthy riparian conditions (CWRF, MWRF)	M	L	M	L
Mogollon vole	wet meadow (PPF)	M	M	MH	M
Arizona myotis bat	PPF DMCF	M M	L L	M M	L L
mule deer	MPOW (winter habitat)	M	L	L	L
jaguar [2/]	habitat connectivity (MBDRF)	M	L	M	L
Springerville pocket mouse	mosaic of conditions (GBG)	MH	L	MH	L
mountain lion	habitat connectivity (all PNVTs)	M	L	M	L
Abert's squirrel	PPF	L	L	L	L
Arizona gray squirrel	large trees (MBDRF)	M	M	M	M
Merriam's shrew	wet meadow (PPF, DMCF)	MH	M	M	M
dwarf shrew	mosaic of conditions (MSG)	MH	L	M	L
water shrew	water quality (CWRF, MWRF) healthy riparian conditions (CWRF, MWRF)	L MH	L M	L MH	M M
White Mountains ground squirrel	mosaic of conditions (MSG) mosaic of conditions (GBG)	MH MH	L L	M MH	L L
White Mountains chipmunk	ample ground veg, litter (WMCF, SFF)	MH	M	M	L
red squirrel	DMCF WMCF SFF	M M M	L L L	L L L	L L L
black bear	dense low-mid canopy, woody debris (DMCF) WMCF SFF habitat connectivity	M MH MH MH	M L L MH	MH M M L	M L L L
New Mexico meadow jumping mouse	H riparian conditions (forested riparian PNVTs)	MH	M	MH	M
Birds					
Northern goshawk	PPF DMCF WMCF	L M L	L L L	L L L	L L L
western burrowing owl	mosaic of conditions (GBG)	H	M	MH	M
juniper titmouse	MPOW	M	L	L	L
zone-tailed hawk	PPF	M	L	L	L
common black-hawk	large trees (MBDRF)	L	L	M	L
red-faced warbler	dense, low vegetation & litter (DMCF) WMCF	MH L	L L	M M	L L
Swainson's thrush	ample litter and woody debris (WMCF, SFF)	M	MH	MH	M
evening grosbeak	dense canopies (forested riparian PNVTs)	M	L	M	L
yellow-billed cuckoo	large trees, dense canopies (forested riparian PNVTs)	M	M	M	L
Montezuma quail	mosaic of conditions (GBG) mosaic of conditions (SDG)	MH MH	L M	MH MH	L L
dusky blue grouse	large down woody (WMCF, SFF)	M	MH	MH	M
Grace's warbler	PPF	L	L	L	L
gray catbird	dense low-mid canopy (forested	M	L	M	L

Table rating descriptions or other information:

[a/] Viability risk ratings are: VH = very high; H = high; and MH = moderately high. Ratings of moderate (M) to low (L) are not considered to be of consequence for species viability (see assumptions).

[b/] Although not known on the ASNFs, the viability risk rating is determined as if present to avoid over-estimating their ranking of F?.

[c/] Collection, along with other viability factors of concern such as disease, are addressed later.

FPS	PNVT and/or Habitat element	Viability risk rating (VRR) [a/]			
		Alt. A	Alt. B	Alt. C	Alt. D
	riparian PNVTs)				
Southwestern willow flycatcher	dense low-mid canopy (MWRF) healthy riparian conditions (MWRF)	MH MH	M M	M MH	L M
peregrine falcon	cliffs healthy riparian conditions (forested riparian PNVTs)	L M	L L	L M	M L
bald eagle	water quality (CWRF, MBDRF) large trees (all forests)	L M	L M	L MH	M M
Lincoln's sparrow	healthy riparian conditions (MWRF)	MH	M	MH	M
MacGillivray's warbler	dense low-mid canopy (forested riparian PNVTs)	MH	M	M	L
flammulated owl	PPF DMCF	M M	L L	L M	L L
savannah sparrow	MSG	M	L	M	L
Mexican spotted owl	DMCF WMCF MPOW PPF where Gambel oak	H H MH MH	M M M M	MH MH M M	M M M L
gray vireo	MPOW	M	M	M	M
Reptiles/Amphibians					
Arizona toad	water quality (MBDRF)	L	L	L	M
Chiricahua leopard frog	water quality	M	M	M	MH
northern leopard frog	water quality	M	M	M	MH
lowland leopard frog	water quality	L	L	L	M
northern Mexican gartersnake (below Rim)	water quality healthy riparian conditions	L MH	L M	L MH	M M
narrow-headed gartersnake (above Rim)	water quality healthy riparian conditions	L MH	L M	L MH	M M
Invertebrates					
plateau giant tiger beetle	SDG	H	MH	H	M
false ameletus mayfly	water quality	L	L	L	M
California floater	water quality	M	M	M	MH
Mosely caddisfly	water quality	M	M	M	MH
Ferris' copper butterfly	wet swale (MSG) WCRA	MH MH	M M	M M	M M
Alberta arctic butterfly	MSG	MH	L	M	L
Arizona snaketail dragonfly	water quality	L	L	M	M
four-spotted skipperling butterfly	wet meadow or shaded opening (PPF)	M	M	MH	M
White Mountains water penny beetle	water quality	L	L	M	M
Three Forks springsnail	water quality	MH	MH	MH	MH
nitocris fritillary butterfly	wet swales (MSG) WCRA	MH MH	M L	M M	M L
nokomis fritillary butterfly	wet swales (MSG) WCRA	MH MH	M L	M M	M L
Plants					
Bigelow's onion	MPOW SDG	M M	L M	M M	L L
Goodding's onion	cool micro-climate (DMCF)	L	M	MH	M
Greene milkweed	mosaic of conditions (MPOW)	H	M	MH	M

Table rating descriptions or other information: [a/] Viability risk ratings are: VH = very high; H = high; and MH = moderately high. Ratings of moderate (M) to low (L) are not considered to be of consequence for species viability (see assumptions). [b/] Although not known on the ASNFs, the viability risk rating is determined as if present to avoid over-estimating their ranking of F?. [c/] Collection, along with other viability factors of concern such as disease, are addressed later.					
FPS	**PNVT and/or Habitat element**	**Viability risk rating (VRR) [a/]**			
		Alt. A	**Alt. B**	**Alt. C**	**Alt. D**
	mosaic of conditions (GBG)	H	M	H	M
crenulate moonwort	SFF	M	M	M	M
White Mountains paintbrush	WMCF (meadows) SFF (meadows)	L L	L L	L L	M M
Mexican hemlock parsley	cool micro-climate (MPOW)	L	M	MH	M
yellow lady's slipper	(WMCF, SFF-collection)	-	-	-	-
Arizona sneezeweed	wet meadow (PPF)	H	MH	MH	MH
Arizona sunflower	mosaic of conditions (GBG) mosiac of treatment (SDG)	M M	L L	M M	L L
Eastwood alumroot	canyon slopes	L	L	L	M
Arizona alumroot	canyon slopes	L	L	L	M
wood nymph	WMCF SFF	L L	L L	M M	L L
heathleaf (bittercress) ragwort	shaded forest opening (WMCF, SFF)	L	L	M	L
superb penstemon	mosaic of conditions (SDG)	L	L	L	M
yellow Jacob's-ladder	(WMCF, SFF - collection [c/])	-	-	-	-
Davidson's cliff carrot	cliffs, canyon slopes	L	L	L	M
Parish alkali grass	wet alkali swales (GBG)	MH	M	M	M
Blumer's dock	water quality healthy riparian conditions (MWRF)	L M	L L	L M	M L
Arizona willow	healthy riparian conditions (MWRF)	MH	M	M	M
Bebbs willow	healthy riparian conditions (MWRF)	MH	L	M	L
hooded lady's tresses	(WMCF, SFF - collection [c/])	-	-	-	-
splachnoid dung moss	MSG	L	L	L	M
Mogollon clover	wet meadow, shaded forest opening (PPF)	M	M	MH	M
Oak Creek triteleia	shaded forest opening (PPF)	M	M	MH	M
carnivorous bladderwort	water quality	L	L	M	M

Table 22 lists the species where viability risk ratings are L or M across all alternatives within all their habitat components. These species include most but not all of the coarse filter species (see table 8). These ratings indicate that LMP management and activities would result in effects no more substantial than normal ecosystem fluctuations thus posing no risk to viability; therefore viability is assured for the following species. These 35 species are not further analyzed except more information is provided in following sections for those that are MIS, ESA or sensitive species.

Table 22. Species for which habitat alone is sufficient to provide viability

PNVT – coarse filter	FPS
Ponderosa pine forest	Albert's squirrel, Arizona myotis bat, northern goshawk, zone-tailed hawk, Grace's warbler, flammulated owl, four-spotted skipperling butterfly
Dry mixed conifer forest	Arizona myotis bat, red squirrel, northern goshawk, flammulated owl
Wet mixed conifer forest	red squirrel, northern goshawk, White Mountains paintbrush, heathleaf ragwort
Madrean pine-oak woodland	mule deer, juniper titmouse
Montane/subalpine grasslands	savannah sparrow, splachnoid dung moss

Semi-desert grassland	superb penstemon, Arizona sunflower
All PNVTs	Townsend's big-eared bat, spotted bat, Arizona montane vole, Eastwood alumroot, Arizona alumroot, Davidson's cliff carrot
All riparian PNVTs	Greater western mastiff bat, Arizona gray squirrel, common black-hawk, evening grosbeak, yellow-billed cuckoo, gray catbird, peregrine falcon, Arizona toad, lowland leopard frog, false ameletus mayfly, Arizona snaketail dragonfly, Blumer's dock, carnivorous bladderwort

Alternative Indicators

Species-Habitat Relationships across Habitats

While all alternatives provide species viability, they do so at different levels of effectiveness. In order to compare how effectively each alternative addresses species needs, table 23 sums the number of viability risk ratings from table 21 by PNVTs for each alternative. Within each habitat element, the alternative with the least viability effectiveness is bracketed by dashes (- -). The lower the number of viability risk ratings, the more effective the alternative is in providing for viability. As previously noted, fine filter standards and guidelines are developed to help address viability effectiveness beyond PNVTs, as needed.

Table 23. Number of species-habitat relationships as an indicator of viability effectiveness by habitat element(s) for each alternative (subtotals and totals)

Habitat elements	Number of viability risk ratings reflecting viability effectiveness Note: for each PNVT, the alternative bracketed by dashes (- -) has the least viability effectiveness			
	Alt. A	**Alt. B**	**Alt. C**	**Alt. D**
Ponderosa Pine Forest	3	0	-5-	0
Dry Mixed Conifer Forest	-4-	0	2	0
Wet Mixed Conifer Forest	3	3	-4-	0
Spruce-Fir Forest	2	2	2	2
Subtotal number of viability risk ratings across Forested PNVTs	**12**	**5**	**13**	**2**
Madrean Pine-Oak Woodland	-3-	1	-3-	2
Subtotal number of viability risk ratings across Forested & Woodland PNVTs	**15**	**6**	**16**	**4**
Montane/Subalpine Grassland	-8-	0	1	0
Great Basin Grassland	-7-	0	6	0
Semi-desert Grassland	-2-	1	1	1
Subtotal number of viability risk ratings across Grassland PNVTs	**17**	**1**	**8**	**1**
All Riparian PNVTs	-14-	2	8	1
TOTAL number of viability risk ratings across all PNVTs	**46**	**9**	**32**	**6**

Of the seven individual PNVTs and the grouped riparian PNVTs above, **alternative A** would have the least overall viability effectiveness among these PNVTs, followed by **alternative C**. **Alternative D**, followed by **alternative B**, would have the greatest viability effectiveness among these PNVTS. However, few species occur across all PNVTs so comparison of ratings is most relevant within PNVT.

Species-Habitat Relationships by Species Groups

While all alternatives provide species viability, they do so at different levels of effectiveness. In order to compare how effectively each alternative addresses species needs, table 24 sums the viability risk ratings from table 77 by species groups for each alternative. The lower the number of viability risk ratings, the

more effective the alternative is in providing for viability. As noted above, fine filter standards and guidelines are developed to help address viability effectiveness as well.

Table 24. Number of species-habitat relationships as an indicator of viability effectiveness by FPS group for each alternative

Viability Risk Ratings comparing alternative viability effectiveness	Alternatives			
	A	B	C	D
ESA species	9	1	5	3
Sensitive species [a/]	27	4	21	4
Remaining FPS [b/]	10	3	9	1
Total:	46	7	35	7

[a/] Includes ESA candidate species.
[b/] Includes highly interactive species not in another category; does not include MIS.

Overall, **alternatives B and D** provide the greatest viability effectiveness as compared to **alternative C**, followed by **alternative A**. This relationship holds for ESA and sensitive FPS as a group and for the remaining FPS. However, as previously noted, few species occur across all PNVTs so comparison of ratings is most relevant within PNVT.

ESA and Sensitive Species, Migratory Birds, and Eagles

The viability risk rating outcomes for ESA and sensitive species by alternative are found in table 21. Two reports provide more detail about environmental consequences for these species. These reports are the Wildlife Specialist Report-Biological Assessment and the Wildlife Specialist Report-Biological Evaluation.

Environmental consequences for other species by alternative are found in two other reports located in the plan set of documents. Migratory birds including Important Birding Areas (IBAs) and bald and golden eagles are analyzed in the Wildlife Specialist Report-Migratory Birds, Eagles, and IBAs and sensitive species are analyzed in the Wildlife Specialist Report-Biological Evaluation.

Highly Interactive Species

Identified highly interactive species are those species that alter habitat in a manner benefitting other species or in the form of affecting prey species, who in turn affect habitat structure and function, or those species that range widely to meet their needs. On the ASNFs, these are pronghorn antelope, Mexican wolf, beaver, Gunnison's prairie dog (although not currently known on the ASNFs), mountain lion, and black bear.

Both PNVT coarse filter desired conditions and fine filter habitat elements addressed by standards and guidelines contribute to the needs of highly interactive species, their habitat, and prey in a general. Appendix B lists standards and guidelines that address highly interactive and other wildlife species needs. See the MIS section above for those plan components addressing pronghorn and the ESA section above for plan components addressing the Mexican wolf. Following are some key plan components addressing the needs of these two species and the other four highly interactive species at both the coarse and fine habitat filter levels:

All Highly Interactive species

- Desired Condition: Large blocks of habitat are interconnected, allowing for behavioral and predator-prey interactions, and the persistence of metapopulations and highly interactive wildlife species across the landscape. Ecological connectivity extends through all plant communities.
- Desired Condition: Vegetative connectivity provides for species dispersal, genetic exchange, and daily and seasonal movements across multiple spatial scales.

- Guideline: Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil cover.
- Desired Condition: Recreation use does not negatively affect wildlife habitat and populations. Negative interactions between people and wildlife are minimized.
- Guideline: Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moisture conditions.
- Desired Condition: WQAs provide semiprimitive nonmotorized recreation opportunities, including relatively quiet recreation opportunities close to or adjacent to intensively used areas (without vehicles less exposure to harm).

Beaver

- Desired Condition: Streamflows provide connectivity among fish populations and provide unobstructed routes critical for fulfilling needs of aquatic, riparian dependent, and many upland species of plants and animals.
- Desired Condition: Ponding and channel characteristics provide habitat, water depth, water duration, and the temperatures necessary for maintaining populations of riparian-dependent species and for their dispersal.
- Guideline: Active grazing allotments should be managed to maintain or improve to desired riparian conditions.

Prairie Dog

- Desired Condition: Average herbaceous vegetation heights vary by grassland PNVT and yearly weather conditions. Ungrazed herbaceous vegetation heights range from 7 to 29 inches in Great Basin grasslands, 7 to 26 inches in montane/subalpine grasslands, and 10 to 32 inches in semi-desert grasslands.
- Desired Condition: Wildlife are free from harassment and from disturbance at a scale that impacts vital functions (e.g., breeding, rearing young) that could affect persistence of the species.

Bear

- Desired Condition: Vegetation conditions provide hiding and thermal cover in contiguous blocks for wildlife. Native plant species are present in all age classes and are healthy, reproducing, and persisting.
- Guideline: Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife.
- Desired Condition: Some large patches in the Madrean pine-oak woodland are closed canopy, have multiple age classes, large trees, and old growth-like characteristics (e.g., numerous snags, large coarse woody debris) in order to provide for wildlife such as Mexican spotted owl and black bear that need denser habitat.
- Guideline: Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo).

Lion

- Desired Condition: Herbaceous vegetation amount and structure (e.g., plant density, height, litter, seed heads) provides habitat to support wildlife and prey species.
- Guideline: Restoration methods, such as thinning or prescribed fire, should leave a mosaic of untreated areas within the larger treated project area to allow recolonization of treated areas by plants, small mammals, and insects (e.g., long-tailed voles, fritillary butterflies).

Bear or Lion

- Guideline: Where Gambel oak or other native hardwood trees and shrubs are desirable to retain for diversity, treatments should improve vigor and growth of these species. *(provides low cover for hiding or stalking)*
- Desired Condition: Snags and coarse woody debris are well distributed throughout the landscape. The number of snags and logs and amount of coarse woody debris varies by seral state ranging from 8 to more than 16 tons per acre. *(provides low cover for hiding or stalking)*
- Desired Condition: Aspen may comprise 10 to 100 percent of the area depending on disturbance (e.g., fire, insects, silvicultural treatments), in multistoried patches. *(provides low cover for hiding or stalking)*

In addition to the above plan components, management areas such as Wildlife Quiet Areas (see following section) also help provide for the needs of these species. The viability of highly interactive species is therefore well provided for under **all alternatives**.

Management Indicator Species (MIS) and Habitat

As previously noted, the role of management indicator species and the basis for their selection is to estimate the effects of each forest plan alternative to them. MIS are selected for alternative comparison (and for later monitoring) in order to assess the effects of LMP management and activities on their populations and the populations of other species with similar habitat needs which they may represent. See the Report on the Selection of Management Indicator Species and Ecological Indicators for information about the merits of Mexican spotted owl, Northern goshawk, and pronghorn antelope as MIS and background on the MIS selection process.

Comparison of the consequences of alternative A and the action alternatives (B, C, and D) are discussed for each of the three MIS as follows. Appendix B lists all standards and guidelines that address MIS and other wildlife species needs. Standards and guidelines along with objectives form the basis for the determination of consequences for MIS for each alternative. Table 25 compares the management effect for the indicator habitats of the three MIS by alternative.

Table 25. Management effect compared by alternative for the MIS indicator habitats

MIS and Habitat	Management Effect [a/]			
	Alt. A	Alt. B	Alt. C	Alt. D
Mexican spotted owl				
Dry mixed conifer	2	1	1	1
Wet mixed conifer	2	1	1	1
Northern goshawk				
Ponderosa pine	2	L	1	1
Pronghorn antelope				
Great Basin grassland	3	1	3	1

[a/] Management effect: 1 = greatest relative improvement in suitable habitat through LMP management and activities; 2 = intermediate relative improvement; 3 = least to no relative improvement.

Mexican Spotted Owl (Dry Mixed Conifer and Wet Mixed Conifer PNVTs)

Alternative A: The Mexican spotted owl, or MSO, is identified as a MIS for management area 1 (forested lands), of the 1987 forest plan. It includes woodlands, ponderosa pine, mixed conifer[8], aspen, and spruce-fir. The management emphasis is for multiple uses including timber and fire production, wildlife habitat, grazing, watershed, and dispersed recreation. Some of the direction for management area 1 includes: protection of stands from insect and disease beyond endemic levels, manage for a minimum of

[8] This includes both dry and wet mixed conifer forest PNVTs which would be indicator habitat for MSO as a management Indicator species under the action alternatives (B, C, and D).

20 percent of the area to provide vertical diversity, a minimum of 30 percent to provide horizontal diversity, allocate no less than 20 percent of each forested ecosystem to old growth that flows across the landscape over time, use pre-European settlement information to develop prescriptions, provide from 1.8 to 2.8 snags per acre, provide a minimum of 2 logs per acre 12 inches or larger, manage livestock to protect aspen regeneration treatments. Table 14 notes the acreage of MSO dry mixed conifer and wet mixed conifer indicator habitat and the amount that is currently suitable post Wallow Fire.

Alternatives B, C, and D: These alternatives all provide desired conditions, standards, or guidelines favorable for the Mexican spotted owl and its indicator habitat (i.e., dry mixed conifer and wet mixed conifer PNVTs). Key examples are found in the ESA section above so are not reiterated here.

Alternatives compared: For MSO, differences among alternatives relate primarily to differences in treatment objectives and overall management effect. LMP objectives for forested PNVTs are found in table 3. By alternative, the maximum restoration of forested acreage per year to occur in any of the four forested PNVTs is: A 17,000 acres; B 35,000 acres; C 55,000 acres; and D 50,000.

The habitat quality or suitability of MSO indicator habitat would vary from existing conditions based on reduced departure from (i.e., movement toward) desired conditions in these indicator habitat PNVTs by alternative. Based on modeling, **alternatives B and D** would be intermediate in improvement of habitat quality for these two PNVTs. The dry mixed conifer forest PNVT would have the greatest habitat improvement under **alternative C**, while the wet mixed conifer forest PNVT would have the greatest habitat improvement under **alternative A**. Because of these mixed outcomes, the overall habitat quality for MSO is considered similar under all LMP alternatives.

As previously noted, substantial acreage within MSO breeding and critical habitat was impacted from the 2011 Wallow Fire. Total number of breeding MSO pairs is therefore likely down after the fire, but population trend is expected to stabilize over the 15-year plan period because forest treatments under **all alternatives** would incorporate MSO Recovery Plan direction, including provisions for primary constituent elements of habitat.

Northern Goshawk (Ponderosa Pine PNVT)

Alternative A: The northern goshawk is identified as a MIS for management area 1 (forested lands), of the 1987 forest plan. It includes woodlands, ponderosa pine, mixed conifer, aspen, and spruce-fir. The management emphasis is for multiple uses including timber and fire production, wildlife habitat, grazing, watershed, and dispersed recreation. See the previous MSO section for some of the direction in the 1987 forest plan for management area 1 which encompasses ponderosa pine, the indicator habitat for this MIS. Table 15 notes the acreage of NOGO ponderosa pine PNVT indicator habitat and the amount that is currently suitable post Wallow Fire.

Alternatives B, C, and D: These alternatives all provide desired conditions, standards, or guidelines favorable for the northern goshawk and its habitat. Key examples follow:

- Desired Condition: Northern goshawk post-fledgling family areas (PFAs) may contain 10 to 20 percent higher basal area in mid-aged to old tree groups than northern goshawk foraging areas and the surrounding forest.
- Desired Condition: Northern goshawk nest areas have forest conditions that are multi-aged and dominated by large trees with relatively denser canopies than the surrounding forest.
- Guideline: A minimum of six nest areas (known and replacement) should be located per northern goshawk territory. Northern goshawk nest and replacement nest areas should be located around active nests, in drainages, at the base of slopes, and on northerly (NW to NE) aspects. Nest areas should be 25 to 30 acres each in size.

- Guideline: Northern goshawk post-fledging family areas (PFAs) of approximately 420 acres in size should be designated around the nest sites.
- Guideline: Active raptor nests should be protected from treatments and disturbance during the nesting season to provide for successful reproduction. Specifically for northern goshawk nest areas, human presence should be minimized during nesting season of March 1 through September 30.
- Desired Condition: Diverse vegetation structure, species composition, densities, and seral states provide quality habitat for native and desirable nonnative plant and animal species throughout their life cycle and at multiple spatial scales. Landscapes provide for the full range of ecosystem diversity at multiple scales, including habitats for those species associated with late seral states and old growth forests.
- Desired Condition: Herbaceous vegetation amount and structure (e.g., plant density, height, litter, seed heads) provides habitat to support wildlife and prey species.
- Desired Condition: Livestock grazing and associated activities contribute to healthy, diverse plant communities, satisfactory condition soils, and wildlife habitat.
- Guideline: Restoration methods, such as thinning or prescribed fire, should leave a mosaic of untreated areas within the larger treated project area to allow recolonization of treated areas by plants, small mammals, and insects (e.g., long-tailed voles, fritillary butterflies).
- Guideline: Trees, snags, and logs immediately adjacent to active red squirrel cone caches, Abert's squirrel nests, and raptor nests should be retained to maintain needed habitat components and provide tree groupings.
- Desired Condition: Wildlife are free from harassment and from disturbance at a scale that impacts vital functions (e.g., breeding, rearing young) that could affect persistence of the species.
- Desired Condition: Recreation use does not negatively affect wildlife habitat and populations. Negative interactions between people and wildlife are minimized.
- Guideline: Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moisture conditions.
- Guideline: The use of underground utilities should be favored to avoid potential conflicts with resources (e.g., scenic integrity, wildlife, wildfire, heritage).
- Desired Condition: WQAs provide semiprimitive nonmotorized recreation opportunities, including relatively quiet recreation opportunities close to or adjacent to intensively used areas.

Alternatives compared: For the northern goshawk, differences among alternatives relate primarily to differences in treatment objectives and overall management effect. LMP objectives for forested PNVTs are found in table 3. As noted above, the maximum restoration of forested acreage per year to occur in any of the four forested PNVTs is: A 17,000 acres; B 35,000 acres; C 55,000 acres; and D 50,000 acres. All alternatives emphasize treatment in the ponderosa pine which is currently more departed from reference conditions than the other forested PNVTs. The habitat quality or suitability of NOGO indicator habitat would vary from existing conditions based on reduced departure from (i.e., movement toward) desired conditions in this indicator PNVT by alternative. Based on modeling, alternatives that would provide the greatest to the least habitat improvement are **alternatives C and B**, followed by **alternative D**, then **alternative A**.

Based on habitat quality improvement (see alternative objectives above), an upward population trend for northern goshawk would be expected under **all alternatives**, especially for **alternatives C and B**, followed by **alternative D, then alternative A**.

Pronghorn Antelope (Great Basin Grassland PNVT)

Alternative A: Pronghorn antelope, or pronghorn, are identified as a MIS for management area 4 (grasslands) of the 1987 forest plan. The management emphasis for the area is visual quality and wildlife

habitat, especially big game winter habitat. Some of the direction for management area 4 includes: fencing to keep livestock from wetter areas, piping water from wet areas to less sensitive areas, livestock control to allow grass and forb regeneration (both cool and warm season growing plants), and leaving new land acquisitions in critical big game range generally unstocked. Direction in the 1987 plan includes retreating approximately 50,000 acres. Actual tree removal in the Great Basin grassland PNVT, occurring over the last decade or so, averages roughly 500 acres per year.

Alternatives B, C, and D: These alternatives all provide desired conditions, standards, or guidelines favorable for the pronghorn antelope and its habitat. Key examples follow:

- Desired Condition: Large blocks of habitat are interconnected, allowing for behavioral and predator-prey interactions, and the persistence of metapopulations and highly interactive wildlife species across the landscape. Ecological connectivity extends through all plant communities.
- Desired Condition: Habitat configuration and availability allows wildlife populations to adjust their movements (e.g., seasonal migration, foraging) in response to climate change and promote genetic flow between wildlife populations.
- Desired Condition: Vegetative ground cover (herbaceous vegetation and litter) is optimized to protect and enrich soils and promote water infiltration. There is a diverse mix of cool and warm season grass and desirable forb species.
- Desired Condition: Native plant communities dominate the landscape.
- Desired Condition: During the critical antelope pronghorn fawning period (May through June), cool season grasses and forbs provide nutritional forage, while shrubs and standing grass growth from the previous year provide adequate hiding cover (10 to 18 inches) to protect fawns from predation.
- Guideline: New fence construction or reconstruction where pronghorn antelope may be present should have a barbless bottom wire which is 18 inches from the ground to facilitate movement between pastures and other fenced areas. Pole and other types of fences should also provide for pronghorn antelope passage where they are present.
- Desired Condition: Livestock grazing and associated activities contribute to healthy, diverse plant communities, satisfactory condition soils, and wildlife habitat.
- Desired Condition: Livestock grazing is in balance with available forage (i.e., grazing and browsing by authorized livestock, wild horses, and wildlife do not exceed established use levels).
- Guideline: Pronghorn antelope fence and other crossings should be installed along known movement corridors to prevent habitat fragmentation.
- Desired Condition: Woolhouse WQA on the Lakeside Ranger District provides high quality winter range for pronghorn antelope and elk within a busy and heavily used wildland-urban interface.
- Desired Condition: These areas [Natural Landscape management area] contribute to ecosystem and species diversity and sustainability; serve as habitat for plants and animals; and offer wildlife corridors, reference areas, primitive and semiprimitive nonmotorized recreation opportunities, and places for people seeking natural scenery and solitude. Grasses, forbs, shrubs, and litter are abundant and continuous to support natural fire regimes.

Alternatives compared: For the pronghorn, differences among alternatives relate primarily to differences in treatment objectives and overall management effect. Plan implementation objectives for grasslands are found in table 3. Alternative A would continue to restore about 500 acres of Great Basin grassland PNVT each year, as would alternative C except that it has an emphasis for restoring montane/subalpine grassland. Alternative B would restore up to 25,000 acres per year with an emphasis in the Great Basin grassland and semi-desert grassland PNVTs. Alternative D would restore up to 24,000 acres per year across all grassland PNVTs.

The quality or suitability of pronghorn indicator habitat would vary greatly from existing condition based on the amount of grassland restoration under each alternative and the resulting reduced departure from (i.e., movement toward) desired conditions in this indicator PNVT. Based on modeling, **alternatives B and D** would substantially improve habitat quality, while a slight improvement in habitat quality would be expected under **alternatives A and C**.

Based on habitat quality improvement (see alternative objectives above), a substantial upward population trend for pronghorn would be expected under **alternatives B and D** and a slight upward population trend would be excepted under **alternatives A and C**.

Other Factors of Viability Concern

Other identified factors of concern for viability of certain FPS are addressed by fine filter standards and guidelines. Table 25 contains some key plan components addressing these concerns.

Table 25. Other factors of viability concern and affected forest planning species (FPS)

Other factors of concern	Forest planning species (FPS)	Addressed by fine filter standard or guideline
Collection or loss from management	nitocris fritillary butterfly, nokomis fritillary butterfly, yellow lady's slipper, hooded lady's tress	• When new water diversions are created or existing water diversions are reanlyzed, measures should be taken to prevent entrapment of fish and aquatic organisms. • Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. • Pesticide use should minimize impacts on non-target plants and animals. • Authorizations to cut, collect, or use forest products for any personal, commercial, or scientific purpose (i.e., permits, contracts, agreements) shall include provisions to ensure the needs of wildlife, which depend upon those forest products, will continue to be met (e.g., fungi and cone collection with respect to overwinter forage needs of squirrels). • Permits issuded for forest products should include stipulations to protect resources. • Special use authorizaions for the collection of live species with limited distribution (e.g., some invertebrates, plants) shall include permit provisions to ensure the species persist on site. • Research special use authorizations should limit impacts to sensitive resources, unique features, and species within the RNA. • The use of underground utilities should be favored to avoid potential conflicts with resources (e.g., scenic integrity, wildlife, wildfire, hertiage). • Power pole installation or replacement under special use authorization should include raptor protection devices in open habitat such as large meadows and grasslands. Raptor protection devices should be installed on existing poles where raptors have been killed.
Nest parasitism	Southwestern willow flycatcher, Grace's warbler	• Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. • Projects and authorized activities shall be designed to reduce the potential for the introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial non-native populations.
Disease	Townsend's big-eared bat, spotted bat, western red bat, Arizona toad, Chiricahua leopard frog, northern leopard frog, lowland leopard frog	• To prevent degration of native species habitat and the incidental or accidental introduction of diseases or non-native species, aquatic species should not be transferred through management activties from on 6th level HUC watershed to another. • When drafting (withdrawing) water from streams or other waterbodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease). • To reduce disturbances from human activities and prevent the spread of disease, bat gates should be constructed and installed in cave and mine entrances used as shelter for bats within 3 years of discovery when there are no conflicts with cultural resources. • Caves and abandoned mines that are used by bats should be managed to prevent

		disturbance to species and spread of disease (e.g., white-nose syndrome).
Entrapment	FPS that are small mammals, bats, and young of other species	• Sufficient water should be left in streams to provide for aquatic species and riparian vegetation. • When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms. • New or reconstructed fencing shall allow for wildlife passage, except where specifically intended to exclude wildlife (e.g., elk fencing). • New livestock watering facilities shall be designed to allow wildlife access and escape. • During maintenance of existing watering facilities, escape ramps that are ineffective or missing should be replaced.
Substantial predation or competition from invasive species	pronghorn antelope, Three Forks springsnail	• Vegetation treatents shall include measures to reduce the potential for the introduction of invasive plants and animals and damage from non-native insects and diseases. • To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or non-native species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another. • Projects and activities should not transfer water between drainages or between unconnected waterbodies within the same drainage to avoid spreading disease and aquatic invasive species. • Noxious plants and non-native invasive species monitoring and control shall be included in contracts, permits, and agreements. • Management should focus on operation and maintenance, safety, aesthetics, and control of noxious weeds and non-native invasive species. [High Use Developed Recreation Area Management Area] • Invasive plant species should be aggressively controlled within energy corridors to prevent or minimize spread.
Intentional harassment, forced removal, or avoidable disturbance	Mexican wolf, Gunnison's prairie dog, black bear, many FPS (at least during important life cycle periods)	• Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo). • Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife. • Developed and dispersed recreation sites and other authorized activities should not be located in places that prevent wildlife or livestock access to available water. • Recreation use does not negatively affect wildlife habitat and populations. Negative interactions between people and wildlife are minimized. • Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources. • Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moistue conditions. • Prairie dog controls should not be authorized except when consistent with approved State of Arizona Gunnison's prairie dog conservation strategies. • Food and other items that attract wildlife should be managed to prevent reliance on humans and to reduce human-wildlife conflicts. • Where trash facilities are provided, they shall be bear-resistant. • Dispersed campsites should not be located on or adjacent to archaeological sites or sensitive wildlife areas. • All WQAs should be managed to preclude snowmobile use to minimize disturbance during the critical winter period. • WQA boundaries should be signed to identify the areas and educate the public about their purpose. • Large group and recreation event special uses should not be authorized within wilderness, recommended wilderness, primitive area, wildlife quiet areas, eligible "wild" river corridors, riparian and wetland areas, cultural resource sites, Phelps Cabin Botanical Area, Phelps Cabin Research Natural Area, or recommended research natural areas to protect the unique character of these areas.

An additional guideline broadly addresses some of these concerns: "Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives." In summary, although some

of these factors of concern are not entirely under Forest Service control, the above plan components would help provide viability for these identified FPS species under **all alternatives**.

Wildlife Quiet Areas, Habitat Security, and Habitat Connectivity and Linkages

Wildlife Quiet Areas (WQAs) and Habitat Security

Wildlife Quiet Areas would comprise a forest management area under all alternatives except alternative A. Each of the plan alternatives provide for a different set and acreage of WQAs across the ASNFs. In providing for greater habitat security due to less human disturbance, especially motorized use, WQAs help contribute to species viability.

Examination of the layout and scale of the existing WQAs across the ASNFs landscape shows they are few and greatly spaced, especially on the Sitgreaves side of the ASNFs. In order to address this, **alternatives B and D** would propose additional WQAs as shown in table 26.

Table 26. Proposed additional wildlife quiet areas by alternative

Additional WQAs	Alt. A (acres)	Alt. B (acres)	Alt. C (acres)	Alt. D (acres)
Bear Springs	--	2,831	--	2,831
Cottonwood Seep	--	2,968	--	2,968
Carr Lake	--	--	--	2,196
Palomino	--	--	--	8,028
Hidden Lake	--	--	--	3,227
Total acres of additional WQAs	0	5,799	0	19,250

To facilitate alternative comparison, it is assumed that the eight existing WQAs would remain in place under **alternative A** through special closure order. These WQAs would become a plan management area (Wildlife Quite Area Management Area) under the action alternatives. WQAs including the ones additionally proposed are summarized by number and acreage in table 27 by alternative.

Table 27. Number of occurrences and acres of WQA management areas that provide greater habitat security by alternative

Alternative	Number of Occurrences [a/]	Acres (Percent)
A	8	45,506 (2%)
B	10	50,173 (3%)
C	8	44,373 (2%)
D	12	59,379 (3%)

[a/] Number of occurrences represents the number of individual areas assigned to the management area or, for alternative A, designated by special closure order.

In addition to WQAs, other management areas such as Wildernesses, Recommended Wilderness,Primitive Area, Research Natural Areas, Recommended Research Natural Areas, and Natural Landscapes also provide greater habitat security through no or limited motorized vehicle use. The location of existing and proposed WQAs by alternative, along with other management areas providing greater habitat security, is shown in figure 3.

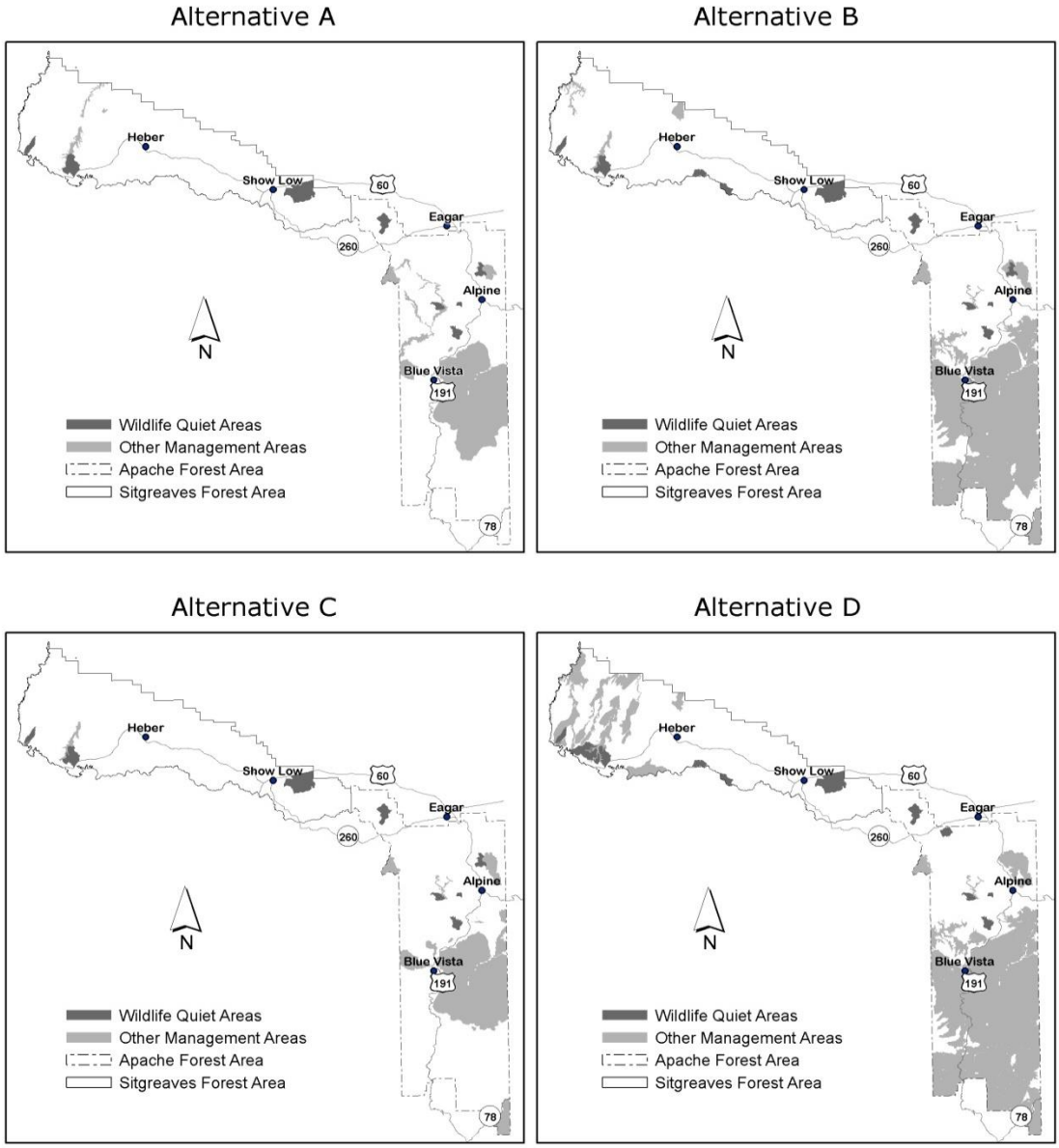


Figure 3. Maps of wildlife quiet areas (WQAs) and other management areas (MAs) providing more secure habitat for each alternative.

Alternatives compared: WQAs and other secure habitat areas would provide beneficial environmental consequences of longevity and continuity of wildlife use. These areas could also lend themselves to assessing the impact of broad-scale thinning and burning treatments and the evaluation of species viability across the ASNFs. They also respond to public input to provide for wildlife and habitats in a sustainable manner. **Alternative D** would provide the greatest amount of acreage in secure habitats, followed by **alternative B**, then **alternatives A and C**.

Habitat Connectivity and Linkages

The premise for WQAs and other more secure habitat management areas is that, in general, the closer secure habitat areas are to one another, the less species risk and more viability effectiveness there is. Therefore for analysis purposes only, straight line distances between these areas are used as a relative indicator of habitat connectivity in order to compare the alternatives. Table 28 displays the estimated average distance between more secure management areas for wildlife by alternative.

Table 28. Habitat connectivity indicator, estimated average distance in miles between management areas by alternative

Management areas that provide habitat security (includes WQAs)	Alt. A [a/]	Alt. B	Alt. C [a/]	Alt. D
	Sitgreaves side of the ASNFs			
	24.1 miles	12.2 miles	24.3 miles	15.3 miles
	Apache side of the ASNFs			
	6.8 miles	5.5 miles	5.9 miles	4.3 miles
	Across the ASNFs			
	15.5 miles	8.2 miles	15.1 miles	9.8 miles

[a/] While both alternative A and C have the same number of WQAs, there are differences among management areas and their acreages.

Alternatives compared: Safe linkages across the landscape are provided by a number of standard and guidelines that address physical obstacles to habitat connectivity. They are in all alternatives; hence **all alternatives** would provide the same viability effectiveness relative to fine filters. These include guidelines for fences and wildlife crossings, and placement of trails relative to wildlife movement. Some management areas have fewer short-term implementation impacts (e.g., use of fire only in wilderness) that would also help contribute to viability effectiveness.

Based on the estimated average distances between secure management areas from table 82, **alternative B** would have less viability risk and therefore the most viability effectiveness in terms of habitat connectedness and linkages. It is followed by **alternative D**. Compared to alternatives B and D, **alternatives A and C** have greater risk and less viability effectiveness. Should WQAs not be retained under **alternative A** by special closure order, this alternative would have the greatest risk and least habitat effectiveness of all the alternatives.

Climate Change

Average global temperature increases in the 20th century occurred at a rate greater than during the previous nine centuries (Karl, et al., 2009). Species composition shifts have been detected in studies in southeastern Arizona (Brown, et al., 1997). Evidence of impacts from changing climate has been demonstrated on a study site near the boundary of the ASNFs and Coconino NF near the Mogollon Rim. During this long-term study, Martin and Maron (2012) found that the abundance of deciduous trees and associated songbirds have declined with decreasing snowfall and associated impacts over 22 years.

Part of the approach to address changes that can impact terrestrial and aquatic ecosystems and better help native species to persist include reducing biotic and abiotic stressors (Bestcha, et al., 2012). Modifying or resetting vegetation structure toward reference (desired) conditions would help make ASNFs vegetation types more resistant, resilient, functional, and better able to absorb disturbance and reestablish ecosystem functions while undergoing change. A resilient ecosystem can better withstand stress like drought, or can rebuild after a major disturbance like a serious storm or fire, without leading to a major shift in the type of ecosystem or the services it provides. The other part of the approach includes prescriptions for management use within the capability and suitability of the ASNFs at a level that allows restoration to progress. **All alternatives** address capability and suitability in compliance with the 1982 planning rule.

Overall, **alternatives B and D** would provide for the greatest movement toward desired conditions; therefore, forest resources would be most able to handle climate changes over time. Conversely, **alternatives A and C** would have the least movement toward desired conditions, so forest resources would be comparatively less able to handle climate changes. Based on the assumption that the closer habitats are to desired conditions, the less the risk to species viability, wildlife habitat and associated species would best be able to adjust to climate changes under **alternatives B and D**. They would be comparatively less able to adjust to climate changes under **alternatives A and C**.

Cumulative Effects

The analysis area for cumulative effects cannot be precisely defined; however, the action area of cumulative effects is defined as the extent that wildlife use habitat on the ASNFs and on adjacent lands, regardless of land ownership. An example would be pronghorn: overall the ASNFs provide primarily summer habitat while adjacent State and private lands provide primarily winter habitat. Although the timing and level of impacts from actions on these other lands cannot be quantified, examples of possible cumulative impacts by types of actions follow.

Thinning and burning on adjacent national forest lands (Gila, Coconino, and Tonto NFs) or tribal lands may also reduce risks on these lands which could benefit species whose range extends beyond the ASNFs. Depending on proximity of ASNFs and other activities, the short-term effects of these off-ASNFs activities may cumulatively limit areas providing wildlife refugia or escape from project activities or from short-term loss of habitat components. These activities may also increase the level and extent of disturbance across the species' landscape such that breeding or young rearing may be less successful during the years of implementation.

Because off-ASNFs developments like wind and solar power facilities, groundwater pumping, mining expansion, and urban development reduce habitat suitability, habitats on the ASNFs become much more important. These developments would also result in direct mortality of individual animals. Loss of habitat and animals could result in the decline or loss of certain species if the impact to their habitats beyond the ASNFs cannot be compensated on the ASNFs. Highway improvements, unless they incorporate adequate wildlife corridors and linkages, could result in the decline of certain species, including loss of genetic diversity as groups of animals become isolated. In addition, soil and forage loss on some adjacent non-Forest Service lands has already resulted in declines of species, such as pronghorn, which also use habitats on the ASNFs.

Forest land exchange and AZGFD acquisitions for important wildlife lands, conservation agreements, and/or water rights could cumulatively provide more wildlife habitat and protect key habitat areas and components that are currently in non-Forest Service ownership. Treatment of invasive species on other lands may help to reduce risk to species on the ASNFs. Public education and law enforcement conducted by AZGFD may contribute to helping protect species and limit disturbance or unlawful removal,

cumulatively benefitting species. Reductions in the amount of feral animal populations, conducted by State agencies, would cumulatively improve habitat conditions for wildlife on the ASNFs.

Unavoidable Adverse Impacts

The LMP provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Before any ground-disturbing actions take place, they must be authorized in a subsequent environmental analysis in accordance with NEPA and other federal laws (e.g., Clean Water Act, Endangered Species Act). Therefore, none of the alternatives implementing the LMP would be expected to cause unavoidable adverse impacts. LMP mechanisms are in place to monitor and use adaptive management principles in order to help alleviate any unanticipated impacts that may occur or need to be addressed singularly or cumulatively.

Irreversible and Irretrievable Commitment of Resources

The LMP provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carryout any project or activity. Because the LMP does not authorize or mandate any ground disturbing actions, none of the alternatives would be expected to cause an irreversible or irretrievable commitment of resources.

Adaptive Management

All alternatives include the use of adaptive management principles and the requirement to monitor outcomes of management and activities (see LMP Chapter 5). Monitoring the results of LMP management and activities would provide a flow of information that may indicate the need to change a course of action or the LMP itself. This is especially important given the uncertainty associated with viability and trade-offs made to meet other goals or because of other constraints (Holthausen, 2002). Scientific findings and the changing needs of society may also indicate the need to adapt resource management to new information. Examples of new information that may indicate a need for change in management or activities include climate change data, additional understanding of species' habitat requirements, or a newly listed species.

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APPENDICES

Appendix A. Description of alternatives and treatment methods

In addition to the 1987 Forest plan (Alternative A) and the LMP (Alternative B), the ASNFs developed two additional alternatives to respond to issues raised by the public (Alternatives C and D). Alternative A is the no action alternative while Alternatives B, C, and D are the action alternatives.

A complete summary of alternatives is outlined in the LMP FEIS. The alternatives include an emphasis, desired conditions, and suitability for various management actions, objectives for treatment, and standard and guidelines. The following information presents those portions of the FEIS alternative summary that have relevance for wildlife.

Elements common to all alternatives

All four alternatives have a number of features in common. In part, they are:

- conserve soil and water resources and do not allow significant or permanent impairment of the productivity of the land;
- provide protection for riparian areas;
- provide for and maintain diversity of plant and animal communities consistent with overall multiple-use objectives;
- provide for species' viability by providing appropriate habitat that is well distributed across the planning area;
- include measures for preventing the destruction or adverse modification of critical habitat for threatened and endangered species;
- use a common list of Management Indicator Species (MIS). The list of 17 MIS used in the 1987 forest plan was reviewed and modified.[9] The following five indicators are used to compare and evaluate alternatives: Mexican spotted owl, northern goshawk, pronghorn antelope, aspen, and riparian;
- emphasize uneven-aged forest conditions, with allowance for some even-aged management;
- use mechanical and fire (planned and unplanned) restoration treatment methods to meet desired conditions (discussed below);
- protect the outstandingly remarkable values for the 23 eligible and 2 suitable wild and scenic rivers;[10]
- retain the existing Escudilla, Bear Wallow and Mount Baldy wildernesses along with the designated Blue Range Primitive area (managed as a wilderness);
- retention of the existing Phelps Cabin research natural area (RNA); and
- direction to control, treat, or eradicate non-native plan and animal invasive species (except in Alternative A).

Main differences among alternatives

The alternatives differ in the number and size of forest plan management areas (MAs). MAs are areas that have similar management intent and a common management strategy. Tables A1 and A2 describe

[9] See the plan set of documents for rationale.

[10] In some instances, protection of the particular outstanding remarkable value (ORV) within the river corridor may be more restrictive than the management prescribed for the greater management area (MA) that the river occurs in or vice versa, the MA may be more restrictive than the river classification (FSH 1909.12, 82.51).

features of the alternatives. Acreage differences among MAs for the action alternatives are generally relatively small, see the FEIS for specifics.

Table A1. Alternative A (no action alternative) management area allocation (acres and percent)

Management Area A	Acres	Management Area	Acres
Forest land	865,473 (43%)	Black River	6,804 (<1%)
Woodland	766,495 (38%)	Chevelon Canyon	10,643 (1%)
Grassland	52,409 (2%)	West Fork Black River	9,066 (<1%)
Riparian	42,645 (2%)	East & West Forks Little Colorado River	1,927 (<1%)
Water	4,071 (<1%)	Blue Range Primitive Area & Additions	199,505 (8%)
Escudilla Demonstration Area	4,898 (<1%)	Bear Wallow Wilderness	11,234 (1%)
Sandrock	26,596 (1%)	Escudilla Wilderness	4,195[11] (<1%)
Research Natural Areas	2,549 (<1%)	Mount Baldy Wilderness	6,842 (<1%)
Developed Recreation Sites	(<1%) The developed recreation sites management areas was not discretely mapped for the 1987 plan.		

Table A2. Alternatives B, C, and D (action alternatives) management area allocation (acres and percent)

Management Areas B, C, D	Alternative B	Alternative C	Alternative D
General Forest	1,224,071 (61%)	1,599,357 (79%)	1,068,718 (53%)
Community-Forest Intermix (CFI) [a/]	60,564 (3%)	60,564 (3%)	58,610 (3%)
High Use Developed Recreation	16,549 (1%)	16,549 (1%)	16,549 (1%)
Energy Corridor	2,547 (<1%)	2,547 (<1%)	2,550 (<1%)
Wildhorse Territory	18,761 (1%)	18,761 (1%)	18,761 (1%)
Wildlife Quiet Area	50,173 (2%)	44,373 (2%)	59,379 (3%)
Natural Landscape	404,802 (20%)	35,408 (2%)	77,119 (4%)
Recommended Research Natural Area	7,814 (<1%)	7,814 (<1%)	5,957 (<1%)
Research Natural Area	261 (<1%)	261 (<1%)	261 (<1%)
Blue Range Primitive Area	199,502 (10%)	199,502 (10%)	199,502 (10%)
Recommended Wilderness	7,074 (<1%)	6,982 (<1%)	484,712 (24%)
Wilderness	23,234 (1%)	23,234 (1%)	23,234 (1%)

[a/] CFIs encompass the area immediately around communities, most often defined as ½ mile from the private land boundary; whereas, Community Wildfire Protection Plans (CWPPs), developed by counties, encompass areas with generally greater in size and have variable distances from private land.

The alternatives also differ in their various features such as how they respond to the issues of vegetation condition (namely, priority for restoration treatments and treatment methods and amounts), recreation opportunities, recommended wilderness, recommended research natural areas (RNAs) and wildlife quiet areas (WQAs), etc. Tables A3 and A4 contrast these differences and shows where they are the same.

Table A3. Alternative features compared[12]

Alternative→ / Objective↓	Alt. A 1987 plan	Alt. B preferred alternative	Alt. C response to comment	Alt. D response to comment
Priority (emphasis) for restoration treatments	Treat around communities to reduce threat from uncharacteristic wildfire; provide wood products for White Mtn. Stewardship Old growth characteristics are retained and/or encouraged [a/]	Treat areas identified in Community Wildfire Action Plans, including the Community-forest intermix (CFI) management area, to reduce threat from uncharacteristic wildfire Old growth characteristics are retained and/or encouraged	Treat areas in the CFI management area to reduce threat from uncharacteristic wildfire Does not include guidance to retain and/or encourage old growth characteristics	Treat areas in the CFI management area to reduce threat from uncharacteristic wildfire All large and old trees are retained except in the CFI
Primary types of restoration treatment methods [b/]	A mix of mechanical and fire	A mix of mechanical and fire	Primarily mechanical, some fire	Primarily fire, some mechanical
Wilderness-additional recommended	none	7,074 acres	6,982 acres	484,712 acres
Research Natural Areas-recommended new RNAs	4 for 2,569 acres	5 for 7,814 acres [c/]	5 for 7,814 acres [c/]	2 for 5,957 acres [c/]
Wildlife Quiet Areas as a plan management area (MA)	(8 for 45,506 acres) [d/]	8 in Alt. A, +2 more for 50,173 acres	8 of Alt. A as MA [d/] for 44,373 acres	7 of 8 in Alt. A, +3 more for 59,379 acres
Motorized travel: -Cross-country (XC)	XC allowed [e/]	XC not allowed [e/]	XC not allowed [e/]	XC not allowed [e/]
-Roads & trails	On designated road & trail system	Like Alt. A until TMR decision & MVUM in place [d/]	Like Alt. A until TMR decision & MVUM in place [d/]	Like Alt. A until TMR decision & MVUM in place [e/]

[a/] For alternative A only, 20% of each forest and woodland type is managed for, or toward, old growth.
[b/] See table A6 for description of mechanical (cut) and burn treatment methods.
[c/] These alternatives would add the current 100 acre Phelps Cabin Botanical Area into the adjacent Phelps Cabin RNA.
[d/] Under Alt. A, these WQAs were put in place by 1980s Special Order; under Alt C, they would comprise a Management Area of slightly fewer acres (due to other MA adjustments).
[e/] XC travel is not allowed, but this only takes place once the TMR decision and motor vehicle use map (MVUM) are in place which only address the road and trail system authorized for use on the ASNFs.

Alternatives have different, but some of the same, objectives as noted in table 4A. Objectives are concise, time-specific statements of measurable planned results that make progress towards or maintain desired conditions. Not every action or objective the ASNFs is identified in the plan, just the primary ones. Variation in achieving objectives may occur during the next 15 years because of changes in environmental conditions, available budgets, and other factors.

[12] See the Final Environmental Impact Statement for any minor adjustments of information in this table.

Table A4. Alternative objectives compared for the 15 year plan period (acreage amounts are approximate; the unit of measure is specified for each objective)[13]

Alternative→ / Objective↓	Alt. A 1987 plan	Alt. B preferred alternative	Alt. C developed in response to comment	Alt. D developed in response to comment
Number of focus 6th level HUC watersheds where condition class is improved by removing or mitigating degrading factors	opportunity [a/]	10/planning period		
Amount of treatments to enhance or restore focus 6th level HUC watersheds	opportunity	350 acres/year		
Amount of treatments in forest types (ponderosa pine, dry mixed conifer, wet mixed conifer, and spruce-fir)	17,000/year (primarily ponderosa pine)	5,000 to 35,000 acres/year (primarily ponderosa pine)	5,500 to 55,000 acres/year (primarily ponderosa pine)	7,500to 50,000 acres/year (primarily ponderosa pine)
Amount of aspen (dominated and co-dominated), representing a range of age classes, maintained	opportunity	50,000 acres/planning period		
Amount of treatments in woodlands (Madrean pine- oak and piñon-juniper)	3,500 acres/year (both woodlands, primarily by fire)	5,000 to 15,000 acres/year (primarily in Madrean pine-oak using fire)	2,500 to 10,000 acres/year (primarily mechanical in piñon-juniper & primarily fire in Madrean pine-oak)	5,000 to 30,000 acres/year (primarily in Madrean pine-oak using fire)
Amount of treatments in grasslands (Great Basin, semi-desert, and montane/ subalpine)	500 acres/year (all 3grassland PNVTs)	up to 25,000 acres/year (primarily in Great Basin & semi-desert grasslands)	500 acres/year (montane/subalpine) & opportunity (other 2 grasslands)	up to 24,000 acres/year (all grasslands)
Amount of treatments in riparian areas to restore desired composition, structure, and function	opportunity	200 to 500 acres/year	opportunity	300 to 600 acres/year
Amount of wet meadows or cienegas restored	opportunity	5 to 25/planning period	opportunity	same as Alt. B
Amount of stream and riparian habitat treatments to restore structure, composition, and function of physical habitat for native fish and riparian-dependent species	Less than 10 miles/year	5 to 15 miles/year	opportunity	same as Alt. B
Average amount of riparian habitat	opportunity	5 miles/year		

[13] See the Final Environmental Impact Statement for any minor adjustments of information in this table.

treated to reduce animal damage to native willows & other rip. species				
Minimum number of projects to provide for aquatic and riparian-associated species and migratory species	opportunity	5/planning period	opportunity	same as Alt. B
Minimum amount of NFS roads or trails that negatively impact streams or riparian areas relocated, removed, repaired, or improved	opportunity	4 miles/planning period	opportunity	same as Alt. B
Average amount of unauthorized roads or trails or NFS level 1 roads that negatively impact streams or riparian areas closed, removed, or re-vegetated	opportunity	2 miles/year	3 miles/year	same as Alt. C
Amount of treatment to contain, control, or eradicate terrestrial invasive species	500 acres/year	500 to 3,500 acres/year		
Minimum amount of treatments to contain, control, or eradicate aquatic invasive species	opportunity	2 miles/year		
Minimum number of un-needed structures removed to improve wildlife connectivity annually	opportunity	5/year		
[a/] Opportunity indicates that there would be no set objective for this alternative; treatments and accomplishments would occur on an opportunity basis as conditions, funding, and staffing allow.				

Plan revision topics are evaluated using "indicators".[14] These are measures that facilitate comparisons of *outcomes* between alternatives. Many indicators are also forest plan objectives. Those indicators not covered above as objectives are compared for the alternatives in table A5.

Table A5. Alternative indicators compared for the 15 year plan period (acreage amounts are approximate; the unit of measure is specified for each objective)[15]

Alternative→ Indicator↓	Alt. A 1987 plan	Alt. B preferred alternative	Alt. C developed in response to comment	Alt. D developed in response to comment
Amount of aspen on the landscape	71,100 acres	68,200 acres	65,800 acres	65,500 acres
Trend of riparian condition and function toward "proper	away	toward	away	toward

[14] NEPA indicators used to compare alternatives are not to be confused with management indicator species (MIS) or ecological indicators (EIs) which inform the NFMA viability analysis.

[15] See the Final Environmental Impact Statement for any minor adjustments of information in this table.

functioning condition" [a/]				
Amount of Great Basin and semi-desert grasslands where woody encroachment is reduced	1%	46%	1%	42%
Provision of accessible and wildlife-proof trash facilities in all developed sites where trash is collected	opportunity	All developed sites within planning period		
Minimum number of forage reserves established on each ranger district	opportunity	1/planning period		

[a/] Proper functioning condition or PFC of riparian-wetland areas reflects a balance in the interaction of geology, soils, water, and vegetation (BLM, 1998); while an area at PFC may contribute to fish and wildlife habitat, it is not a measure of either the quantity or quality of that habitat, nor a measure of its ability to sustain wildlife.

Treatments methods - all alternative

There are two primary methods of treatment to restore ecosystem structure and function regardless of alternative. These are, as noted above, mechanical (or cutting) and burning (i.e., use of fire--wild or prescribed), both focused mainly on affecting changes in forest structure with associated understory vegetation and soils effects. The application of these methods often entail differing short term impacts to wildlife and their habitat with the goal of moving toward desired conditions. Table A6 contains more explanation and shows where these treatment methods would be applied relative to suitable and non-suitable timber lands.[16] The difference between these lands is that suitable timber land is harvested on a regulated basis with the purpose of providing a sustained yield of industrial wood products. This entails repeated entry into the same area or stand to cut and harvest trees, generally every 20-40 years. Non-suitable timber land is cut at varying levels and timing as needed for different purposes. Under this plan, both are be used as restoration treatments to reach desired conditions

Each alternative has a different combination of these two methods applied to varying acreage. Mechanical treatments (see 1.1 and 1.2 in table A6 and table footnote a) entail cutting to remove trees and burning (2a and 2b below) entail the application of fire to remove trees, both with the goal of moving the site toward desired conditions. Both methods have associated short term implementation effects caused by skidding or fire. For example, ground and shrubby cover is removed or reduced, as is down wood or debris, and bare ground is exposed.

Each alternative has a different combination of these two methods applied to varying acreage. The purpose of both the mechanical (cut) treatment method (see 1.1 and 1.2 in table A6 and table footnote a) and the burn treatment method (2.1 and 2.2 in table A6) is to remove trees, with the goal of moving the site toward desired conditions. Both methods have associated short term implementation effects. Soil and vegetation is disturbed by heavy equipment cutting and skidding trees,[17] while the burn method removes above ground plant growth.[18] For example, ground and shrubby cover is removed or reduced, as is down wood or debris, and bare ground is exposed. This is considered a short term implementation effect where plant and litter cover generally returns within a year.

The duration and amount of these implementation impacts vary by site specific conditions and by treatment.[19] With the burning treatment method, regrowth of plant cover is often faster and more extensive than with mechanical treatment because prescribed and managed fires affect only above ground plant parts. With mechanical treatment, less medium to small down wood or debris may be removed than with burning, although it may be substantially rearranged on site by vehicles and equipment. The extent of disturbance to herbaceous and shrubby (short stature woody) vegetation with mechanical treatments is greater than with burning treatments, given the use of heavy equipment (versus fire is mostly carried through fuels by wind across most of the treated area). Although the burning method can impact soil organic matter, the mechanical method generally impacts other soil properties such as mixing horizons,

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[16] Suitable and non suitable are designations required by the 1976 National Forest Management Act for forest planning and management.

[17] In addition, the pile burning associated with the mechanical or cut treatment method usually sterilizes soil, destroys plants, and provides a prime seed bed for noxious weeds under and the near vicinity of the pile. These impacts are considered long-term effects. On the other hand, nearby tree canopies can also be damaged by heat from pile burning although efforts are made to avoid nearby tree damage so that this is considered a short term effect.

[18] Burning is not a precise treatment method and as a result, some areas can burn at a greater severity than intended (some less). Planned and implementation actions usually effectively the extent of such areas.

[19] Statements in this paragraph are based on personal observations as a forestry technician and professional biologist working on timber projects since the late 1970s to present.

compaction, reconfiguration of micro-surface flows, etc. These are mitigated as practicable with site-specific application of best management practices (BMPs), depending on funding and workforce. However, if these functions are restored generally within a year, they are considered a short term implementation effect.

Table A6. Treatment methods for ASNFs plan revision alternatives, distinguishing NFMA suitable (sustained yield) lands and non-suitable lands

Suitability for sustained timber production→		Suitable timber lands	Non-suitable (non timber) lands	
Treatment methods ↓		Treatment method applied	Treatment method applied	Treatments applied↓ where MAs have limitations to the type of treatment allowed [a/]
Cut (mechanical)	1.1) Cutting to remove trees [b/] - repetitive entry [c/]; may include limited tree planting	X		
	1.2) Cutting to remove trees [b/] - single entry [d/]; may include limited tree planting		X	
Burn	2.1) Planned (Rx) ignition fire to kill trees – single or repetitive entry	X	X	X
	2.2) Unplanned ignition fire to kill trees [e/] – single or repetitive entry	X	X	X

[a/] Specifically for the following Management Areas: Wilderness, Recommended Wilderness, and Blue Range Primitive Area.

[b/] These treatments by themselves include fire as in pile burning, but only for cleaning up fuels generated from cutting; this treatment occurs on appropriate soils and almost entirely on slopes ≤40% (although it can include hand thinning with chainsaws on limited areas with >40% slope).

[c/] While repetitive for sustained yield, most areas would receive only a single cut entry during the 15-year plan period based on modeling a 30 year cutting cycles during FVS modeling; actual cutting cycles may be different - see the Silviculturist Specialist Report in the plan set of documents.

[d/] Modeled as a single cut followed by prescribed burning(s); while there could be more than a single cut, this is unlikely to be common given the 15-year plan period.

[e/] Unplanned ignitions (wildfires) that meet a variety of resource objectives such as fuels reduction occur throughout the plan period and on all lands; those that burn in a manner that will move site conditions toward desired conditions are included as a method of treatment and were modeled, i.e., "unplanned ignitions" (otherwise, wildfires are not included).

Appendix B. Plan Decisions and Species Viability

As part of the plan revision process, coarse filter plan decisions (i.e., desired condition statements) were developed that describe the desired outcomes and conditions for vegetation, riparian and aquatic features, and other resources within the planning area. These desired conditions help to provide habitat for wildlife which helps to reduce risks to species and provide for their viability. Still, desired conditions could result in low to moderate risk ratings for some species. However, because low to moderate ratings of risk are assumed to be similar enough to normal ecosystem fluctuations, it is assumed this is within a species' ability to adjust, thus posing little risk to viability. Where the risk rating would be moderately-high, high, or very high, additional fine filter plan components (e.g., standards, guidelines) were developed to address or mitigate risk. However, the coarse-fine filter approach is not entirely discrete in that standards and guidelines can contribute to viability for some coarse filter species, while the needs of fine filter species can also be provided for, in part, by coarse filter desired conditions and PNVTs.

Table B1 provides a crosswalk that shows how plan decisions meet species viability needs. The crosswalk lists those coarse and fine filter plan decisions that reduce risks to species and help provide for viability. Other plan decisions (objectives, special areas, suitability, and monitoring) and management area allocations also contribute to species viability and are discussed in the Wildlife and Rare Plants and Fisheries sections of chapter 3 of the FEIS.

In the table below, the following abbreviations are used:

DC = desired condition
ST = standard
GL = guideline
PNVT = potential natural vegetation type
MA = management area
FPS = forest planning species

Table B1. Species crosswalk for how plan decisions meet species' viability needs[20]

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
All PNVTs, all habitat elements, and other factors of concern	All FPS	**GLs for Soil:** Projects with ground-disturbing activities should be designed to minimize long- and short-term impacts to soil resources. Where disturbance cannot be avoided, project-specific soil and water conservation practices should be developed. Severely disturbed sites should be revegetated with native plant species when loss of long-term soil productivity is predicted. Locally collected seed should be used where available and cost effective. Seeds should be tested to ensure they are free from noxious weeds and invasive nonnative plants at a State-certified seed testing laboratory before acceptance and mixing. Coarse woody debris retention and/or creation should be used as needed to help retain long-term soil productivity. **GL for Water Resources:** Projects with ground-disturbing activities should be designed to minimize long and short-term impacts to water resources. Where disturbance cannot be avoided, project-specific soil and water conservation practices and best management practices (BMPs) should be developed. **ST for All PNVTs:** Vegetation treatments shall include measures to reduce the potential for the introduction of invasive plants and animals and damage from nonnative insects and diseases. **GLs for All PNVTs:** During project design and implementation, precautions should be taken to reduce the potential for damage to residual vegetation in order to prevent premature or excessive mortality. Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil

[20] See the Final Land Management Plan for any minor adjustments of information in this table.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		cover. **GLs for Wildlife and Rare Plants and Aquatic Habitat and Species:** Management and activities should not contribute to a trend toward the Federal listing of a species. Activities occurring within federally listed species habitat should apply habitat management direction and species protection measures from recovery plans. The needs of localized species (e.g., New Mexico meadow jumping mouse, Bebb willow, White Mountains paintbrush) should be considered and provided for during project activities to ensure their limited or specialized habitats are not lost or degraded. **ST for Invasive Species:** Projects and authorized activities shall be designed to reduce the potential for the introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations. **GLs for Invasive Species:** Project areas should be monitored to ensure there is no introduction or spread of invasive species. Treatment of invasive species should be designed to effectively control or eliminate them; multiple treatments may be needed. **GLs for Landscape Scale Disturbance Events:** Erosion control mitigation features should be implemented to protect significant resource values and infrastructure such as stream channels, roads, structures, threatened and endangered species, and cultural resources. Projects and activities (e.g., revegetation, mulching, lop and scatter) should be designed to stabilize soils and restore nutrient cycling, if needed, and establish movement toward the desired conditions for the affected PNVT(s). **GL for Motorized Opportunities**: New roads or motorized trails should be located to avoid Mexican spotted owl protected activity centers (PACs), northern goshawk post-fledgling family areas (PFAs), and other wildlife areas as identified; seasonal restrictions may be an option. **ST for Forest Products:** Authorizations to cut, collect, or use forest products for any personal, commercial, or scientific purpose (i.e., permits, contracts, agreements) shall include provisions to ensure the needs of wildlife, which depend upon those forest products, will continue to be met (e.g., fungi and cone collection

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		with respect to overwinter forage needs of squirrels). **GLs for Livestock Grazing:** Grazing use on seasonal allotments should be timed to the appropriate plant growth stage and soil moisture. Forage, browse, and cover needs of wildlife, authorized livestock, and wild horses should be managed in balance with available forage so that plants providing for these needs remain at or move toward a healthy, persistent state. **GL for Wildlife Quiet AreaManagement Area:** Restoration treatments should consider the needs of wildlife (e.g., calving/fawning areas, wallows, game crossings) to minimize potential impacts to the species and their habitat. **ST for WildernessManagement Area:** Human-caused disturbed areas that do not complement wilderness characteristics will be rehabilitated to a natural appearance, using plant species or other materials native to the area. **ST for Recommended WildernessManagement Area:** Human-caused disturbed areas that do not complement wilderness characteristics shall be rehabilitated to a natural appearance, using plant species or other materials native to the area. **GL for Research Natural AreaManagement Area:** To minimize impacts to unique and sensitive plant species, recreational activities (other than use on the designated trail) should not be encouraged. **GL for Recommended Research Natural AreaManagement Area:** To minimize impacts to unique and sensitive plant and animal species, recreational activities should not be encouraged.
Forested PNVTs	All FPS listed under ponderosa pine, dry mixed conifer, wet mixed conifer and spruce-fir forested PNVTs	**GLs for All Forested PNVTs:** Where current forests are lacking proportional representation of late seral states and species composition on a landscape scale, old growth characteristics should be retained or encouraged to the greatest extent possible within the scope of meeting other desired conditions (e.g., reduce impacts from insects and disease, reduce the threat of uncharacteristic wildfire). Healthy Southwestern white pine should be retained to maintain the wide range of genetic variability that contributes to resistance against the nonnative white pine blister rust disease. Tree species that are less susceptible to root disease should be retained within areas of root disease infection

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		to reduce spread of disease. When thinning dwarf mistletoe infected sites, as much mistletoe should be removed as possible without sacrificing the healthiest, most desirable trees for the particular site (in some situations this may involve retaining some trees in the upper canopy that are lightly infected to meet multiple resource objectives). Trees, snags, and logs immediately adjacent to active red squirrel cone caches, Abert's squirrel nests, and raptor nests should be retained to maintain needed habitat components and provide tree groupings. **Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife.** **GLs for Wildlife and Rare Plants:** A minimum of six nest areas (known and replacement) should be located per northern goshawk territory. Northern goshawk nest and replacement nest areas should be located around active nests, in drainages, at the base of slopes, and on northerly (northwest to northeast) aspects. Nest areas should be 25 to 30 acres each in size. Northern goshawk post-fledging family areas (PFAs) of approximately 420 acres in size should be designated around the nest sites. During treatments, snags should be retained in the largest diameter classes available as needed to meet wildlife or other resource needs. Active raptor nests should be protected from treatments and disturbance during the nesting season to provide for successful reproduction. Specifically for goshawk nest areas, human presence should be minimized during nesting season of March 1 through September 30.
Ponderosa pine forested PNVT	Arizona myotis bat, Abert's squirrel, northern goshawk, zone-tailed hawk, Grace's warbler, flammulated owl, Mexican spotted owl (where Gambel oak)	**GL for Ponderosa Pine:** Where Gambel oak or other native hardwood trees and shrubs are desirable to retain for diversity, treatments should improve vigor and growth of these species. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
Dry mixed conifer forested PNVT	Arizona myotis bat, red squirrel, northern goshawk, flammulated owl, Mexican spotted owl	**GL for Dry Mixed Conifer:** Where Gambel oak or other native hardwood trees and shrubs are desirable to retain for diversity, treatments should improve vigor and growth of these species. **GL for Aspen:** Restoration of aspen clones should occur where aspen is overmature or in decline to maintain a sustainable presence of this species at the landscape level. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.
Wet mixed conifer forested PNVT	red squirrel, black bear, northern goshawk, red-faced warbler, dusky blue grouse, MacGillvray's warbler, Mexican spotted owl, yellow lady's slipper, wood nymph, heathleaf ragwort, yellow Jacob's-ladder, hooded lady's tresses	**GL for Aspen:** Restoration of aspen clones should occur where aspen is overmature or in decline to maintain a sustainable presence of this species at the landscape level. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.
Spruce-fir forested PNVT	Red squirrel, black bear, Mexican spotted owl, crenulate moonwort, White Mountains paintbrush, yellow lady's slipper, wood nymph, heathleaf ragwort, yellow Jacob's-ladder, hooded lady's tresses	**GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
Madrean pine-oak woodland PNVT	mule deer (winter), juniper titmouse, Mexican spotted owl (often in association with canyons), gray vireo, Bigelow's onion	**GL for All Woodland PNVTs:** Treatments should leave single or small groups of medium to large trees that are widely spaced with expanses of herbaceous vegetation and coarse woody debris to provide for soil productivity, traditional uses (e.g., piñon nut gathering), and wildlife needs such as foraging habitat for migratory birds (e.g., black-throated gray warbler, pinyon jay) and other birds. **GL for Madrean pine-oak:** Where Mexican spotted owls are found nesting in canyons or on north slopes within the Madrean pine-oak woodland, adjacent treatments should be modified to meet the needs of foraging owls. **GLs for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. During treatments, snags should be retained in the largest diameter classes available as needed to meet wildlife or other resource needs. Active raptor nests should be protected from treatments and disturbance during the nesting season to provide for successful reproduction. Specifically for goshawk nest areas, human presence should be minimized during nesting season of March 1 through September 30.
Montane/subalpine grasslands PNVT	pronghorn antelope, Gunnison's prairie dog, dwarf shrew, savannah sparrow, splachnoid dung moss	**ST for ALL PNVTs:** Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential. **GLs for Grasslands:** New fence construction or reconstruction where pronghorn antelope may be present should have a barbless bottom wire which is 18 inches from the ground to facilitate movement between pastures and other fenced areas. Pole and other types of fences should also provide for pronghorn antelope passage where they are present. Pronghorn antelope fence and other crossings should be installed along known movement corridors to prevent habitat fragmentation. **GLs for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. Prairie dog controls should not be authorized except when consistent with approved State of Arizona Gunnison's prairie dog conservation strategies. **GL for Livestock Grazing:** Grazing use on seasonal allotments should be timed to the appropriate plant growth stage and soil moisture.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
Great Basin grassland PNVT	pronghorn antelope, Gunnison's prairie dog, Arizona sunflower	**ST for ALL PNVTs:** Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential. **GLs for Grasslands:** New fence construction or reconstruction where pronghorn antelope may be present should have a barbless bottom wire which is 18 inches from the ground to facilitate movement between pastures and other fenced areas. Pole and other types of fences should also provide for pronghorn antelope passage where they are present. Pronghorn antelope fence and other crossings should be installed along known movement corridors to prevent habitat fragmentation. **GLs for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. Prairie dog controls should not be authorized except when consistent with approved State of Arizona Gunnison's prairie dog conservation strategies.
Semi-desert grassland PNVT	Bigelow's onion, Arizona sunflower, superb penstemon	**ST for All PNVTs:** Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential. **GLs for Grasslands:** New fence construction or reconstruction where pronghorn antelope may be present should have a barbless bottom wire which is 18 inches from the ground to facilitate movement between pastures and other fenced areas. Pole and other types of fences should also provide for pronghorn antelope passage where they are present. Pronghorn antelope fence and other crossings should be installed along known movement corridors to prevent habitat fragmentation. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
Sometimes shaded or often wet meadow or forest opening (ponderosa pine, dry mixed conifer, wet mixed conifer, and spruce-fir forested and Madrean pine-oak woodland PNVTs)	Mogollon vole, Merriam's shrew, four-spotted skipperling butterfly, Arizona sneezeweed, Mogollon clover, Oak Creek triteleia	**GL for All PNVTs:** Restoration methods, such as thinning or prescribed fire, should leave a mosaic of untreated areas within the larger treated project area to allow recolonization of treated areas by plants, small mammals, and insects (e.g., long-tailed voles, fritillary butterflies). **GL for Ponderosa Pine and Dry Mixed Conifer:** Where consistent with project or activity objectives, canopy cover should be retained on the south and southwest sides of small, existing forest openings that are naturally cooler and moister. These small (generally one-tenth to one-quarter acre) shaded openings provide habitat conditions needed by small mammals, plants, and insects (e.g., Merriam's shrew, Mogollon clover, four-spotted skipperling butterfly). Where these openings naturally occur across a project area, these conditions should be maintained on an average of two or more such openings per 100 acres. **GL for Riparian Areas:** Wet meadows and cienegas should not be used for concentrated activities (e.g., equipment storage, forest product or mineral stockpiling, livestock handling facilities, special uses) that cause damage to soil and vegetation. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **GLs for Motorized Opportunities:** New roads, motorized trails, or designated motorized areas should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic species. As projects occur in riparian or wet meadow areas, unneeded roads or motorized trails should be closed or relocated, drainage restored, and native vegetation reestablished to move these areas toward their desired condition. **GL for Nonmotorized Opportunities:** New nonmotorized routes should avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic habitat. **GL for Livestock Grazing:** Critical areas (e.g., meadows) should be managed to address the inherent or unique site factors, condition, values, or potential conflicts. **GL for Special Uses:** As applicable, issuance of special use authorizations should incorporate measures to

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
Cool understory micro-climate (dry mixed conifer forested and Madrean pine-oak woodland PNVTs)	Goodding's onion, Mexican hemlock parsley	**GLs for Wildlife and Rare Plants:** Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo). The needs of localized species (e.g., New Mexico meadow jumping mouse, Bebb willow, White Mountains paintbrush) should be considered and provided for during project activities to ensure their limited or specialized habitats are not lost or degraded. **GL for Special Uses:** As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
Mosaic of conditions (species that need adjacent untreated areas for persistence)	lesser long-nosed bat, long-tailed vole, dwarf shrew, White Mountains ground squirrel, Springerville pocket mouse, western burrowing owl, Montezuma's quail, plateau giant tiger beetle, Greene milkweed	**GL for All PNVTs:** Restoration methods, such as thinning or prescribed fire, should leave a mosaic of untreated areas within the larger treated project area to allow recolonization of treated areas by plants, small mammals, and insects (e.g., long-tailed voles, fritillary butterflies). **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **ST for All PNVTs:** Within each PNVT, vegetation management activities shall be designed to maintain or move plant composition towards a moderate to high plant community similarity as compared to site potential.
Dense, low-mid canopy with ample ground vegetation/litter and/or woody debris (dry mixed conifer, wet	southern red-backed vole, dusky blue grouse, western red bat, ocelot, White Mountains chipmunk, black bear, red-faced warbler, MacGillvray's warbler	**GL for Soil:** Coarse woody debris retention and/or creation should be used as needed to help retain long-term soil productivity. **GLs for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g.,

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
mixed conifer, and spruce-fir forested and riparian forested PNVTs)	(mixed broadleaf deciduous riparian forest), Swainson's thrush, gray catbird (riparian forested PNVTs), southwestern willow flycatcher (montane willow riparian forest)	Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo).
Seasonally wetted swales (montane/subalpine and Great Basin grassland PNVTs)	Ferris' copper butterfly, Alberta artic butterfly, nitocris fritillary butterfly, nokomis fritillary butterfly, Parish alkali grass (alkali soils only)	**GL for All PNVTs:** Restoration methods, such as thinning or prescribed fire, should leave a mosaic of untreated areas within the larger treated project area to allow recolonization of treated areas by plants, small mammals, and insects (e.g., long-tailed voles, fritillary butterflies). **GL for Special Uses:** As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
High quality water (all riparian PNVTs)	water shrew, bald eagle, Arizona toad, Chiricahua leopard frog, northern leopard frog, lowland leopard frog, northern Mexican gartersnake, narrow-headed gartersnake, false ameletus mayfly, California floater, Mosely caddisfly, Arizona snaketail dragonfly,	**GL for Aquatic Habitat and Species:** Sufficient water should be left in streams to provide for aquatic species and riparian vegetation. **GLs for Riparian Areas:** Storage of fuels and other toxicants should be located outside of riparian areas to prevent spills that could impair water quality or harm aquatic species. Equipment should be fueled or serviced outside of riparian areas to prevent spills that could impair water quality or harm aquatic species. Construction or maintenance equipment service areas should be located and treated to prevent gas, oil, or other contaminants from washing or leaching into streams. **GLs for Water Resources:** Streams, streambanks, shorelines, lakes, wetlands, and other bodies of water should be protected from detrimental changes in water temperature and sediment to protect aquatic species

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
	White Mountains water penny beetle, Three Forks springsnail, Blumer's dock, carnivorous bladderwort	and riparian habitat. Streamside management zones should be in place between streams and disturbed areas and/or road locations to maintain water quality and suitable stream temperatures for aquatic species. As State of Arizona water rights permits (e.g., water impoundments, diversions) are issued, the base level of instream flow should be retained by the Apache-Sitgreaves NFs. Constraints (e.g., maximum limit to which water level can be drawn down, minimum distance from a connected river, stream, wetland, or groundwater-dependent ecosystem) should be established for new groundwater pumping sites permitted on NFS lands in order to protect the character and function of water resources. Short-term impacts in watersheds containing Outstanding Arizona Waters may be allowed when long-term benefits to water quality, riparian areas, and aquatic resources would occur. To protect water quality and aquatic species, heavy equipment and vehicles driven into a water body to accomplish work should be completely clean of petroleum residue. Water levels should be below the gear boxes of the equipment in use. Lubricants and fuels should be sealed such that inundation by water should not result in leaks. **GLs for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. Any action likely to cause a disturbance and take to bald and golden eagles in nesting and young rearing areas should be avoided per the Bald and Golden Eagle Protection Act. **ST for Dispersed Recreation:** Dispersed campsites shall not be designated in areas with sensitive soils or within 50 feet of streams, wetlands, or riparian areas to prevent vegetation and bank damage, soil compaction, additional sediment, or soil and water contamination. **ST for Motorized Opportunities:** Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety. **GL for Motorized Opportunities:** New roads, motorized trails, or designated motorized areas should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		mitigated to reduce impacts to aquatic species. **GL for Nonmotorized Opportunities:** New nonmotorized routes should avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic habitat. **GL for Livestock Grazing:** To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones. **STs for Water Uses:** Special uses for water diversions shall maintain fish, wildlife, and aesthetic values and otherwise protect the environment. Streams on NFS lands with high aquatic values and at risk from new water diversions shall be preserved and protected with instream flow water rights. Groundwater withdrawals shall not measurably diminish surface waterflows on NFS lands without an appropriate surface water right.
Healthy riparian conditions (i.e., well vegetated and untrampled streambanks and floodplains) (all riparian PNVTs)	Arizona montane vole, water shrew, NM meadow jumping mouse, southwestern willow flycatcher, peregrine falcon, Lincoln's sparrow (montane willow riparian forest), northern Mexican gartersnake, narrow-headed gartersnake, Blumer's dock, Arizona willow (montane willow riparian forest only),	**GLs for Aquatic Habitat and Species:** The needs of rare and unique species associated with wetlands, fens, bogs, and springs should be given priority consideration when developing these areas for waterfowl habitat and other uses. Sufficient water should be left in streams to provide for aquatic species and riparian vegetation. Projects and activities should avoid damming or impounding free-flowing waters to provide streamflows needed for aquatic and riparian-dependent species. **GLs for Riparian Areas:** Ground-disturbing projects (including prescribed fire) which may degrade long-term riparian conditions, should be avoided. Wet meadows and cienegas should not be used for concentrated activities (e.g., equipment storage, forest product or mineral stockpiling, livestock handling facilities, special uses) that cause damage to soil and vegetation.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
	Bebb willow	Active grazing allotments should be managed to maintain or improve to desired riparian conditions. **ST for Water Resources:** Consistent with existing water rights, water diversions or obstructions shall at all times allow sufficient water to pass downstream to preserve minimum levels of waterflow which maintain aquatic life and other purposes of national forest establishment. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **ST for Motorized Opportunities:** Road maintenance and construction activities shall be designed to reduce sediment (e.g., water bars, sediment traps, grade dips) while first providing for user safety. **GLs for Motorized Opportunities:** New roads, motorized trails, or designated motorized areas should be located to avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic species. As projects occur in riparian or wet meadow areas, unneeded roads or motorized trails should be closed or relocated, drainage restored, and native vegetation reestablished to move these areas toward their desired condition. Roads and motorized trails removed from the transportation network should be treated in order to avoid future risk to hydrologic function and aquatic habitat. **GL for Nonmotorized Opportunities:** New nonmotorized routes should avoid meadows, wetlands, riparian areas, stream bottoms, sacred sites, and areas with high concentrations of significant archaeological sites. The number of stream crossings should be minimized or mitigated to reduce impacts to aquatic habitat. **GLs for Livestock Grazing:** Critical areas (e.g., riparian) should be managed to address the inherent or unique site factors, condition, values, or potential conflicts. New livestock troughs, tanks, and holding facilities should be located out of riparian areas to reduce concentration of livestock in these areas. Existing facilities in riparian areas should be modified, relocated, or removed where their presence is determined to inhibit movement toward desired riparian or aquatic conditions.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		To minimize potential resource impacts from livestock, salt or nutritional supplements should not be placed within a quarter of a mile of any riparian area or water source. Salt or nutritional supplements should also be located to minimize herbivory impacts to aspen clones. To prevent resource damage (e.g., streambanks) and disturbance to federally listed and sensitive wildlife species, trailing of livestock should not occur along riparian areas. Where no alternative route is available, approval may be granted where effective mitigation measures are implemented (e.g., timing of trailing, number of livestock trailed at one time). **GL for Minerals and Geology:** Streambed and floodplain alteration or removal of material should not occur if it prevents attainment of riparian, channel morphology, or streambank desired conditions. **GLs for Energy CorridorManagement Area:** Trees and shrubs in riparian areas should only be removed when there is an imminent threat to facilities and, in these cases, trees should be left for large coarse woody debris recruitment into the stream and riparian system. When planning and implementing vegetation treatments (e.g., corridor maintenance), vegetation within riparian zones that provides rooting strength important for bank stability should be encouraged.
Large trees, snags, and/or dense canopies (mixed broadleaf deciduous, cotton-willow, and montane willow riparian forested PNVTs)	beaver, greater western mastiff bat, Allen's big-eared bat, Arizona gray squirrel, common black-hawk, evening grosbeak, yellow-billed cuckoo, bald eagle	**GLs for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo). During treatments, snags should be retained in the largest diameter classes available as needed to meet wildlife or other resource needs. **GL for Landscape Scale Disturbance Events:** An adequate number and size of snags and logs, appropriate for the affected PNVT, should be retained individually and in clumps to provide benefits for wildlife and coarse woody debris for soil and other resource benefits.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
Permanent wet meadow-like areas (wetland/cienega riparian areas PNVT including fens and bogs)	Ferris' copper butterfly, nitocris fritillary butterfly, nokomis fritillary butterfly	**GL for All PNVTs:** Restoration methods, such as thinning or prescribed fire, should leave a mosaic of untreated areas within the larger treated project area to allow recolonization of treated areas by plants, small mammals, and insects (e.g., long-tailed voles, fritillary butterflies). **GLs for Aquatic Habitat and Species:** The needs of rare and unique species associated with wetlands, fens, bogs, and springs should be given priority consideration when developing these areas for waterfowl habitat and other uses. **GL for Motorized Opportunities:** As projects occur, existing meadow crossings should be relocated or redesigned, as needed, to maintain or restore hydrologic function using appropriate tools such as French drains and elevated culverts. **GL for Nonmotorized Opportunities:** Meadow crossings should be designed or redesigned to maintain or restore hydrologic function using appropriate tools such as French drains and elevated culverts. **GL for Special Uses:** As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
Canyon slopes/cliffs, caves, rocky slopes (often in vicinity of riparian areas, often cool micro-climate) (all PNVTs)	Townsend's big-eared bat, spotted bat, greater western mastiff bat, Allen's big-eared bat, peregrine falcon, Eastwood alumroot, Arizona alumroot, Davidson's cliff carrot	**GLs for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. Rare and unique features (e.g., talus slopes, cliffs, canyon slopes, caves, fens, bogs, sinkholes) should be protected to retain their distinctive ecological functions and maintain viability of associated species. The needs of localized species (e.g., New Mexico meadow jumping mouse, Bebb willow, White Mountains paintbrush) should be considered and provided for during project activities to ensure their limited or specialized habitats are not lost or degraded. **GL for Special Uses:** As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens).
Habitat connectivity (all PNVTs)	Mexican wolf, jaguar, mountain lion, black bear	**GL for All PNVTs:** Landscape scale restoration projects should be designed to spread treatments out spatially and/or temporally within the project area to reduce implementation impacts and allow reestablishment of vegetation and soil cover. **GL for Aquatic Habitat and Species:** Sufficient water should be left in streams to provide for aquatic species and riparian vegetation.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		GL for All Woodland PNVTs: Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **GLs for Overall Recreation Opportunities:** Developed and dispersed recreation sites and other authorized activities should not be located in places that prevent wildlife or livestock access to available water. Constructed features should be maintained to support the purpose(s) for which they were built. Constructed features should be removed when no longer needed. **GL for Motorized Opportunities:** Roads and motorized trails should be designed and located so as to not impede terrestrial and aquatic species movement and connectivity. **GL for Nonmotorized Opportunities:** New trails and trail relocations should be designed and located so as to not impede terrestrial and aquatic species movement and connectivity. **ST for Livestock Grazing:** New or reconstructed fencing shall allow for wildlife passage, except where specifically intended to exclude wildlife (e.g., elk fencing). **GLs for Wildlife Quite AreaManagement Area:** Fences surrounding and within WQAs should be inspected and improved to allow wildlife movement within and outside of the areas. Fences should be removed if no longer needed. Hiding cover and travelways for wildlife should be maintained to provide for security and connectivity of habitat. Restoration treatments should consider the needs of wildlife (e.g., calving/fawning areas, wallows, game crossings) to minimize potential impacts to the species and their habitat.
Collection or loss from management	nitocris fritillary butterfly, nokomis fritillary butterfly, yellow lady's slipper, hooded	**ST for Aquatic Habitat and Species:** When drafting (withdrawing) water from streams or other waterbodies, measures will be taken to prevent entrapment of fish and aquatic organisms and the spread of parasites or disease (e.g., Asian tapeworm, chytrid fungus, whirling disease).

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
	lady's tresses	**GL for Aquatic Habitat and Species:** When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **GL for Invasive Species:** Pesticide use should minimize impacts on non-target plants and animals. **ST for Forest Products:** Authorizations to cut, collect, or use forest products for any personal, commercial, or scientific purpose (i.e., permits, contracts, agreements) shall include provisions to ensure the needs of wildlife, which depend upon those forest products, will continue to be met (e.g., fungi and cone collection with respect to overwinter forage needs of squirrels). **GL for Forest Products:** Permits issued for forest products should include stipulations to protect resources. **ST for Special Uses:** Special use authorizations for the collection of live species with limited distribution (e.g., some invertebrates, plants) shall include permit provisions to ensure the species persist onsite. **GL for Special Uses:** As applicable, issuance of special use authorizations should incorporate measures to reduce potential impacts to wildlife and avoid rare and unique habitats (e.g., bogs, fens). **GLs for Research Natural AreaManagement Area:** Management measures should be used (e.g., fencing) to protect unique features. To minimize impacts to unique and sensitive plant species, recreational activities, other than use on the designated trail, should not be encouraged. Research special use authorizations should limit impacts to sensitive resources, unique features, and species within the RNA. **GLs for Recommended Resarch Natural AreaManagement Area:** To minimize impacts to unique and sensitive plant and animal species, recreational activities should not be encouraged.

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		If necessary, recommended RNAs should be fenced to manage unique features. Research special use authorizations should limit impacts to sensitive resources, unique features, and species within recommended RNAs. Recommended RNAs should be managed for nonmotorized access within the area to minimize ground disturbances and protect the resources which make these areas unique.
Nest parasitism	southwestern willow flycatcher, Grace's warbler	**GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **ST for Invasive Species:** Projects and authorized activities shall be designed to reduce the potential for the introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations.
Disease	Townsend's big-eared bat, spotted bat, western red bat, Arizona toad, Chiricahua leopard frog, northern leopard frog, lowland leopard frog	**GL for Aquatic Habitat and Species:** To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **GL for Livestock Grazing:** Efforts (e.g., temporary fencing, increased herding, herding dogs) should be made to prevent transfer of disease from domestic sheep and goats to bighorn sheep wherever bighorn sheep occur. Permit conversions to domestic sheep or goats should not be allowed in areas adjacent to or inhabited by bighorn sheep. **GLs for Minerals and Geology:** To reduce disturbances from human activities and prevent the spread of disease, bat gates should be constructed and installed in cave and mine entrances used as shelter for bats within 3 years of discovery when there are no conflicts with cultural resources. Caves and abandoned mines that are used by bats should be managed to prevent disturbance to species and spread of disease (e.g., white-nose syndrome).

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
Entrapment	FPS that are small mammals, bats, young of other species	**GLs for Aquatic Habitat and Species:** Sufficient water should be left in streams to provide for aquatic species and riparian vegetation. When new water diversions are created or existing water diversions are reanalyzed, measures should be taken to prevent entrapment of fish and aquatic organisms. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **STs for Livestock Grazing:** New or reconstructed fencing shall allow for wildlife passage, except where specifically intended to exclude wildlife (e.g., elk fencing). New livestock watering facilities shall be designed to allow wildlife access and escape. **GL for Livestock Grazing:** During maintenance of existing watering facilities, escape ramps that are ineffective or missing should be replaced. **GLs for Special Uses:** Environmental disturbance should be minimized by co-locating pipelines, power lines, fiber optic lines, and communications facilities. Power pole installation or replacement under special use authorization should include raptor protection devices in open habitat such as large meadows and grasslands. Raptor protection devices should be installed on existing poles where raptors have been killed. **GL for Wildlife Quite AreaManagement Area:** Fences surrounding and within WQAs should be inspected and improved to allow wildlife movement within and outside of the areas. Fences should be removed if no longer needed.
Substantial predation or competition from invasive species	pronghorn antelope, Three Forks springsnail	**ST for All PNVTs:** Vegetation treatments shall include measures to reduce the potential for the introduction of invasive plants and animals and damage from nonnative insects and diseases. **GL for Aquatic Habitat and Species:** To prevent degradation of native species habitat and the incidental or accidental introduction of diseases or nonnative species, aquatic species should not be transferred through management activities from one 6th level HUC watershed to another. **GL for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. **ST for Invasive Species**: Projects and authorized activities shall be designed to reduce the potential for the introduction of new species or spread of existing invasive or undesirable aquatic or terrestrial nonnative populations. **GL for Invasive Species:** Projects and activities should not transfer water between drainages or between unconnected waterbodies within the same drainage to avoid spreading disease and aquatic invasive species. **ST for Special Uses:** Noxious plants and nonnative invasive species monitoring and control shall be included in contracts, permits, and agreements. **GL for High Use Developed Recreation AreaManagement Area:** Management should focus on operation and maintenance, safety, aesthetics, and control of noxious weeds and nonnative invasive species. **GL for Energy CorridorManagement Area:** Invasive plant species should be aggressively controlled within energy corridors to prevent or minimize spread.
Intentional harassment, forced removal, or avoidable disturbance	Mexican wolf, Gunnison's prairie dog, black bear, many FPS (at least during important life cycle periods)	**GL for All Forested PNVTs:** Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife. **GL for All Woodland PNVTs:** Hiding cover, approach cover (by waters), and travel corridor cover should be provided where needed by wildlife. **GLs for Wildlife and Rare Plants:** Modifications, mitigations, or other measures should be incorporated to reduce negative impacts to plants, animals, and their habitats and to help provide for species needs, consistent with project or activity objectives. Cool and/or dense vegetation cover should be provided for species needing these habitat components (e.g., Goodding's onion, black bear, White Mountains chipmunk, western yellow-billed cuckoo). **GL for Wildland Fire Management:** Firelines, helispots, and fire camps should be located to avoid disturbance to critical species and impacts to cultural resources. **GLs for Overall Recreation Opportunities:** Developed and dispersed recreation sites and other authorized activities should not be located in places that prevent wildlife or livestock access to available water. Food and other items that attract wildlife should be managed to prevent reliance on humans and to reduce

PNVT, Habitat Element, or Other Factors of Concern	Associated Forest Planning Species (FPS)	Plan Decisions That Address Risks to Species Viability
		human-wildlife conflicts. **GLs for Dispersed Recreation:** Timing restrictions on recreation uses should be considered to reduce conflicts with wildlife needs or soil moisture conditions. Dispersed campsites should not be located on or adjacent to archaeological sites or sensitive wildlife areas. **ST for Developed Recreation:** Where trash facilities are provided, they shall be bear resistant. **GLs for Special Uses:** Large group and recreation event special uses should not be authorized within wilderness, recommended wilderness, primitive area, wildlife quiet areas, eligible "wild" river corridors, riparian and wetland areas, cultural resource sites, Phelps Cabin Botanical Area, Phelps Cabin Research Natural Area (RNA), or recommended RNAs to protect the unique character of these areas. The use of underground utilities should be favored to avoid potential conflicts with resources (e.g., scenic integrity, wildlife, wildfire, heritage). **GLs for Minerals and Geology:** To reduce disturbances from human activities and prevent the spread of disease, bat gates should be constructed and installed in cave and mine entrances used as shelter for bats within 3 years of discovery when there are no conflicts with cultural resources. Caves and abandoned mines that are used by bats should be managed to prevent disturbance to species and spread of disease (e.g., white-nose syndrome). **GLs for Wildlife Quiet AreaManagement Area:** All WQAs should be managed to preclude snowmobile use to minimize disturbance during the critical winter period. WQA boundaries should be signed to identify the areas and educate the public about their purpose. **GL for Research Natural AreaManagement Area:** Research special use authorizations should limit impacts to sensitive resources, unique features, and species within the RNA. **GL for Recommended Resarch Natural AreaManagement Area:** Research special use authorizations should limit impacts to sensitive resources, unique features, and species within recommended RNAs.

Appendix C. Ecological Existing Conditions

Beginning in 2008 as part of the forest plan revision process, the existing ecological, social, and economic conditions on the ASNFs were identified. The resulting Ecological Sustainability Report, Comprehensive Evaluation Report, and Resources Evaluation Report documented findings and the need for change. These reports are found in the plan set of documents and form the basis for development of a revised forest plan.

While social and economic factors can influence wildlife, these are generally outside of Forest Service influence, e.g., hunter demand for deer. On the other hand, ecological conditions are tied to habitats and the associated animals and plants. A need for change was identified for some of the ecological conditions providing habitat for wildlife and plant species on the ASNFs. Some of these ecological conditions, with examples of implications for wildlife and their habitat, follow.

Soils

- Approximately one-third are considered to be in unsatisfactory or impaired condition; this amount increased by about five times after the 2011 Wallow Fire.
  - Limited ground cover provides less than adequate cover for small mammals that are prey for larger animals.
  - There are 2,832 miles of open NFS roads and 156 miles of NFS motorized trails in the current road and trail system (from TMR analysis) impacting soils and watersheds.

Water

- Overall water quality is good to excellent but some streams and lakes fall sort of state and federal water quality standards.
  - Sediment from inadequate ground cover in the watershed or soil impacts near streams increases siltation that can smother invertebrates.
  - The impact to water quality in major waterways[21] from the 2011 Wallow Fire is unknown at this time; however, impacts will be long term as watersheds slowly recover, even absent of management impacts.

Vegetation

Eight of the 14 vegetation types on the ASNFs are moderately or further departed from desired conditions and from their historic condition; see table 14 and the ESR Vegetation Specialist Report for more detail. This departure is due to prior and ongoing factors such as forest management, livestock grazing, fire suppression, non-native invasive plant and animal species introductions, and the presence of roads. Specific examples include:

- Semi-desert and Great Basin grasslands are more characterized by woodland species.
  - Grassland birds and mammals have lost a substantial amount of habitat on the ASNFs.
  - Pronghorn antelope have lost substantial Great Basin grassland habitat as over 60% of it has been encroached by trees.

- Ponderosa pine today is dominated by young to mid-age forests with higher canopy closures with fewer large trees overall.
  - Recent large fires demonstrate this Forest's vulnerability to crown fire, facilitated by ladder fuels,[22] with loss of suitable forested habitat across very large areas.
  - Large trees are lost where wildfire soil burn severity is moderate to high; more than a fourth of the ponderosa pine in the Wallow Fire burned at these levels, coupled with other large fires, means a further imbalance of tree age classes while trees regenerate and grow over extended time periods.

[21] These major waterways are: Black River, Little Colorado River and major tributaries, and Blue River; all are critically important to downstream, off-Forest users.

[22] Ladder fuels are smaller trees under larger ones that, when they burn, carry the fire into the crowns of the larger trees.

- Some wetland/cienega and montane willow riparian areas exhibit soil compaction from ungulate use and a level of ungulate foraging use precluding restoration of satisfactory conditions.
  - Unique and rare species of vertebrates and invertebrates have experienced major population declines.
  - Even with low gradients, some areas evidence nick points for the start of erosion gullies.

- Madrean pine-oak woodlands exhibit invasion of young, dense woody species with over three-quarters of this type with encroaching trees.
  - Nesting and foraging conditions for ground nesting birds such as Montezuma quail are reduced, as well making these habitats more vulnerable to uncharacteristic wildfire.

Aquatic Biota

- 72% of the over 2,500 miles of riparian habitat are either susceptible to degradation or not functioning.
  - This creates risks for numerous species: As of 2012, there are 7 native fishes, 1 native amphibian, and 1 native invertebrate listed or proposed for listing under the ESA; and there is 1 native fish and 1 native reptile that are currently candidates for listing.
  - The 2011 Wallow Fire burned moderately to severely along over 100 miles of perennial streams , killing riparian vegetation and exposing streambanks to subsequent high flows and erosion.

Species diversity

- While the ASNFs provides a variety of habitats, habitat condition and land management practices here and elsewhere have contributed to concern for the viability of a number of species.
  - As of 2012, outside of aquatic habitats, there are 7 species listed or proposed for listing under ESA and 3 species that are candidates for listing.

Invasive species

- A number of non-native invasive species are impacting wildlife and habitat
  - Crayfish have become widespread across the Forest predating on both native aquatic species and over-utilizing aquatic vegetation; bullfrogs are beginning to appear on the Sitgreaves side of the ASNFs; there are several non-native noxious weed species (terrestrial and aquatic) beginning to proliferate along roads, in disturbed areas, and in water bodies; and there is the threat of the spread of chytrid fungus which can decimate amphibian populations.
  - Where they burned moderately to severely, the 2001 Wallow Fire and earlier large fires facilitate the spread of noxious weeds through introduction from firefighting equipment and the exposure of bare, burned soil which becomes a seedbed.

Climate change

- Changes may impact the timing of precipitation and intensity of natural events such as drought.
  - The ability of wildlife to adapt to differing patterns of moisture, forage growth and water availability are unknown.

Note: For forest plan revision, environmental consequences for wildlife are analyzed in terms of risk to viability in compliance with NFMA. Viability, as a consequence of forest plan alternatives, is based on habitat and limitations relative to existing and future resource conditions that affect vegetation type and other habitat elements. As such, there is not necessarily a direct comparison between ESR existing condition discussions and species viability discussions by alternative. However, the other resource specialist report address existing conditions and environmental consequences for those respective areas for each of the alternatives that, in turn, influence habitat and viability of associated species. For more information, see the various specialists' reports prepared for the FEIS covering vegetation, silviculture, riparian, watershed, and invasive species.

Appendix D. Fine filter habitat element descriptions

The fine filter habitat elements from table 10 are further described in table D1. Also further described are the other factors of viability concern from table 13. Note that each item can describe a variety of specific situations; however, the groupings are made to help facilitate analysis.

Table D1. Description of fine filter habitat and other factors influencing FPS viability

Factor	Description
Habitat elements	
High water quality and/or healthy riparian conditions	Yearlong or nearly yearlong presence of adequate amounts of water and/or saturated soils; dense, tall herbaceous riparian vegetation, with or without riparian trees; no soil compaction
Sometimes shaded or often wet meadows	Shaded areas in openings among trees or open wet meadows (cool micro-climate); extensive ground cover present and soils are little to not compacted
Dense low or mid canopy or shrubs	Density of vegetation cover at the shrub or low canopy level, often with cool micro-climate
Large trees and/or dense upper canopy	Generally, > 16" dbh (diameter at breast height) and often with closed canopies (generally >60% canopy closure)
Snags	Large (>12" dbh, generally >16" dbh), provided by both dying and long dead trees
Down wood or debris	Logs (12" plus) or small woody material or leaf/needle litter on the forest floor usually shaded by overstory trees
Canyon slopes, cliffs, talus or rocky slopes	Cliffs or cool, shaded canyon slopes usually associated with riparian areas or riparian forests, or areas dominated by rocks often with some slope
Other factors of viability concern	
Habitat connectivity	Connectivity of suitable habitat for travel or movement among needed habitat types or habitat components
Collection or loss from management	Removal or loss of rare or uncommon species, most often plants, but also animals or invertebrates
Impacts from parasitism, disease, entrapment, and predation or competition from invasive species	E.g., nest parasitism by cowbirds as influenced by grazing management; aquatic and terrestrial disease as spread by recreation or grazing activities; unsustainable predation or habitat competition from invasive species such as crayfish; small mammal entrapment in troughs, etc.
Intentional harassment, forced removal, or avoidable disturbance	Resulting in disturbance to important life function (e.g., feeding young) or in removal or death

Appendix E. Wildlife quiet areas (WQAs)

Wildlife quiet areas (WQAs) provide a refugium from one of the most intrusive of human disturbance, i.e., motorized vehicle use, while not precluding forest management nor hunting or other recreational activities. They are an identified public scoping issue of concern and are important in the consideration of viability. In addition, WQAs provide relatively undisturbed habitat for a more natural predator-prey interaction. In these areas, wildlife can pursue life functions such as foraging/hunting, breeding, young rearing, resting, etc. without impacts from vehicle noise and movement, and the greater presence of people often associated with vehicles (as compared to where only foot or horseback travel is allowed). While large animals do not pursue all activities within refugia, they provide secure areas that are available during critical periods, e.g., winter time or fawning. A network of refugium areas across a landscape can help provide security and habitat connectivity as, for the ASNFs, across the Mogollon Rim. WQAs and habitat linkages benefit highly interactive species as well by providing safer movement corridors.

The identification and selection of WQAs began in the late 1970s. At this time, the Arizona Game and Fish Department (AZGFD) became interested in the effects of motorized vehicle use on game populations (Neff 1977), especially with the growth of forest visitor use facilitated in part by the increased use of recreational vehicles.[23] Motorized vehicle use can cause animal stress and disrupt resting, foraging and other important life functions. In addition, the opportunity for a hunting experience free of vehicle influence upon wildlife was being diminished. In 1983, the two agencies began a cooperative approach to address the needs of wildlife, signing a memorandum of understanding to establish "wildlife habitat areas" that became known as Wildlife Quiet Areas. This approach was supported by several items of direction in the 1987 Forest Plan. Each area was set up for specific species' (or multiple species') needs.

The general public, hunters, wildlife enthusiasts, and others helped identify areas providing effective habitat security. In all cases, public access would continue to be provided, with hiking, horseback riding and bicycling being considered compatible uses within the habitat areas. Designation of a WQA would also not preclude emergency activities nor approved management uses, such as water lines, timber harvest, and livestock grazing. The selection of areas considered the following:

- Young bearing and rearing locations
- High quality forage
- Good hiding (resting and travel) cover
- Critical wintering locations
- Location relative to heavily used recreation areas
- Need for security within overall heavily populated areas

In 1985, the first five WQAs were selected and implemented by Forest Special Order. The process involved periodic review of the WQAs. Over time, some WQAs were dropped where the expected wildlife benefit did not materialize (e.g., Swale WQA). Alternatively, new WQAs (e.g., Open Draw and Upper Coyote Creek WQAs) were designated where habitat needs for wildlife were identified. Initially, WQAs were to be shifted to different locations over time; however, re-signing new boundaries every few years was cost prohibitive. In addition, State and Forest biologists were observing greater wildlife affinity (numbers and amount of use) and fidelity over time in established WQAs, especially big game and other large mammals.

[23] Sales of all-terrain vehicles in Arizona alone jumped substantially between 1995 and 2000 and more than half of Arizonans participated in four-wheel driving, and about one in four participated in ATV vehicle use at that time (Forest Service, 2003).

In 1991, the Southwestern Regional Office, USFS, published a pamphlet entitled "Quiet Places…Quite Times on the ASNFs" in conjunction with AZGFD. The ASNFs Wildlife and Fish Program incorporated the WQAs into its annual program goals starting in 1991. The WQA program has been monitored and evaluated for effectiveness over the years with reviews during the 1980s, 1990s, and 2000s. WQAs proposed to comprise the WQA Management Area under each plan revision alternative were again evaluated after the 2011 Wallow Wildfire (see the 2012 Wildlife Quiet Area and Habitat Linkages Report).

A number of objectives or benefits were expected of WQAs. These continue to take place and are as follows:

- Reduced wildlife disturbance and stress, resulting in healthier animals and populations.
- More effective wildlife use of all available and suitable habitats.
- Increased value of the outdoor experience (based on public feedback).
- Improved (non-motorized) hunting experience (based on hunter feedback).
- Lengthened time big game animals stay in the areas (per AZGFD).

In 2004, AZGFD began a long term research project looking at wildlife use in wildland-urban interface areas, which included some WQAs. This research and observations by Forest and State biologists and others have noted the following benefits to wildlife, people, and other resources from WQAs:

- Improved population recruitment (more effective habitat).
- More acres of available and suitable habitat are used (more habitat).
- Peaceful nature viewing and greater chance of observing and photographing wildlife.
- Increased quality of the non-motorized hunt experience.
- Healing of road related erosion and reduced user-created tracks.
- Improvement in soil and vegetation (improved habitat quality).
- Reduced damage to fences, corrals and other range developments.

Forest and State biologist believe these benefits (which vary among WQAs) are likely the function of:

- Wildlife knowledge of, and site fidelity to, long term security (core habitat) areas.
- Improved (more natural) predator prey functions (reduced human-related disturbance to both predator and prey).
- Secure areas helping to provide habitat linkages across open, heavily human-utilized and managed areas.

Examination of the layout and scale of WQAs across the ASNFs landscape shows these are few and greatly spaced WQAs, primarily on the Sitgreaves NF. In order to address the need on the Sitgreaves side, the action alternatives proposed additional WQAs as shown in table E1. Four of the additional WQAs are areas now management much like this management area but are not now designated as WQAs.

Table E1. Additional Wildlife Quiet Areas for the Sitgreaves NF by action alternatives

Additional WQAs	Alt. A (acres)	Alt. B (acres)	Alt. C (acres)	Alt. D (acres)
Bear Springs	--	2,831	--	2,831
Cottonwood Seep	--	2,968	--	2,968
Carr Lake	--	--	--	2,196
Palomino	--	--	--	8,028
Hidden Lake	--	--	--	3,227
Acres of additional WQAs:	0	5,799	0	19,250

Features of other management areas also lend themselves to greater habitat security (less human disturbance). This may be in the form of fewer or non-mechanized activities or types of treatment methods with less short-term implementation impacts (e.g., use of fire only in wilderness). Based on suitability, size, and location, the following management areas, in addition to WQAs, contribute to less overall disturbance for wildlife: Wilderness, Recommended Wilderness, Primitive Area, Research Natural Area, Recommended Research Natural Area, and Natural Landscape Management Areas. See figure 2 for the map showing WQAs and other management areas providing greater habitat security across the landscape of the Apache-Sitgreaves NFs.

Differences in size for a WQA among alternatives is a function of the amount of other management areas under each alternative, most often affected by size or number of wildernesses, as described in table A1 and A2.

Table E2. Comparison of WQAs by alternative – number and acreage

WQA Name	District (comment)	Alt. A [a/]	Alt. B	Alt. C	Alt. D
Beaver Turkey Ridge	Black Mesa	3,295 not a MA	3,224	3,224	2,961
Hulsey Bench	Alpine	3,469 not a MA	3,459	3,459	--
Middle Mountain	Alpine	3,629 not a MA	3,629	3,629	3,629
Open Draw	Alpine	2,499 not a MA	2,499	2,499	2,499
St. Peters Dome	Springerville	5,850 not a MA	5,850	5,850	5,850
Upper Coyote	Alpine	829 not a MA	829	829	829
Willow Springs - Horse Trap	Black Mesa	8,690 not a MA	7,637	7,637	6,736
Woolhouse	Lakeside	17,245 not a MA	17,245	17,245	17,245
Bear Springs	Black Mesa New, fill gap	--	2,831	--	2,831
Cottonwood Seep	Black Mesa & Lakeside New, fill gap	--	2,968	--	2,968
Carr Lake	Black Mesa Designate as WQA	--	--	--	2,196
Palomino	Black Mesa Designate as WQA	--	--	--	8,407
Hidden Lake	Springerville Designate as WQA	--	--	--	3,227
No. of WQAs **Acres of WQAs** **% of ASNFs**		8 45,506 2.2%	10 50,173 2.4%	8 44,372 2.1%	12 59,379 2.8%

[a/] The eight WQAs under Alternative A are implemented via forest special closure order and are those current as of December 2012; they would become a management area in alternatives B, C, and D.

Appendix F. Existing conditions for the current 1987 Forest Plan (Alt. A) management indicator species (MIS)

Table F1 provides the affected environment or existing condition information for the 17 management indicator species (MIS) under the current forest plan as of 2011 in terms of habitat and population trend (the following reflects post-2011 Wallow Fire conditions). Table F2 provides the latest population trend for these 17 MIS.

Table F1. 2011 MIS existing condition regarding population trend

1987 Forest Plan Management Area (MA)	MIS	Type of habitat	Habitat trend	Population trend
MA 1 TIMBER	red-napped (yellow-bellied) sapsucker	snags	stable	stable
	mule deer	early succession	increasing	Stable to increasing
	Merriam's turkey	late succession	stable	stable
	northern goshawk	late succession	stable to declining	declining
	pygmy nuthatch	late succession	declining	stable
	Rocky Mountain elk	early succession	increasing	stable to declining
	Abert 's squirrel	early succession	stable to declining	stable
	red squirrel	late succession	declining	stable to declining
	hairy woodpecker	snags	increasing	stable
	Mexican spotted owl	late succession	declining	declining
MA 2 WOODLAND	juniper (plain) titmouse	snags	stable	stable
	mule deer	as above	as above	as above
	Rocky Mountain elk	as above	as above	as above
	pronghorn antelope	early succession	stable	increasing
MA 3 RIPARIAN	Lincoln sparrow	high elevation riparian	low populations but stable	(assumed) stable
	macro-invertebrates	high quality riparian	declining	declining
	yellow-breasted chat	low elevation riparian	stable (but lower than potential)	(assumed) stable
	Lucy's warbler	low elevation riparian	(assumed) low but stable	(assumed) increasing
MA 4 GRASSLAND	pronghorn antelope	as above	as above	as above
	Rocky Mountain elk	as above	as above	as above
MA 5 WATER	cinnamon teal	wetlands	stable to potentially declining	(assumed) declining

continued

Table F2. 2011 MIS existing condition regarding population trend

1987 Forest Plan Management Area (MA)	MIS	Type of habitat	Habitat trend	Population trend
MA 1 TIMBER	red-napped (yellow-bellied) sapsucker	snags	stable	stable
	mule deer	early succession	increasing	Stable to increasing
	Merriam's turkey	late succession	stable	stable
	northern goshawk	late succession	stable to declining	declining
	pygmy nuthatch	late succession	declining	stable
	Rocky Mountain elk	early succession	increasing	stable to declining
	Abert 's squirrel	early succession	stable to declining	stable
	red squirrel	late succession	declining	stable to declining
	hairy woodpecker	snags	increasing	stable
	Mexican spotted owl	late succession	declining	declining
MA 2 WOODLAND	juniper (plain) titmouse	snags	stable	stable
	mule deer	as above	as above	as above
	Rocky Mountain elk	as above	as above	as above
	pronghorn antelope	early succession	stable	increasing
MA 3 RIPARIAN	Lincoln sparrow	high elevation riparian	stable (but low populations)	stable
	macro-invertebrates	high quality riparian	declining	declining
	yellow-breasted chat	low elevation riparian	stable (but lower than potential)	stable
	Lucy's warbler	low elevation riparian	low (but low populations)	increasing
MA 4 GRASSLAND	pronghorn antelope	as above	as above	as above
	Rocky Mountain elk	as above	as above	as above
MA 5 WATER	cinnamon teal	wetlands	stable to potentially declining	declining